



EDIH4UrbanSAVE

Course Content & Methodology – Final Version
Deliverable D4.3, Version 1.9, 28.11.2024



This project has received funding from the European Union's Digital 2021 research and innovation program under grant agreement No 101083713.

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Course Content & Methodology

Work package	WP4
Task	T4.1-T4.6
Document number	D4.3
Deliverable type	Document, report
Title	Course Content & Methodology – final version
Author(s) and Contributor(s)	Nataliya Martynyuk, Stephanie von Riegen
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Location	Teams Collaboration Platform: WP4 EDIH_Deliverable_4_3_Course Content & Methodology_final version
Version	1.9
Status	Final version
Dissemination Level	Public

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

History of changes

Date	Ver.	Author(s)	Change description
08.08.2024	1.0	ARIC Nataliya Martynyuk	Document creation
09.09.2024	1.1	ARIC Nataliya Martynyuk	Focus: Template, structure
17.10.2024	1.2	ARIC Nataliya Martynyuk, HITeC Stephanie von Riegen, HAW Steffen Treske, HWK Friedemann Masur, TUHH Johannes Schnelle	Focus: contributions of partners
21.10.2024	1.3	ARIC Nataliya Martynyuk	Focus: Certificate courses; HAW and TUHH contribution
23.10.2024	1.4	HITeC Stephanie von Riegen	Focus: HITeC contribution
24.10.2024	1.5	HITeC Stephanie von Riegen	Adding content slides
17.11.2024	1.6	ARIC Nataliya Martynyuk	Adding content slides
20.11.2024	1.7	HITeC Kai Himstedt	Document revision, final review (1)
21.11.2024	1.8	ARIC Nataliya Martynyuk	Text corrections
25.11.2024	1.9	HITeC Stephanie von Riegen	Final review (2)

Executive summary

This deliverable describes the services related to the pillar “Course Content & methodology” in the European Digital Innovation Hub for urban interconnected supply and value Ecosystems¹ (EDIH4UrbanSAVE). Aligned with the Grant Agreement (GA), Tasks 4.1 – 4.6 and based on Deliverable 4.1 and 4.2, the document outlines a curriculum comprising innovative skill-enhancing formats. This deliverable is an updated version of “Course Content & methodology” after a project duration of 24 months. [Changes, updates and enhancements to the previous version are marked in blue to make changes easier to recognize.](#)

After a short overview in a catalogue, developed Skills & Training formats are explained in detail. Concept of joint applied academy (*EDIH Academy*), which includes offering of application-oriented certificate courses as well as the Skills & Training formats, are presented. Methodology for certificate courses for key technologies are highlighted.

¹ In the following text, EDIH4UrbanSAVE is also referred to as EDIH Hamburg.

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1. Introduction

The EDIH will prepare the European society and economy and place Europe at the forefront of sustainable tech development and the twin transition (digital & green). Therefore, important new and established innovation actors and the education sector have joined forces across clusters and industries. The EDIH Hamburg will contribute to the twin transition of local Small and Medium Enterprises (SMEs), small mid-caps and Public Sector Organisations (PSOs) with a portfolio based on existing local competencies, covering the key digital technologies of AI (Artificial Intelligence), HPC (High-Performance Computing), cybersecurity, distributed infrastructure and digital skills, including, where relevant, their environmental impact. A large-scale digital transformation of the metropolitan region of Hamburg will be facilitated by formats offered in *EDIH Academy*.

1.1 *EDIH Academy* Concept

All educational services to be provided under the project have been combined into a concept of joint applied *EDIH Academy*. It will offer demand-based (further) education opportunities aiming to provide project's target groups (SMEs, small mid-caps and PSOs) with the best tools to excel in the digital age and to promote the successful integration of key technologies into everyday operations.

In general, the *EDIH Academy* will offer needs-driven trainings (see Section 2) and application-oriented certified courses for key technologies (see Section 3). The trainings will be delivered in various formats developed by the project partners and provide a general overview or introduction to a topic or skill in a short and concise form. Whereas certificate courses will be longer learning interventions that will provide comprehensive, in-depth coverage of a topic or skill and offer formal certification.

Local SMEs, small mid-caps and PSOs will be able to acquire the required core competencies in the key technologies and digital skills in a demand-driven manner as well as learn about respective methods (e.g., agile development, design-thinking, technology road mapping) and a proper innovation mindset (open innovation and human-centred approach). Training and teaching activities will be based on modern methods from experience-based learning as well as e-learning and blended learning, using state-of-the-art software and hardware environments. The variety of topics and training formats developed will help to fill the knowledge gaps in the relevant field and ensure a positive learning experience.

To ensure continuous improvement of the services, the *EDIH Academy* emphasizes ongoing feedback by customers (see Sections 2.5 and 3.2). By implementing a Continuous Improvement Process (CIP), an agile feedback process is established. Direct feedback by customers will help to understand the target groups, their needs and preferences for training activities. Service development and improvement will follow a two-step process, starting with a pilot phase and progressing to regular operations to match customer needs.

Learning courses enable SMEs and PSOs to get an overview of suitable key technologies with their requirement, understand and use the latest tools, ensuring they remain at the forefront of technological change. Overall, outcomes by *EDIH Academy* operation to be achieved include:

- need-based (further) education is on offer
- awareness and skills on future topics among the young and aged is raised
- skilled workers are offered an opportunity to play an active part in the digital transformation, and, by extension, in their own future work environment

- generally, the level of digital skills and the local human capital is raised
- the shortage in skilled workers in the short and long term is alleviated

These positive effects on human capital will enable businesses to undergo digital transformation and to innovate.

2. Overall Skills & Training Services Curriculum

This section takes a closer look at the services and formats developed for the “Skills & Training” (ST) pillar of the project. The services are described in terms of formats, focus, scope and partner involvement. Materials for operation are handled by each partner individually. The entry formats (e.g., workshops at the basic and expert level) are essentially also embedded into a consulting process in which, tailored to the current practice, needs, goals and challenges of enterprises or organisations are assessed in meetings/interviews/questionnaires in order to obtain an overview of potentials. This approach and an enterprise tech check-up are the basis to develop a strategy and EDIH Hamburg service roadmap to include sector and technology trends, business models, etc. towards organisation development goals, gains, risks, priorities and resource allocations. An outcome for the organisation is an overview of suitable key technologies with their requirement and concrete strategy road mapping steps: use case development, secure funding, identifying partners, event and networking opportunities.

2.1 Skills & Training Services Portfolio

Based on the target groups’ needs, their context and these attributes, we identified how the key technologies of ADCH (AI, Digitisation, Cybersecurity, and HPC) have the potential to transform SMEs and public services. In what follows, the activities of the EDIH in the skills & training services are described in more detail in Figure 1.

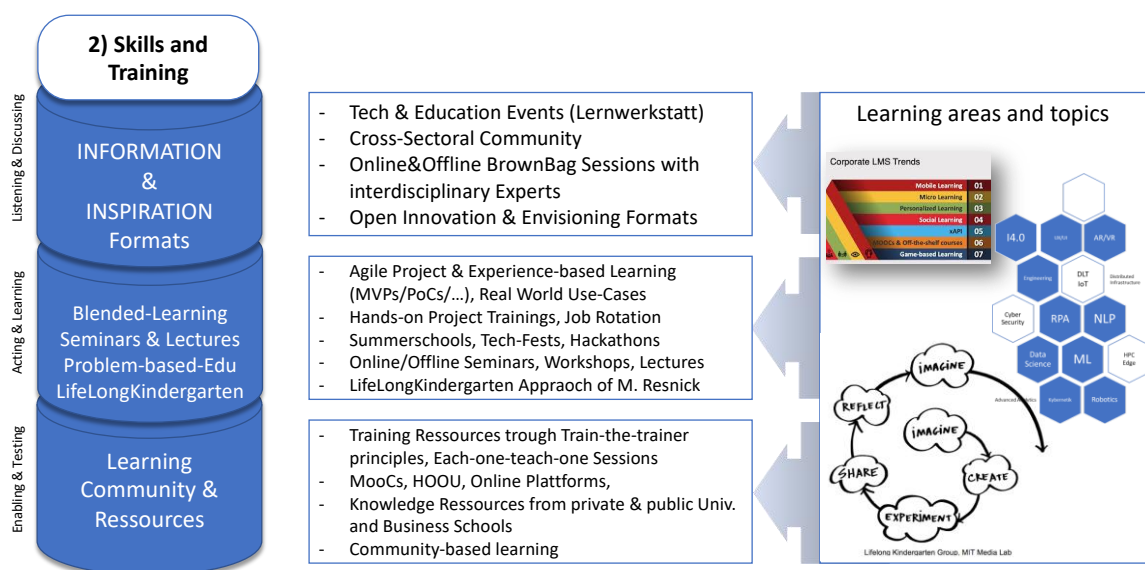


Figure 1: EDIH Hamburg service portfolio for Skills & Training

The service portfolio, depicted above, is divided into three levels, in which different types of interaction, learning and cooperation with the intended target groups (Logistics, Aviation-, Transportation-, Maritime-Industry, Services, Crafts & Food Industry and the public administration, integrated via the Public Private Partnerships) are promoted. These are information formats for different skill levels (e.g. brown bag sessions, webinars, cross sectoral community events), in which the target groups are rather inspired and “consume”, up to hands-on implementation and education formats.

The first level of services is formed by “Listening & Discussing” formats that provide information about the key technologies ADCH (e.g., in expert lectures, tech sessions, deep dives and interactive meetups) and focus in particular on interdisciplinary exchange, networking in showrooms and innovative environments such as in the DigiHub, ARIC, or the innovation lab network of the EDIH Hamburg consortium.

The second level is formed by the “Acting & Learning” and “Advice & Matching” offers. Here, activities are compiled that actively involve the ecosystem, ensure interdisciplinary exchange (including demo days, hands-on sessions, hackathons, etc.) and publicly demonstrate applications to a broad target group that are already in use or are already being tested in pilots. In these formats, the target group is activated through interaction, collaboration and joint learning. In the pillar “Skills & Training”, blended-learning concepts and train-the-trainer models are applied and self-developed in this level (e.g., data literacy courses). Problem and project-based learning helps to focus on transfer of knowledge, strengthening practical relevance and competencies that are needed in the real world.

The third level supports the measures and offerings of the first two levels. The innovation community is built up analogously, which bundles experts, use cases and network access. EDIH tech scouts will network bilaterally with experts to enlarge this community (ARIC already has >360 AI, HPC, Big Data, Cloud digitalisation experts in the community).

2.2 Skills & Training Services Catalogue

The *EDIH Academy* will offer Skills & Training services in various formats (e.g., masterclasses, webinars, seminars, workshops, demonstrations, consultations, community events) on a variety of topics (e.g., AI, HPC, cybersecurity, Machine Learning, digital transformation) for different skill levels. The condensed list of Skills & Training services is listed in

	Partner	Title
1.	HITeC	An insight into the field of HPC
2.	HITeC	The AI act
3.	HITeC	AI for deciders
4.	HITeC	An introduction to Machine Learning
5.	HITeC	Convolutional Neural Networks
6.	HITeC	AutoML and Hyperparameter Optimisation
7.	HITeC	Embedded AI
8.	HITeC	An introduction to Image Generation with AI
9.	HITeC	Test Management – recommendation and best practices of software testing from industry & research
10.	HITeC	Enabling the realization of own innovations
11.	HITeC	An Introduction to threat detection and prevention
12.	HITeC	An introduction to ML security and privacy
13.	HITeC	An introduction to web security: Attacks
14.	HITeC	An Introduction to web security: authentication and data integrity
15.	HITeC	An Introduction to web security: denial of service and hosting
16.	HAW	Search engine optimization: becoming more visible on the web
17.	HAW	Data as the basis for business decisions – Data Driven Business

18.	HAW	Digitalization of intralogistics – collect and use data directly from the material flow
19.	HAW	OGD – Public data is there to be used
20.	HAW	Turning old into new: how can machines be digitized at low cost?
21.	HAW	Creating customer favourites: with data to a better product
22.	HAW	Beyond reality: the Metaverse and its possibilities
23.	HAW	AI-supported search engine optimization for SMEs
24.	HAW	Unpredictable? Addressing Supply Chain Risks with SCRM
25.	HAW	Production of the future: Optimally utilizing machines through retrofitting
26.	HAW	Digital assistance – end of monotonous work
27.	HAW, TUHH	Smart Supply Chain – DLT Demonstrator
28.	HAW	From old to new – improving the energy balance
29.	HAW	Vom Datenschutz zum Datennutz
30.	HAW	From data to action - Artificial Intelligence in quality management
31.	HAW	From keyword to content: AI-powered SEO techniques
32.	HAW	CARVIS – Carbon Visualization in supply Chains Demonstrator (formerly known as Carbon Accounting Demonstrator)
33.	HAW	Content is (KI)ng – AI-powered SEO
34.	HAW	AI-Hackathon
35.	HAW	Customer relationship management – It is impossible to have none
36.	HAW	DIY Chatbot
37.	HAW	AI tools for craftsmen
38.	HAW	Training AI models for everybody
39.	HAW	How do I tell my Chatbot? Effective prompting techniques for better answers
40.	HAW	Intelligent image recognition: AI for quality management
41.	HAW	AI tricks for SEO: How does my company become visible online?
42.	HAW	Website as a success factor: Branding, storytelling, dramaturgy
43.	HAW, TUHH	Prompt Engineering – Better results when using ChatGPT and Stable Diffusion (Webinar)
44.	TUHH, HAW	The smart supply chain – More transparency through IoT and decentralised networks (“Demonstration”)
45.	TUHH	Workshops using the LEGO® SERIOUS PLAY® (LSP) method
46.	TUHH	From linear to circular – Sustainable transformation of business models
47.	TUHH	Creating sustainable products with design thinking
48.	TUHH	Identifying and addressing challenges in sustainability reporting
49.	TUHH	Developing a future oriented business model – but how?
50.	TUHH	Digital technologies to enhance scope 3 carbon accounting
51.	TUHH	Machine Learning basics: how to create value with ML
52.	TUHH	Digital Twins: The self-optimizing company
53.	TUHH	Navigate Uncertain Times Agile and Purposefully with OKR
54.	TUHH	Ready to Thrive Through Crisis - Equipped with Expertise for the Future!
55.	TUHH	Resilient Future: Strategies for Business Continuity in a Volatile World

56.	TUHH	Artificial Intelligence in Production
57.	HWK	Current topics in digital transformation (“Info event”)
58.	HWK	Current topics in digital transformation (“Experience exchange”)
59.	HWK	Digitalization Consultation
60.	ARIC	ARIC Insights
61.	ARIC	LLMs in logistics – opportunities and risks of Bard, ChatGPT & Co
62.	ARIC	Workshop for Startup Support Programs: How to identify AI in Startups?
63.	ARIC	Introduction to generative AI
64.	ARIC	Responsible AI
65.	ARIC	Certificate course "Elements of AI for Business"

Table 1.

The project partners are committed to further developing and discovering new non-standard training formats for the project’s target groups. For example, competencies are imparted through concrete “doing” (e.g. summer schools, workshops, implementing, experimenting) in the joint innovation laboratories such as the ARIC “AI Lab/Showroom”², “Creative Space for Technical Innovations”³, “DESY Innovation Factory”⁴, “Homeport Lab”⁵ and other training facilities (e.g. Institute for “Responsible AI”⁶). The creative industries (artists, musicians, designers and other creatives) could be involved, in particular through the cooperation partner Cluster *Kreativwirtschaft* (e.g., in workshops series “AI & music” and “AI & arts”). This creates a creativity-promoting mix between tech and art that breaks up usual thought patterns and has a focused people-centred approach. An example of a non-standard training format is also a didactic card game⁷ developed by *PLOT4ai* that performs threat modeling on AI/ML systems. The consortium has already established intensive contacts with representatives of the above-mentioned fields.

	Partner	Title
66.	HITeC	An insight into the field of HPC
67.	HITeC	The AI act
68.	HITeC	AI for deciders
69.	HITeC	An introduction to Machine Learning
70.	HITeC	Convolutional Neural Networks
71.	HITeC	AutoML and Hyperparameter Optimisation
72.	HITeC	Embedded AI
73.	HITeC	An introduction to Image Generation with AI
74.	HITeC	Test Management – recommendation and best practices of software testing from industry & research

² <https://aric-hamburg.de/pressemeldung/ai-showroom/>, retrieved in November 2024

³ <https://csti.haw-hamburg.de/>, retrieved in November 2024

⁴ https://innovation.desy.de/ueber_uns/projekte/dif/index_ger.html, retrieved in November 2024

⁵ <https://www.homeport.hamburg/spaces/landtestflaechen>, retrieved in November 2024

⁶ <https://www.responsible.ai/who-we-are#:~:text=The%20Responsible%20AI%20Institute%20%28RAI%20Institute%29%20is%20a,landscape%20of%20creating%2C%20selling%20or%20buying%20AI%20products.,> retrieved in November 2024

⁷ <https://plot4.ai/>, retrieved in November 2024

75.	HITeC	Enabling the realization of own innovations
76.	HITeC	An Introduction to threat detection and prevention
77.	HITeC	An introduction to ML security and privacy
78.	HITeC	An introduction to web security: Attacks
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81.	HAW	Search engine optimization: becoming more visible on the web
82.	HAW	Data as the basis for business decisions – Data Driven Business
83.	HAW	Digitalization of intralogistics – collect and use data directly from the material flow
84.	HAW	OGD – Public data is there to be used
85.	HAW	Turning old into new: how can machines be digitized at low cost?
86.	HAW	Creating customer favourites: with data to a better product
87.	HAW	Beyond reality: the Metaverse and its possibilities
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119.	TUHH	Ready to Thrive Through Crisis - Equipped with Expertise for the Future!
120.	TUHH	Resilient Future: Strategies for Business Continuity in a Volatile World
121.	TUHH	Artificial Intelligence in Production
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126.	ARIC	LLMs in logistics – opportunities and risks of Bard, ChatGPT & Co
127.	ARIC	Workshop for Startup Support Programs: How to identify AI in Startups?
128.	ARIC	Introduction to generative AI
129.	ARIC	Responsible AI
130.	ARIC	Certificate course "Elements of AI for Business"

Table 1: Skills & Training services catalogue

2.3 Skills & Training Services Content

Partner: HITeC		Title: An insight into the field of HPC	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Webinar		Focused on key technologies: HPC	Status: ready to offer
Stakeholder from SME/PAs side: those with a need for HPC			
Requirements for participation: strong IT affinity			
est. Duration: 60 - 120 minutes			

Description of “An Insight into the Field of HPC”:

HPC (High-Performance Computing) systems are used when a simple PC or a single workstation is no longer capable of performing the required computations or analyses of big data volumes in a reasonable amount of time. In traditional HPC, a corresponding task is split and processed in parallel on the compute nodes of an HPC system, which shortens the runtimes. A single compute node is roughly comparable to a powerful PC. Simply put, many compute nodes are then connected via a high-speed network to build an HPC cluster system. HPC represents a key technology for solving complex problems. In the context of the presentation, examples are given of typical tasks that are processed with an HPC cluster.

The impressive progress of the performance (measured in Floating Point Operations per Second (FLOPs)) of HPC systems will be shown with the evolution of the Top500 list⁸ (established in 1993) of the most powerful supercomputers, which is updated twice a year. The typical architecture of current HPC cluster systems is described at a basic level. A further topic of the presentation will be the execution of parallel programs on a cluster system. Unlike using a simple PC, the users of HPC systems compete for the expensive resources of the cluster. Workload managers are meant to manage these resources with an appropriate scheduling so that users are treated fairly. The concept of the presentation is based on ideas for the HPC-Führerschein (“HPC Driving License” in English) from the PeCoH (Performance Conscious HPC) project⁹ and on ideas presented on the EDIH Network eLearning platform in a webinar¹⁰ by Laura Morselli.

Value of service:

The participants of the training will acquire skills and will learn about

- the hardware components of an HPC cluster and their functions
- parallel computer architectures, in particular: the distinction between shared and distributed memory systems
- I/O architectures used in HPC environments: local, distributed, parallel and hierarchical file systems
- how the performance of parallel programs may be assessed
- FLOPS which is the key measurement unit for the performance of HPC systems, and its pitfalls
- Moore’s law and its significance for performance frontiers in modern HPC

⁸ TOP 500 – The List, www.top500.org, retrieved in November 2023

⁹ Performance Conscious HPC, www.hhcc.uni-hamburg.de/pecoh.html, retrieved in November 2023

¹⁰ Available at <https://elearning.edihnetwork.eu/user/view.php?id=79&course=10>, retrieved in November 2023

- the definitions for key terms: speedup, efficiency, and scalability
- Amdahl's law and its significance for performance frontiers in modern HPC
- overheads for communication and synchronization that are introduced by parallelization
- other sources of parallel inefficiency: load imbalances, hardware effects
- how workload managers control the unattended background execution of programs or jobs, respectively, by the help of job queues
- typical scheduling principles (e.g., first come first served, shortest job first) to achieve objectives like minimizing the averaged elapsed program runtimes, and maximizing the utilization of the available HPC resources

Learning methods used: lecture

List of references and/or learning resources: Kai Himstedt worked in the Project PeCoH and can contribute the topics developed in the EDIH project¹¹. The contents were a joint effort by Nathanael Hübbe, Hinnerk Stüben and Kai Himstedt.

Furthermore, Laura Morselli's slides from the train-the-trainer event with the section "Introduction to HPC" on the EU's online eLearning platform¹² have received attention for further development.

Overview slides: see Annex 1.

Partner: HITeC		Title: An introduction to the AI Act	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Webinar		Focused on key technologies: AI	Status: in preparation
Stakeholder from SME/PAs side: for those who are deciders for development in SMEs and PSOs			
Requirements for participation: none			
Duration: 75 minutes			

Description of "Introduction the the AI Act"

The workshop on the AI Act (Artificial Intelligence Regulation) for SMEs will focus on informing customers about the upcoming legal framework and showing them how they can implement and benefit from the provisions of the AI Act. The added value of such a workshop lies in the transfer of knowledge and practice-oriented strategies to prepare for the new regulation and secure competitive advantages. SMEs that ensure early compliance with the AI Act can build trust with customers, investors and business partners and potentially gain market share.

The format language can be German or English (depending on participants).

Value of service:

The participants of the training will acquire skills and learn about

¹¹ Performance Conscious HPC, www.hhcc.uni-hamburg.de/pecoh.html, retrieved in November 2023

¹² <https://european-digital-innovation-hubs.ec.europa.eu/knowledge-hub/edih-train-trainer-courses/introduction-hpc>, retrieved in November 2023

- general principles, terms and concepts of the AI Act
- relevance for EDIH customers
- overview of the provisions
- Duties and requirements
- Requirements for the explainability of AI models
- best practices

Learning methods used: lecture.

Overview slides: see Annex 2.

Partner: HITeC		Title: AI for deciders	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Webinar		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: for those who are deciders in SMEs			
Requirements for participation: none			
est. Duration: 75 minutes			

Description of “*AI for deciders*”:

The workshop aims explicitly at people without a computer science background, and there especially deciders, CEOs (Chief Executive Officer), marketing experts, or generally all future users, who want to learn about the general principles and methods of Machine Learning and data-driven Artificial Intelligence (AI). It is for those who are not developers and have no experience with AI or AI-projects, but want to/have to discuss using AI in your company or to decide about AI projects. Participants are going to learn about the basic concepts of AI and Machine Learning, especially how it works, what they need to implement successful AI projects, and what data they need to achieve good results. The workshop conveys the needed vocabulary to talk to others and to understand problems.

The workshop introduces the basic concepts behind data-driven AI and Machine Learning. The main aim is for all participants to develop a basic understanding of the general process and all important keywords along the way, without delving into technical details. At the end of the workshop, all participants should be able to answer the following questions (among others): How does an AI system learn? What kind of data do I need and how much? What problems can I solve with AI? Which competencies do I need in my team to implement a successful AI project?

The workshop consists of a presentation where all the concepts will be explained, and a second part where 1-2 use cases are discussed, to show how AI projects can be successfully implemented.

The format language can be German or English (depending on participants).

Value of service:

The participants of the training will acquire skills and learn about

- general principles, terms and concepts of AI
- AI buzzwords

- which problems ML can solve
- what requirements data must satisfy
- bias
- overfitting
- AI project requirements
- best practices

Learning methods used: lecture.

Overview slides: see Annex 3.

Partner: HITeC		Title: An introduction to Machine Learning	
Service: ST-1 /ST-2	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop & Training		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: Beginners with an affinity for development			
Requirements for participation: beginners with Python knowledge or at least programming knowledge			
est. Duration: 3 Sessions, 180 minutes each			

Description of “*An introduction to Machine Learning*”:

This applied workshop aims at beginners with Python experience, or at least general programming skills, who want to get a practical introduction to the topic of AI and Machine Learning.

The workshop consists of three sessions for the three different main learning paradigms of data-driven AI: Supervised, unsupervised, and Reinforcement Learning. In each session, first, the basic principles of the learning paradigm and its use cases will be explained. The participants will learn about 1-2 representative methods for each paradigm: k-means and DBSCAN (Density-Based Spatial Clustering of Applications with Noise, unsupervised), Regression and Multi-Layer Perceptron Network (MLP, supervised), and Q-Learning (Reinforcement Learning). The selection of those methods was done according to didactic as well as application-oriented criteria, i.e., they are simple enough to quickly grasp the underlying principles, but are also the foundation on which many applied methods are based on.

Each session contains both a theoretical part, in which the basic principles and methods will be introduced to build a solid foundation and a hands-on part, in which prepared tasks will be implemented together and discussed after the theoretical concepts have been understood. The understanding of the theoretical principles will be thus deepened, while all participants gain hands-on experience with the respective methods. The chosen examples all are based on freely available data and software frameworks, to enable everybody to continue learning after each session independently. By this, we want to ensure that each participant has the possibility to easily transfer and expand their knowledge towards their own problem cases after the workshop ends.

Since the hands-on session is done with Python code, basic programming skills are needed (optimally already in Python). The programming tasks will be done online through Google Collaboratory, so the participant would need a working Google account. Basic mathematical

skills (robust school knowledge) are beneficial to understand the mathematical underpinnings of each method.

In classical simulation systems, a code-driven approach is usually in the foreground, with which a large number of equations, as they are typically created for the models of real-life problems, are solved with the help of numerical methods. Machine Learning (ML) is a subset of AI (Artificial Intelligence) that, in contrast, is based on a data-driven approach generating knowledge from experience, so to speak, and recognizing patterns after a training phase on representative sample data. These patterns are then transferred in the sense of a generalization for the analysis of further unknown input data, for example for decision-making or classification.

Deep Learning, a major topic of the workshop, is a subset of ML and is based on neural networks to mimic the learning of the human brain with corresponding algorithms. Three training types can be distinguished: a) Unsupervised learning to automatically group data by their correlated properties, b) supervised learning to handle labeled data by explicitly assigning properties in the training phase to the current input (e.g. for classification), and c) reinforcement learning based not on data sets but on rewards for “good actions” in the interaction with the environment during the training phase.

Value of service:

The participants of the training will acquire skills and learn about

- learning paradigms of AI
- data-driven AI
- which problems ML can solve
- what requirements data must satisfy
- evaluating the results after training and validation
- overfitting of parameters, which leads to the loss of generalization capability
- supervised/unsupervised learning
- reinforcement learning
- k-means
- DBSCAN
- Regression
- MLP
- Q-Learning.

Learning methods used: lecture and hands-on part

List of references and/or learning resources: The concept of the workshop is based on ideas for an AI training course held earlier at HITeC and covers also ideas presented on the EDIH Network eLearning platform in a train-the-trainer webinar¹³.

Overview slides: see Annex 4.

¹³ Available at <https://elearning.edihnetwork.eu/course/view.php?id=23> , retrieved in May 2023

Partner: HITeC		Title: Convolutional Neural Networks	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Hands-on session		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: intermediates with an affinity with neural network/learning			
Requirements for participation: intermediates with Python knowledge/programming knowledge			
est. Duration: 180 minutes			

Description of “Convolutional Neural Networks”:

This session is for intermediates (advanced beginners) who already have experience with neural networks and supervised learning.

This workshop deals with a special class of neural networks that are partly responsible for the quick rise of deep learning: Convolutional Neural Networks (CNN). This type of network is specifically well suited for pattern recognition and is for many years now the state of the art in image processing. This class is often also part of neural processing chains, where high-dimensional, complex inputs have to be transformed to higher-level, more abstract representations for further processing. The goal for this workshop is to teach the specific features of this network type, especially in comparison to the Multi-Layer Perceptron, as a typical representative of supervised neural learning. The common hyperparameters will be discussed and their effects demonstrated within a realistic application example.

After a theoretical part, in which the basic principles and features will be introduced, prepared tasks will be implemented together and discussed in a hands-on fashion. Therefore, the understanding of the theoretical principles will be deepened, while all participants gain hands-on experience with the effects of different design decisions and hyperparameters. The chosen examples all are based on freely available data and software frameworks, to enable everybody to continue learning after each session independently. By this, we want to ensure that each participant has the possibility to easily transfer and expand their knowledge towards their own problem cases after the workshop ends.

Knowledge about general neural processing and supervised learning will be assumed. Optimally, all participants should have completed the first and second part of the workshop series “*An introduction to Machine Learning*”.

Since the hands-on session is done with Python code, basic programming skills are needed (optimally already in Python). The programming tasks will be done online through Google Collaboratory, so participants need a working Google account. Basic mathematical skills (robust school knowledge) are beneficial to understand the mathematical underpinnings of each method.

Value of service:

The participants of the training will acquire skills and learn about

- Image Processing
- CNN
- Pattern recognition.

Learning methods used: lecture and hands-on part.

Overview slides: see Annex 5.

Partner: HITeC		Title: AutoML and Hyperparameter Optimisation	
Service: ST-2	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop and Training		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: for those who are developers in SMEs			
Requirements for participation: Participants with practical experience with neural networks and supervised learning			
est. Duration: 180 minutes			

Description of “*AutoML and Hyperparameter Optimisation*”:

This workshop aims at advanced users who have already practical experience with neural networks (especially MLP and CNN) and supervised learning and are now interested to optimize them.

A big issue with current deep learning approaches is finding optimal hyperparameters (e.g. network structure, learning rate, activation function, etc.) for a given problem case. Because of a long list of possible parameters, their possible interactions, and the often still missing knowledge on optimal parameters in the given domain, often automatic search in the parameter space is the tool of choice. This workshop introduces the general ideas and principles in two steps: First, the basic process is shown by optimizing an MLP for a simple regression problem. Then, in a second step, the effects of different methods and parametrizations are demonstrated on a more complex and realistic classification problem for a CNN. At the end of the workshop, all participants will have gained an overview of currently used optimization methods and practical knowledge on at least one state-of-the-art approach.

Each session contains both a theoretical part, in which the basic principles and methods will be introduced, and a hands-on part, in which prepared tasks will be implemented together and discussed. Therefore, the understanding of the theoretical principles will be deepened, while all participants gain hands-on experience with the respective methods. The chosen examples all are based on freely available data and software frameworks, to enable everybody to continue learning after each session independently. By this, we want to ensure that each participant has the possibility to easily transfer and expand their knowledge towards their own problem cases after the workshop ends.

Practical experience with neural network programming in Python is expected. Optimally, all participants should have already completed the three sections of “*An introduction to Machine Learning*”, in which that knowledge is taught. This workshop seamlessly builds on “*An introduction to Machine Learning*” in terms of use cases and examples and thus is the ideal continuation.

Since the hands-on session is done with Python code, basic programming skills are needed (optimally already in Python). The programming tasks will be done online through Google Collaboratory, participants need a Google account.

The format language is English only at the moment.

Value of service:

The participants of the training will acquire skills and learn about

- Advanced Neural Learning
- Optimization of MLP
- CNN
- Hyperparameter
- Optimization.

Learning methods used: lecture and hands-on part

Overview slides: see Annex 6.

Partner: HITeC		Title: Embedded AI	
Service: ST-2	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop and Training		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: for those who are developers in SMEs			
Requirements for participation: Participants with practical experience with neural networks and supervised learning			
est. Duration: two sessions, each 120 minutes or one session with 120 minutes			

Description of “Embedded AI”:

This workshop aims at advanced users with practical experience with neural networks (especially MLP and CNN) and supervised learning and are now interested in deploying them in an embedded system.

Embedded AI has many applications in healthcare, the automotive industry, and smart homes. One issue is finding suitable embedded hardware for a particular application. Many factors should be considered when designing an embedded system, such as accuracy, cost, memory, programming efforts, and power consumption. Depending on the application, one may have different priorities. This workshop first introduces applications and decision-making factors. It is also demonstrated how embedded hardware can be programmed. Different neural networks and applications will be shown in this workshop.

The session contains both a theoretical part, in which the basic principles and methods will be introduced, and a demonstration part, in which the instructor implements and demonstrates a trained model on the embedded device. Therefore, the understanding of the theoretical principles will be deepened while all participants get a closer look at how it is done in practice. The chosen examples are all based on freely available data and software frameworks to enable everybody to continue learning after each session independently. By this, we want to ensure that each participant has the possibility to easily transfer and expand their knowledge towards their own problem cases after the workshop ends.

Practical experience with neural network programming in Python is expected. Optimally, all participants should have already completed all sessions of “*An introduction in Machine Learning*”.

The format language is English only at the moment.

Value of service:

The participants of the training will acquire skills and learn about

- Embedded devices/systems
- Programming embedded systems
- Examples in NN

Learning methods used: lecture and hands-on part

Overview slides: see Annex 7.

Partner: HITEC		Title: An introduction to Image Generation with AI	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: for those with a need for AI based image generation			
Requirements for participation: none			
est. Duration: 120 minutes			

Description of “*An introduction to Image Generation with AI*”:

Image generation with AI has made significant progress in recent months. Diffusion-based AI models can generate or alter images based on prompts formulated in natural language. This technology enables to generate unique visuals, artworks, and designs with the help of intelligent algorithms, even without extensive artistic skills. AI-driven image generation offers many practical benefits. It allows for the rapid creation of diverse and high-quality visual content for designing product prototypes, marketing materials, enhancing digital presence and creating engaging social media content

The workshop will give a comprehensive introduction to the theoretical basics of image generation with diffusion models. Next, different use-cases and techniques will be covered with hands-on examples: Image generation from prompts, altering existing image based on prompts, Inpainting, Outpainting, using simple 3D models as a basis for images and using generative language models for prompt generation. The workshop will also cover advanced topics like using Low-Rank Adaptation to tune existing models towards desired styles or image content.

The concept of the workshop is based on practical experience, best practices and tutorials from the generative AI art community.

Value of service:

The participants of the training will acquire skills and learn about

- terminology and concepts of AI for image generation
- an overview of image generation with diffusion models
- possible use cases and application of image generation
- workflows and best practices for typical tasks in AI-based image generation
- tuning generative models for specific tasks
- examples of using large language models for automating prompt generation
- limitations and challenges of AI-based image generation

Learning methods used: lecture with best practices.

Overview slides: see Annex 8

Partner: HITEC		Title: Test Management – recommendation and best practices of software testing from industry & research	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Lecture		Focused on key technologies: Digitisation	Status: in operation
Stakeholder from SME/PAs side: for those who are developers in SMEs			
Requirements for participation: none			
est. Duration: 45 minutes			

Description of “*Test Management – Recommendation and Best Practices*”:

The lecture is to give the audience an overview of software testing. It covers the state-of-the-art testing techniques and methodologies such as test automation, continuous testing, and agile testing. Furthermore, some topics of AI-based testing have been touched. Finally, it shows a learning path for software testing based on the International Software Testing Qualifications Board (ISTQB) certifications.

Due to undefined testing background and experiences of audience, this presentation is focusing mainly on the fundamental testing techniques. Therefore, no prior knowledge of software testing is required. However, listeners are expected to bring their own questions from daily testing practices, so that we can organize follow-up sessions to cover their expectations explicitly.

The talking time is about 30 minutes, excluding 15 minutes Q&A.

Value of service:

The participants of the lecture will acquire skills and learn about

- Why testing?
- Relationship between cost and quality
- Test Strategy and Test Concept
- Continuous testing
- Manual test vs test automation
- Agile testing
- Cross platform testing
- AI-based testing
- Certification for testing.

Learning methods used: lecture

Overview slides: see Annex 10.

Partner: HITEC		Title: Enabling the realization of own innovations	
Service: ST-1		Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)	
Format: Hands-on workshop		Focused on key technologies: all	Status: in preparation
Stakeholder from SME/PAs side: for those with a need to work out and implement innovations			
Requirements for participation: none			
est. Duration: 120 - 240 minutes			

Description of “*Enabling the realization of own innovations*”:

The format for enabling the realization of own innovations is aimed at EDIH customers to provide them with the necessary skills to independently develop and implement use cases for their specific business requirements.

The target groups for this service are from various industries or disciplines that want to improve their understanding of the development and implementation of use cases in the context of digital transformation and innovation. This workshop deals with the following areas:

- Introduction to use cases:
 - Basics and definition of use cases in the corporate context
 - Importance and benefits of use cases for business development and innovation
- Use case identification:
 - Methods for identifying relevant use cases for their organisation
 - Analysis of company processes to identify potential use cases
- Use case development:
 - Steps and best practices for developing use cases
 - Creation of use case scenarios, user interactions and use cases
- Use case prioritization and evaluation:
 - Criteria for prioritizing use cases based on organisation goals and resources
 - Methods for evaluating the feasibility, profitability and practicability of use cases
- Prototyping and validation:
 - Creation of prototypes for selected use cases
 - Methods for validating and reviewing prototypes in collaboration with relevant stakeholders
- Implementation and scaling:
 - Strategies for implementing successful use cases in the organization
 - Approaches to scaling successful use cases for broader application

This will be a hands-on workshop with interactive sessions where representatives will actively learn methodologies of developing use cases for their own organization.

Case studies and real-life examples to illustrate concrete use cases and solutions.

EDIH customers will receive support from an experienced software development expert in the field of use case development.

Value of service:

After completing the format, participants will be able to independently identify, develop, evaluate and successfully implement use cases in their organization in order to improve their business or organization processes and implement innovative solutions.

Learning methods used: hands-on workshop with interactive session

Overview slides: see Annex 11.

Partner: HITeC		Title: An introduction to threat detection and prevention	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Webinar		Focused on key technologies: Cyber Security	Status: in operation
Stakeholder from SME/PAs side: those with a need for improving the security of their IT systems and workflows			
Requirements for participation: none			
Duration: 120 minutes			

Description of “*An introduction to Threat detection and Prevention*”

This workshop is designed to familiarize the attendees with the fundamental aspects of network threats and attacks and learn strategies to protect against such intrusions. They will also be introduced to real-world scenarios and learn strategies for securing networks and implementing effective security measures. This course includes both theoretical insights and practical exercises.

The workshop will be offered in English.

Value of service:

The participants of the training will acquire skills and learn about:

- Understanding enterprise network security
- Network monitoring and analysis
- Emerging network threats and attacks
- Intrusion detection and prevention techniques
- Common tools used to identify and prevent threats
- Gain hands-on experience with an industry-leading tool

Learning methods used: lecture with practical demonstrations

Overview slides: see Annex 12.

Partner: HITeC		Title: An introduction to ML security and privacy	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Webinar		Focused on key technologies: Cyber Security	Status: in preperation

Stakeholder from SME/PAs side:	those with a need for improving the security of their IT systems and workflows
Requirements for participation:	none
Duration:	120 minutes

Partner:	HITeC	Title:	An introduction to web security: Attacks
Service:	ST-1	Target Group:	all (Startups, Craft, Public, Administration, Logistics, Industry)
Format:	Webinar	Focused on key technologies:	Cyber Security
Status:	in operation		
Stakeholder from SME/PAs side:	those with a need for improving the security of their IT systems and workflows		
Requirements for participation:	none		
Duration:	120 minutes		

Description of “An introduction to web security: Attacks”

The workshop provides a practical introduction to the world of web security and will be offered as a series in three parts. The attendees will learn about threats such as (no) SQL-Injection, XSS, and LLM-Prompt Injection, as well as secure programming, communication, and considerations for hosting web applications. Attendees are encouraged to join a discussion around practice examples and think about ways to improve web security in their organization.

The workshop will be offered in German.

Value of service:

The participants of the training will acquire skills and learn about:

- Identification of threats such as (no) SQL Injection, XSS, and LLM, CSRF, SSRF
- Prompt Injection
- Techniques to counter the above-mentioned threats

Overview slides: see Annex 13.

Partner:	HITeC	Title:	An Introduction to web security: authentication and data integrity
Service:	ST-1	Target Group:	all (Startups, Craft, Public, Administration, Logistics, Industry)
Format:	Webinar	Focused on key technologies:	Cyber Security
Status:	in operation		
Stakeholder from SME/PAs side:	those with a need for improving the security of their IT systems and workflows		
Requirements for participation:	none		
Duration:	120 minutes		

Description of “An introduction to web security: Authentication and data integrity”

In this second workshop of the web security series, the attendees will be sensitized about password protection and introduced to more advanced techniques such as salting and hashing as well as public key infrastructure and the usefulness of using secure protocols such as HTTPS and TLS.

The workshop will be offered in German.

Value of service:

The participants of the training will acquire skills and learn about:

- Password protection, hashing and salting
- Encryption techniques
- PKI, HTTPS and TLS, as well as passkeys

Slides: available on request

Partner: HITeC		Title: An Introduction to web security: denial of service and hosting	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Webinar		Focused on key technologies: Cyber Security	Status: in operation
Stakeholder from SME/PAs side: those with a need for improving the security of their IT systems and workflows			
Requirements for participation: none			
Duration: 120 minutes			

Description of “*An introduction to web security: Denial of Service and Hosting*”

In this last part of the web security series, attendees will learn about designing a secure architecture and webhosting both on-premise and in the cloud. They will also be informed about the Denial-of-Service threat (DDoS), its possible occurrence scenarios, and ways an architecture can be made resilient to this threat.

The workshop will be offered in German.

Value of service:

The participants of the training will acquire skills and learn about:

- Security Architecture
- Hosting (server and cloud)
- Fundamentals of DDoS and protection techniques

Slides: available on request

Partner: HAW		Title: Search engine optimization: Becoming more visible on the web	
Service: ST-1	Target Group: all		
Format: webinar		Focused on key technologies: digital marketing	Status: in operation

Stakeholder from SME/PAs side:	for those who want to augment their visibility online
Requirements for participation:	none
Duration:	60 minutes

Description of “*Search engine optimization: Becoming more visible on the web*”:

In today’s digital world, being visible online is crucial. But how can a company improve its presence in popular search engines? This event offers practical insights and proven strategies to successfully position a company in the digital space. The participants learn how to use targeted Search Engine Optimization (SEO) measures to increase visibility, drive more qualified traffic to a website and ultimately increase sales. From choosing the right keywords to optimizing a website for better rankings, participants learn how to harness the power of search engines for their business.

Value of service:

What to expect:

- An understanding of the basics of Search Engine Optimization (SEO)
- Practical tips for selecting and using relevant keywords
- Optimization of websites for better visibility in search results
- Success strategies to increase the online presence and conversions
- Practical examples: success stories from SMEs that use SEO successfully
- Tools that help with the implementation of a targeted SEO strategy

Learning methods used: lecture.

List of references and/or learning resources:

Suchmaschinen-Optimierung: Das umfassende Handbuch, Sebastian Erlhofer, 10. Aktualisierte Auflage, Rheinwerk Computing.

Overview slides: see Annex 15.

Partner:	HAW	Title:	Data as the basis for business decisions – Data Driven Business
Service:	ST-1	Target Group:	all (Startups, Craft, Public, Administration, Logistics, Industry)
Format:	webinar	Focused on key technologies:	all
Status:	in operation		
Stakeholder from SME/PAs side:	for those who want to implement Data in their Business Modell		
Requirements for participation:	none		
Duration:	60 minutes		

Description of “*Data as the basis for business decisions – Data Driven Business*”:

Digitalization has sparked a data revolution that has fundamentally changed the way companies operate today. Data is collected in almost all areas of business, from customer interactions to production processes and supply chains. If a company know how to not only collect this data, but also analyze it in a targeted manner and turn it into actionable insights, it will gain a decisive competitive advantage.

Value of service:

- How to transform a business into a data driven business
- Which data can be used?
- Which opportunities for data usage can arise
- Which difficulties can occur?

Learning methods used: lecture.

Overview slides: see Annex 16

Partner: HAW		Title: Digitalization of intralogistics – collect and use data directly from the material flow	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: digitalization	Status: in operation
Stakeholder from SME/PAs side: for those who want to implement data in their business model			
Requirements for participation: none			
Duration: 60 minutes			

Description of “*Digitalization of intralogistics – collect and use data directly from the material flow*”:

Data and key figures drive logistics like no other industry. Optimizing logistics processes contributes directly to increasing efficiency and improving competitiveness. But how can digitalization help to get even more out of intralogistics?

What opportunities lie in the consistent collection and utilization of data, illustrated by intralogistics as an example? While it is common to concentrate on data from the information flow due to its accessibility and structured form in IT systems, it is crucial to recognize that valuable insights can also be derived from the material flow, which often does not receive sufficient attention for technical reasons.

Value of service: In this course, the participants will learn about technologies that can be used to turn logistical objects into data sources for optimizing processes.

Learning methods used: lecture.

Overview slides: see Annex 17.

Partner: HAW		Title: OGD – Public data is here to be used	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: all	Status: in operation
Stakeholder from SME/PAs side: for those who want to make use of public data			
Requirements for participation: none			
Duration: 90 minutes			

Description of “*OGD – Public data is here to be used*”:

The development of business models and products and the development of new target groups is often rather random. The use of freely available public data enables more systematic work and better targeting of potential customers. Using examples, experts will show participants how they can use OGD (Open Government Data) to systematically develop business models and customer approaches. In addition to an introduction to the topic of OGD, experts will show the participants how to identify and use possible data sources.

Value of service:

- Participants will learn what different kinds of openly accessible data there is and what the advantages and disadvantages compared to private data are
- Participants will learn how to acquire publicly accessible (government) data
- Through use cases, participants will know, how the usage of public accessible data can help them assessing potential, support them in forecasting and improve business planning.

Learning methods used: lecture.

Overview slides: see Annex 18.

Partner: HAW		Title: Turning old into new: how can machines be digitized at low cost?	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Retrofitting	Status: in operation
Stakeholder from SME/PAs side: for those who wants to digitize existing machines at low cost			
Requirements for participation: none			
Duration: 90 minutes			

Description of “*Turning old into new: how can machines be digitized at low cost?*”:

Nowadays, the use of innovative technologies is essential for a company’s competitiveness. But how can your company bring old machines into the digital age? Retrofitting offers a cost-effective alternative for converting analog systems into networked and intelligent devices.

Questions we want to answer:

- What are the benefits of retrofitting?
- What are the requirements that my company must meet?
- What does retrofitting look like in practice?
- What steps should I follow to retrofit my system?

Value of service:

- Participants will have a deeper understanding of the benefits of retrofitting.
- Participants will know what to do to digitalize their analog systems.

Learning methods used: lecture.

Overview slides: see Annex 19.

Partner: HAW		Title: Creating customer favorites: with data to a better product	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Weibull Analysis	Status: in preparation
Stakeholder from SME/PAs side: for those who want to make improvements through data			
Requirements for participation: none			
Duration: 90 minutes			

Description of “*Creating customer favorites: with data to a better product*”:

The Weibull analysis is introduced and the participants will learn how it can be used to optimize the maintenance strategies. Products can be improved and thereby increase customer satisfaction.

It will be explained which requirements need to be met when introducing it into the company and what benefits can be expected in the long term if it is successfully implemented. The tool provided enables the participants to carry out their own subsequent analyses themselves.

Why: To demonstrate the benefits of data in the manufacturing industry.

What: Application-oriented introduction to the subject area and concrete practical examples for the application of reliability.

How: Presentation of the most important requirements for the analysis and presentation of an app for implementation.

Value of service:

Participants will understand the potential of Weibull analysis.

Learning methods used: lecture.

Overview slides: see Annex 20.

Partner: HAW		Title: Beyond reality: the Metaverse and its possibilities	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Virtual Reality (VR)	Status: planned
Stakeholder from SME/PAs side: for those who want to implement virtual reality into their marketing			
Requirements for participation: none			
Duration: 60 minutes			

Description of “*Beyond reality: the Metaverse and its possibilities*”:

Metaverse enables companies to get to know their customers perfectly. The Metaverse is a “wonderful galaxy” full of possibilities. In this webinar, participants dive into the future of marketing. Experts will teach them the basic technologies, tell them where the term comes from and take them on a journey to value-adding applications for their business.

Value of service:

Participants will get an understanding of

- Metaverse
- how to “use” the Metaverse for marketing
- how to generate added value for their business by using VR.

Learning methods used: lecture.

Overview slides: see Annex 21.

Partner: HAW		Title: AI-supported search engine optimization for SMEs	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: 4-part workshop		Focused on key technologies: (generative) AI, Search Engine Optimization (SEO)	Status: planned
Stakeholder from SME/PAs side: for those who want to learn hands-on how to use SEO and want to learn which AI-supported tools they can use to augment their SEO strategy			
Requirements for participation: none			
Duration: 120 - 180 minutes			

Description of “AI-supported search engine optimization for SMEs”:

Workshop 1: Fundamentals of SEO for SMBs

- Introduction to SEO for SMBs: In this part, experts will explain the basic benefits of SEO for small and medium-sized businesses and why it is important to be found in search results.
- Keyword research and audience definition: Different techniques for choosing the right keywords for your business and target audience will be covered, as well as the importance of long-tail keywords and local SEO.
- On-page optimization: Here, a closer look is taken at optimizing meta tags, headings, images, and the importance of a clear page structure.

Workshop 2: Off-Page Optimization and Content Strategies

- Link building strategies for SMBs: The experts will discuss how participants can generate high-quality backlinks and what practices should be avoided.
- Content marketing for SMBs: This covers the creation of relevant and informative content that appeals to the target audience of SMEs and helps improve their visibility.
- Leveraging AI for Content Optimization: It is covered how AI can support content creation and optimization to be more efficient and targeted.

Workshop 3: Technical SEO and Website Performance

- Mobile optimization: The critical importance of mobile optimization for SEO and practical tips on how to ensure a website is mobile-friendly will be discussed.
- Structured Data and Rich Snippets: This part will explain how SMEs can implement structured data on their website to get better search results with rich snippets.
- Using AI for technical optimization: It will be shown how AI tools can help to analyze and optimize technical aspects such as load times and server configurations.

Workshop 4: AI-Powered SEO Tools and Analytics

- Overview of leading AI tools: A selection of powerful AI-powered SEO tools will be presented that can help SMEs with analysis, keyword research, and competitor analysis.
- Data-Driven SEO and Decision Making: It will be shown how to effectively use data to improve SEO strategies and make informed decisions.
- Success measurement and reporting: It will be discussed which Key Performance Indicators (KPIs) should be tracked to measure the success of SEO efforts and how to create meaningful reports.

Value of service: Participants will learn hands-on how to use SEO and which AI-supported tools they can use to augment their SEO strategy.

Learning methods used: Each workshop will include a mix of presentations, practical exercises and discussions to ensure that the participants can directly apply what they have learned and that individual questions are answered.

List of references and/or learning resources:

Suchmaschinen-Optimierung: Das umfassende Handbuch, Sebastian Erlhofer, 10. Aktualisierte Auflage, Rheinwerk Computing.

Slides: available on request.

Partner: HAW		Title: Unpredictable? Addressing Supply Chain Risks with SCRM	
Service: ST-1	Target Group: Logistics, Industry, SME		
Format: webinar		Focused on key technologies: SCRM	Status: in operation
Stakeholder from SME/PAs side: managers, deciders			
Requirements for participation: none			
Duration: 30 minutes			

Description of “Unpredictable? Addressing Supply Chain Risks with SCRM”:

This webinar gives SME a brief overview about the core concepts, key terms, most common and accessible methods and practical use cases of supply chain risk management. Participants will learn how to identify potential risks, assess their impact, and implement strategies to mitigate disruptions. Real-world examples illustrate how risk management can help businesses optimize supply chains, and safeguard against unforeseen challenges.

Value of service:

- Key Concepts: Participants will grasp the essential terms and concepts in supply chain risk management.
- Risk Identification: learn how to spot potential risks in supply chain operations.
- Strategic Risk Mitigation: explore practical strategies and real-world use cases to manage and mitigate risks.
- Decision-Making: executives will leave with actionable insights to improve their supply chain operations, ensuring business continuity and minimizing disruptions.

Learning methods used: Lecture, discussion, case studies

Overview slides: see Annex 23.

Partner: HAW		Title: Production of the Future: Optimally Utilizing Machines through Retrofitting	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Transfer learning, digitalization, energy efficiency, and retrofitting Status: in operation	Status: in operation
Stakeholder from SME/PAs side: Managers, Deciders			
Requirements for participation: none			
Duration: 45 minutes			

Description of “*Production of the Future: Optimally Utilizing Machines through Retrofitting*”:

This format explores how retrofitting can enhance industrial processes, with a focus on the practical application of transfer learning and digitalization. Attendees will gain insight into the fundamentals of sensors and processing units used to measure environmental parameters, which serve as a foundation for retrofitting possibilities. The session will showcase multiple real-world examples of retrofitting that optimize overall process performance, create a new digital business model and modernize operations.

Value of service:

Participants will gain insights into the use of sensors to measure environmental parameters and develop a deeper understanding of retrofitting and its potential to enhance various processes. They will also explore AI readiness, learning how retrofit can be leveraged to improve different use cases, optimizing performance and modernizing operations.

Learning methods used: Lecture, discussion, case studies.

Overview slides: see Annex 24.

Partner: HAW		Title: Digital Assistance – End of Monotonous Work	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Robotic Process Automation	Status: in operation
Stakeholder from SME/PAs side: Managers, Deciders			
Requirements for participation: none			
Duration: 30 min			

Description of “*Digital Assistance – End of Monotonous Work*”:

This session explores how Robotic Process Automation (RPA) can automate repetitive tasks, reducing manual errors and increasing efficiency. By eliminating monotonous work, employees

can focus on creative and complex responsibilities. The session will demonstrate how digital assistants streamline processes, offering faster and more reliable outcomes compared to traditional manual operations.

Value of service:

- Understanding the basics of Robotic Process Automation
- Insights into automating repetitive and mundane tasks
- Practical examples of improved efficiency and error reduction

Learning methods used: Lecture, practical examples.

Overview slides: see Annex 25.

Partner: HAW, TUHH		Title: Smart Supply Chain - DLT Demonstrator	
Service: ST-1	Target Group: Logistics, Industry		
Format: live demonstration		Focused on key technologies: dlt	Status: in operation
Stakeholder from SME/PAs side: Managers, Deciders			
Requirements for participation: none			
Duration: 60 minutes			

Description of “Smart Supply Chain - DLT Demonstrator”:

This Supply Chain DLT Demonstrator showcases how Distributed Ledger Technologies (DLTs) enhance secure, real-time data exchange between supply chain partners. It aims to highlight the value of tamper-proof, decentralized data sharing for better planning and transparency. Topics include secure data exchange, smart contracts, and real-time validation in supplier-customer relationships.

Value of service:

- Users will understand how DLT improves data security and transparency.
- Gain insight into real-time, validated data exchange for better supply chain decisions.
- Develop awareness of how smart contracts automate and streamline supply chain operations.
- Learn how DLT reduces inefficiencies, delays, and errors.

Learning methods used: demonstration.

Slides: available on request

Partner: HAW		Title: From Old to New - Improving the Energy Balance	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Transfer learning, digitalization, energy efficiency, and retrofitting	Status: in operation
Stakeholder from SME/PAs side: industrial			
Requirements for participation: none			

Duration: 45 minutes

Description of “*From Old to New - Improving the Energy Balance*”:

This session explores how retrofitting can enhance the energy efficiency of industrial processes, focusing on the practical application of transfer learning and digitalization. Attendees will gain insight in the fundamentals of sensors and processing units to measure environmental parameters. Based on this the possibility of retrofitting is explored, based on an approach „you can’t manage what you can’t measure“. Lastly, different real-world examples of retrofitting to improve overall energy balance are presented and explained.

Value of service:

Participants will gain insights into the use of sensors to measure environmental parameters, as well as a deeper understanding of retrofitting and its potential to improve energy balance. Additionally, they will develop knowledge on AI readiness, learning how digital tools can enhance retrofit projects for optimized energy efficiency.

Learning methods used: Lecture, discussion, case studies.

Overview slides: see Annex 26.

Partner: HAW+external partner		Title: Vom Datenschutz zum Datennutz	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: AI, data protection	Status: in operation
Stakeholder from SME/PAs side: Managers, Deciders			
Requirements for participation: none			
Duration: 60 minutes			

Description of “*Mit Datenschutz zum Datennutz*”:

When it comes to data protection, German companies like to be seen as data keepers. A full cupboard or cellar means that paper files have to be cleared out from time to time. Digital data is much more patient. In times of low storage prices and a huge range of cloud services, companies can store data practically forever. In the current trend towards artificial intelligence (AI), collected digital company data appears to be easily accessible. And in case of doubt, AI also provides ideas on what can be done profitably with the data.

Value of service: Participants will gain insights into:

- Basics of Artificial Intelligence (AI)
- Data protection - protective hand or shackle of digitalization
- Technical and legal risks
- Case studies: Typical AI use cases in companies
- Five points that companies should consider when introducing AI

Learning methods used: lecture, discussion.

Overview slides: see Annex 27.

Partner: HAW		Title: From Data to Action - Artificial Intelligence in Quality Management	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: Startups, SMEs, Industry Professionals			
Requirements for participation: none			
Duration: 30 minutes			

Description of “*From Data to Action - Artificial Intelligence in Quality Management*”:

This session covers the application of Artificial Intelligence, specifically transfer learning and image classification, in quality assurance for an injection mold factory. It includes both the theoretical aspects and a practical use case of digitalization in quality management.

Value of service:

- Understanding of transfer learning in quality assurance
- Ability to apply AI-driven image classification in industrial settings
- Insights into digitalization projects for quality optimization
- Practical knowledge of AI's impact on operational processes

Learning methods used: Lecture, case study, practical demonstrations

Overview slides: see Annex 28.

Partner: HAW		Title: From keyword to content: AI-powered SEO techniques	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: workshop		Focused on key technologies: AI, marketing, content creation	Status: planned
Stakeholder from SME/PAs side: managers, deciders			
Requirements for participation: none			
Duration: 180 minutes			

Description of “*From keyword to content: AI-powered SEO techniques*”:

This hands-on workshop introduces participants to AI-powered SEO techniques, focusing on how to transform targeted keywords into high-quality, optimized content. The session covers AI-driven keyword research, content creation strategies, and optimization tools that enhance website rankings and engagement. Through practical exercises, participants will apply AI tools to generate effective SEO content that drives traffic and improves online visibility.

Value of service:

- Master the use of AI tools for keyword research and content creation
- Gain hands-on experience in creating SEO-optimized content
- Learn how to improve website rankings and attract relevant traffic
- Practical insights into AI applications for marketing and content strategies
- Tools and techniques to automate and enhance content generation

Learning methods used: Discussion, practical exercises, demonstrations.

Overview slides: see Annex 29.

Partner: HAW		Title: CARVIS – Carbon Visualization in Supply Chains Demonstrator (formerly known as Carbon Accounting Demonstrator)	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: live demonstration		Focused on key technologies: Carbon Accounting, Web Applications, Sankey Diagrams, CO2 Visualization	Status: in operation
Stakeholder from SME/PAs side: Startups, SMEs, Industry Professionals, Logistics Providers			
Requirements for participation: none			
Duration: 60 minutes			

Description of “CARVIS”:

The Carbon Accounting Demonstrator is a web app designed to showcase the environmental impact of different transportation routes, vehicle types, and sourcing strategies for ports. Using a spatial Sankey diagram, participants can visualize CO₂ equivalents and understand the effects of various sourcing strategies, including location and transportation medium, in real time.

Value of service:

- Understanding the impact of transportation routes on carbon emissions
- Ability to evaluate and compare different sourcing strategies using CO₂ equivalents
- Insights into sustainable decision-making in logistics
- Practical experience with CO₂ visualization through Sankey diagrams

Learning methods used: demonstration.

Overview slides: see Annex 30.

Partner: HAW + Mittelstand Digital Zentrum Berlin		Title: Content is (KI)ng - AI-powered SEO	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Webinar		Focused on key technologies: AI; Search Engine and Website Optimization	Status: in operation
Stakeholder from SME/PAs side: Startups, SMEs, Industry Professionals, Logistics Providers			
Requirements for participation: none			
Duration: 90 minutes			

Description of “Content is (KI)ng - AI-powered SEO”:

This webinar provides an in-depth look at how AI can enhance SEO strategies. It covers methods for using AI-driven tools to optimize content, improve keyword research, and create meta-descriptions. Key concepts include Google's E-E-A-T approach, best practices for AI

content in SEO, and insights on leveraging ChatGPT for keyword ideas and content planning. Practical applications in content marketing are illustrated with real-world examples.

Value of service:

- Understanding AI-driven SEO strategies and tools
- Ability to generate and optimize keywords with AI
- Knowledge of creating effective content plans and meta-data using AI
- Enhanced skills in content optimization for higher search engine visibility

Learning methods used: demonstration, case studies, Q&A.

Overview slides: *see Annex 31.*

Partner: HAW		Title: AI-Hackathon	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: workshop		Focused on key technologies: Transfer Learning, Machine Learning	Status: in operation
Stakeholder from SME/PAs side: All (Startups, Craft, Public, Administration, Logistics, Industry)			
Requirements for participation: none			
Duration: 30 min			

Description of “AI-Hackathon”:

The AI-Hackathon focuses on understanding machine learning through hands-on experience in a competitive team environment. Participants will train machine learning models using transfer learning techniques, evaluate them using key metrics like F1-score, confusion matrix, and accuracy, and compare their results. This hackathon provides both theoretical knowledge and practical insights into the evaluation and improvement of machine learning models.

Value of service:

- Knowledge of transfer learning in real-world AI applications
- Hands-on experience in training and evaluating machine learning models
- Understanding key evaluation metrics: F1-score, confusion matrix, and accuracy
- Team collaboration in solving AI challenges

Learning methods used: lecture, practical exercises.

Overview slides: *see Annex 32.*

Partner: HAW		Title: Customer Relationship Management – It is impossible to have none	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Customer Relationship Management (CRM), data analytics, digital marketing	Status: in operation
Stakeholder from SME/PAs side: All (Startups, Craft, Public, Administration, Logistics, Industry)			
Requirements for participation: none			

Duration: 60-90 minutes

Description of “*Customer Relationship Management – It is impossible to have none*”:

This session dives into the importance of Customer Relationship Management (CRM) for modern businesses. Participants will learn how CRM tools and strategies can enhance customer satisfaction, improve sales, and streamline communication across teams. The webinar will explore how even companies without a formal CRM system are inherently managing customer relationships, and how formalizing these processes through digital solutions can lead to improved business outcomes.

Value of service:

- Understanding the key components and benefits of CRM
- Insights into how CRM improves customer satisfaction and loyalty
- Tools and strategies to optimize customer communication and sales tracking
- Practical examples of successful CRM implementation in different industries
- How to choose the right CRM tool for your business needs

Learning methods used: lecture, discussion

Overview slides: see Annex 33.

Partner: HAW		Title: DIY Chatbot – Workshop	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: workshop		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: All (Startups, Craft, Public, Administration, Logistics, Industry)			
Requirements for participation: Personal PC / Laptop			
Duration: 180 minutes			

Description of “*DIY Chatbot*”:

This hands-on workshop will guide participants through the deployment of open-source language models on local hardware and offer an in-depth tutorial on building and deploying custom chatbots using their own data with Retrieval-Augmented Generation (RAG) techniques. Participants will also explore the agentic use of large language models (LLMs) in real-world scenarios. The workshop includes practical exercises on participants' own hardware, allowing for immediate application of learned skills.

Value of service:

- Understanding of how to deploy open-source language models on local systems
- Ability to build and deploy custom chatbots using personal or company data
- Practical experience with Retrieval-Augmented Generation (RAG) techniques
- Exploration of agentic capabilities in large language models
- Hands-on experience working directly on participant hardware

Learning methods used: Lecture, practical exercises, demonstrations, hands-on workshop with real-time implementation.

Overview slides: see Annex 34.

Partner: HAW		Title: AI Tools for craftsmen	
Service: ST-1	Target Group: Crafts		
Format: workshop		Focused on key technologies: LLMs (Large Language Models), Retrieval-Augmented Generation (RAG),	Status: in operation
Stakeholder from SME/PAs side: All (Startups, Craft, Public, Administration, Logistics, Industry)			
Requirements for participation: none			
Duration: 25 minutes			

Description of “AI Tools for craftsmen”:

This session provides a theoretical overview of large language models (LLMs) and Retrieval-Augmented Generation (RAG) techniques. Participants will take part in a brief hands-on workshop focused on using open-source and commercial chatbot platforms to easily integrate RAG-based chatbots into their websites. The session emphasizes practical application for craftsmen to enhance their online presence and customer interaction.

Value of service:

- Basic understanding of LLMs and RAG
- Ability to integrate RAG-based chatbots into websites
- Practical experience with both open-source and commercial chatbot providers
- Improved customer interaction through AI-driven tools

Learning methods used: Lecture, practical exercises, demonstrations.

Overview slides: see Annex 35.

Partner: HAW		Title: Training AI models for everybody	
Service: ST-1	all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: workshop		Focused on key technologies: CNNs (Convolutional Neural Networks), Image Classification Models, Practical AI Training	Status: in operation
Stakeholder from SME/PAs side: Startups, SMEs, Industry Professionals, Developers			
Requirements for participation: none			
Duration: 180 minutes			

Description of “Training AI models for everybody”:

This extended version of the AI Hackathon offers a more comprehensive, hands-on experience with practical exercises focused on training AI models. The session dives deeper into how Convolutional Neural Networks (CNNs) work for image classification, providing both theory and practical training. Participants will gain insights into the model training process, including data preparation, model selection, and evaluation.

Value of service:

- In-depth understanding of CNNs and image classification models
- Hands-on experience in training AI models f
- Ability to prepare data and evaluate model performance
- Practical knowledge of AI's application in various industries

Learning methods used: Lecture, practical exercises, demonstrations, hands-on model training, group discussions.

Overview slides: see Annex 36.

Partner: HAW		Title: How do I tell my Chatbot? Effective prompting Techniques for better answers	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: workshop		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: All (Startups, Craft, Public, Administration, Logistics, Industry)			
Requirements for participation: PC / Laptop			
Duration: 180 minutes			

Description of “How do I tell my Chatbot? Effective prompting Techniques for better answers”:

This is an in-depth hands-on workshop on different prompting techniques (COT, Few Short, R-U-F-E / K-O-N-S-T-R-U-K-T(-E) methods, practical exercises and installation of open source chatbot software and LLMs).

Value of service:

- understanding of basics of Large Language Models;
- exploration of advanced LLM parameters;
- hands-on experience in prompting
- practical knowledge of operating in R-U-F-E and K-O-N-S-T-R-U-K-T(-E) Frameworks.

Learning methods used: lecture, group discussions, practical exercises.

Overview slides: see Annex 37.

Partner: HAW		Title: Intelligent image recognition: AI for quality management	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: workshop		Focused on key technologies: Prompt Engineering, Chain-of-Thought (CoT), Few-shot Learning, Open-source Chatbot Software, Large Language Models (LLMs)	Status: in operation
Stakeholder from SME/PAs side: Startups, SMEs, Industry Professionals			
Requirements for participation: none			
Duration: 180 min.			

Description of “*Intelligent image recognition: AI for quality management*”:

This hands-on workshop will explore advanced prompting techniques, including Chain-of-Thought (CoT), few-shot learning, and complex context based methods for enhancing chatbot responses. Participants will engage in practical exercises and learn to install and use open-source chatbot software and large language models (LLMs). The session provides practical insights into improving the accuracy and relevance of chatbot outputs through effective prompting.

Value of service:

- Understanding of key prompting techniques (CoT, few-shot learning)
- Practical experience in deploying and using open-source chatbot software
- Improved chatbot performance through optimized prompting strategies
- Hands-on installation and configuration of LLM-based chatbots

Learning methods used: Lecture, practical exercises, demonstrations.

Overview slides: see Annex 38.

Partner: HAW		Title: AI tricks for SEO: How does my company become visible online?	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: generative AI	Status: in operation
Stakeholder from SME/PAs side: managers, deciders			
Requirements for participation: none			
Duration: 30 minutes			

Description of “*AI tricks for SEO: How does my company become visible online?*”:

This webinar focuses on leveraging AI-powered techniques to boost SEO and enhance your company's online visibility. Participants will learn how generative AI tools can help with keyword optimization, content generation, and overall website ranking improvements. The session covers practical applications of AI for SEO, ensuring businesses can effectively compete in digital space and increase their website traffic.

Value of service:

- Learn how to use generative AI for SEO optimization
- Discover techniques for keyword research and content creation
- Understand how AI can improve your website's search engine ranking
- Practical strategies to increase online visibility and attract more visitors
- Real-world examples of successful AI-powered SEO implementations

Learning methods used: lecture, discussion.

Overview slides: see Annex 39.

Partner: HAW+ Mittelstand Digital Zentrum Berlin		Title: Website as a success factor: Branding, storytelling, dramaturgy
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)	

Format: webinar	Focused on key technologies: Digital marketing, branding, user experience (UX), content creation	Status: planned
Stakeholder from SME/PAs side: managers, deciders,		
Requirements for participation: none		
Duration: 60 minutes		

Description of “*Website as a success factor: Branding, storytelling, dramaturgy*”:

In this session, participants will learn how to transform their website into a powerful communication platform by focusing on branding, storytelling, and dramaturgy. The webinar will cover how to create an emotional and functional connection with visitors, ensuring the brand stands out from competitors. Topics include optimizing the website's Hero section, structuring content for engagement, and integrating storytelling to build a strong, recognizable brand identity.

Value of service:

- Understanding the principles of website branding and storytelling
- Practical tips for structuring content to improve engagement and conversion
- Tools for building emotional and functional differentiation from competitors
- Case studies showing successful branding and storytelling strategies
- Techniques to make websites more effective in converting visitors into loyal customers

Learning methods used: lecture, discussion.

Slides: available on request

Partner: HAW+TUHH		Title: Prompt Engineering: Better results when using ChatGPT and Stable Diffusion (Webinar)	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: Prompt Engineering	Status: in operation
Stakeholder from SME/PAs side: for those who want to improve their knowledge & skills when using generative AI tools			
Requirements for participation: none			
Duration: 60 minutes			

Description of “*Prompt Engineering: Better results when using ChatGPT and Stable Diffusion (Webinar)*”:

This webinar is dedicated to improving the results of using ChatGPT and Stable Diffusion specifically for SMEs. Participants learn how to optimize the performance of ChatGPT and Stable Diffusion by cleverly formulation requests (prompts). Experts will share real-world examples and best practices to get better and more accurate answers from ChatGPT and Stable Diffusion.

Value of service:

- Participants will get a good understanding of text- and photo-generating AI
- Participants will learn the differences between several prompt engineering techniques
- Participants will learn what outcomes can be expected when using different prompt techniques
- Participants will learn the limitations of ChatGPT and Stable Diffusion.

Learning methods used: lecture.

Overview slides: see Annex 40.

Partner: HAW+TUHH		Title: The smart supply chain – more transparency through IoT and decentralised networks	
Service: ST-5	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: “Demonstration”		Focused on key technologies: Digitization, IoT, Cloud, and Logistics	Status: in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in Digitization and Logistics			
Requirements for participation: none			
est. Duration: 45 - 120 minutes			

Description of “*The smart supply chain – more transparency through IoT and decentralised networks*”:

Transparency and automation are playing an increasingly important role in increasing efficiency, resilience, and sustainability in supply chains. A key to this is the integration of supply chains through digital technologies such as cloud computing, blockchain, RFID or sensor technology.

Within the format, an interactive demonstrator is used to show an approach for integrating shippers, logistics service providers and shipping companies on a decentralized data platform. The stakeholders can exchange data, view stored data and use it for data-driven decision-making processes with the help of data analysis and AI. The platform provides standardized interfaces for integration into the companies’ own ERP (Enterprise Resource Planning) systems or TMSs (Transportation Management Systems).

An interactive web application and a model train are used to provide a better understanding of the interaction between the flow of goods, sensors, and the data platform.

Value of service:

- Goals and requirements in today’s supply chains
- Areas of application for Information and Communication Technologies (ICT) in logistics
- Overview of application areas and functioning of digital technologies in logistics
- Forms of communication in global supply chains
- Requirements and objectives for the use of digital technologies
- Implementation example based on a case study in the maritime supply chain.

Learning methods used: Presentation, Demonstration, Discussion, Case study.

List of references and/or learning resources:

1. Bousonville, T. (2017). *Logistik 4.0: Die digitale Transformation der Wertschöpfungskette*. Wiesbaden: Springer Gabler.
2. Behdani, Behzad; Fan, Yun; Bloemhof, Jacqueline M. (2019): *Cool chain and temperature-controlled transport: An overview of concepts, challenges, and technologies*. In: Riccardo Accorsi und Riccardo Manzini (Hg.): *Sustainable Food Supply Chains*: Elsevier, pp. 167-183.
3. Otto, Boris; Jürjens, Jan; Schon, Jochen; Auer, Sören; Menz, Nadja; Wenzel, Sven; Cirullies (2016): *INDUSTRIAL DATA SPACE. DIGITALE SOUVERÄNITÄT ÜBER DATEN*. Hg. v. Fraunhofer Gesellschaft und Industrial Data Space e.V.
4. Sony Network Communications Europe BV. (Hg.) (2021): *Tracking technologies for supply chain visibility. A guide to help supply chain managers find the perfect fit*.
5. Teucke, M.; Broda, E.; Freitag, M. (2022): *An Inter organizational Digital Platform for Efficient Container Transportation*. In: *Lecture Notes in Logistics*, pp. 290-300.

Overview slides: see Annex 41.

Partner: TUHH		Title: Workshops using the LEGO® SERIOUS PLAY® (LSP) method	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: Method work, work 4.0, new work	Status: in operation
Stakeholder from SME/PAs side: for those who want to get to know the benefits of using methods for their company & explicitly the LEGO(R) SERIOUS PLAY(R) method.			
Requirements for participation: none			
est. Duration: 60 - 480 minutes			

Description of “Workshops using the LEGO® SERIOUS PLAY® method”:

The improvement that can be achieved through the targeted use of methods is often underestimated, not only in SMEs. Among the numerous available methods, the LEGO® SERIOUS PLAY® (LSP) method stands out due to its versatility and ability to yield excellent results when used correctly. This method can be effectively applied to various topics such as team building, promoting creative and innovative thinking, product development, and strategy development. Depending on the workshop’s specific focus, participants work on either a case study or a specific problem within their company. The duration of a workshop varies depending on the circumstances, ranging from a brief introduction lasting 60 minutes to multi-day events.

Value of service:

- Participants understand the benefits that the usage of methods – not only LSP – offer their organisation.
- The structure and procedure of a workshop using the LSP method are explained. The focus is on experience, which makes the method easier to understand.
- Participants go through a workshop with the LSP method.
- The principles used by the LSP method are explained:

- Rapid Prototyping
- Constructionism
- Storytelling & Metaphors
- Flow Theory
- It is shown when a workshop with the LSP method can and cannot be used.

Learning methods used: presentation, discussion and practical exercise.

List of references and/or learning resources:

LEGO® (2010): *Open-source: Introduction to LEGO® SERIOUS PLAY®*¹⁴.

Overview slides: see Annex 42.

Partner: TUHH		Title: From linear to circular – Sustainable transformation of business models	
Service: ST-1		Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)	
Format: Workshop or presentation		Focused on key technologies: Circular Economy, business models	Status: completed
Stakeholder from SME/PAs side: for those with a need for improving their business model and transforming it to a circular one			
Requirements for participation: none			
est. Duration: 90 - 240 minutes			

Description of “*From linear to circular – Sustainable transformation of business models*”:

In the face of growing regulatory requirements, changing societal expectations and material shortages, SMEs increasingly feel pressure to transform their business model in a sustainable way. Manufacturers in particular need to start integrating the principles of the circular economy and thus change or even rethink their business model. This interactive format offers insights on what the Circular Economy is, which circular business models exist and might be suitable and possible starting points for transforming SMEs’ business model into a more sustainable circular model. Moreover, it will provide the opportunity to exchange ideas with other companies that also want to take the path to a circular business model.

Value of service:

- Introduction to the Circular Economy and circular strategies
- Analysis of current position of SMEs business models in the circular context
- Analysis of suitable cooperation and partnerships that SMEs need when transforming their business model
- Discussion of arising opportunities and challenges
- Determination of further steps to take to develop a circular business model.

Learning methods used: presentation, discussion and practical exercise using a micro board.

¹⁴https://www.lego.com/cdn/cs/set/assets/blt8ec1d6ff766ddfd4/LEGO_SERIOUS_PLAY_OpenSource_14mb.pdf
f retrieved in Oktober 2023

List of references and/or learning resources:

1. Achterberg, E.; Hinfelaar, J.; Bocken, N. (2016): *Master circular business with the value hill*.¹⁵
2. Ellen MacArthur Foundation (2015): *Towards a Circular Economy: Business Rationale for an Accelerated Transition*.¹⁶
3. Europäische Kommission (2023): *Ökodesign für nachhaltige Produkte*.¹⁷
4. Fennemann, V.; Hohaus, C.; Kopka, J.-P. (2018): *Circular Economy Logistics: Für eine Kreislaufwirtschaft 4.0*.¹⁸
5. Lichtenthäler, S.; Neligan, A.: *How Circular Are Businesses in Germany?* in: *Intereconomics*, Vol. 58, No. 2, pp. 79-86 (2023).

Overview slides: see Annex 43.

Partner: TUHH		Title: Creating sustainable products with design thinking	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: Method work, design thinking, Circular Economy	Status: in operation
Stakeholder from SME/PAs side: for those who would like to learn more about how to use the creative method of design thinking to improve product sustainability and circularity			
Requirements for participation: none			
est. Duration: 90 - 240 minutes			

Description of “Creating sustainable products with design thinking”:

Design thinking is one of the best-known agile methods for developing creative solutions and breaking out of existing thought patterns. This method is used in companies to develop and optimize products, services, business models and processes with a high level of innovation. In this workshop, SMEs learn about various design thinking methods and Circular Economy strategies in a compact and practical way. They will apply these directly to make an exemplary product (more) sustainable. Considering the growing environmental pollution, climate change, and resource scarcity, it is imperative that we prioritize sustainability in product design. The transition from the current linear economy to a circular economy plays a crucial role in this process. This workshop enables the participants to apply their newly acquired knowledge of design thinking and circular economy principles in their company.

Value of service:

- Introduction to the Circular Economy and circular strategies

¹⁵ https://assets.website-files.com/5d26d80e8836af2d12ed1269/5dea74fe88e8a5c63e2c7121_finance-white-paper-20160923.pdf, retrieved on 02.11.2023.

¹⁶ <https://www.ellenmacarthurfoundation.org/towards-a-circular-economy-business-rationale-for-an-accelerated-transition>, retrieved on 02.11.2023.

¹⁷ https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products_de, retrieved on 02.11.2023.

¹⁸ https://www.innovationslabor-logistik.de/wp-content/uploads/2017/10/07_Whitepaper_CE_WEB.pdf, retrieved on 27.10.2023.

- Introduction to design thinking principles
- Hands-on practice: applying Design Thinking Methods to a Sample Product

Learning methods used: presentation, discussion and practical exercise, design thinking

List of references and/or learning resources:

1. Ellen MacArthur Foundation (2015): *Towards a Circular Economy: Business Rationale for an Accelerated Transition*.
2. Europäische Kommission (2024): Ökodesign-Verordnung.
3. Lewrick, M.; Link, P.; Leifer, L. (2019): *Das Design Thinking Toolbook: Die besten Werkzeuge & Methoden*.
4. Hasso-Plattner-Institut (2024): *What is Design Thinking?*

Overview slides: see Annex 44.

Partner: TUHH		Title: Identifying and addressing challenges in sustainability reporting	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: sustainability reporting, regulations	Status: in operation
Stakeholder from SME/PAs side: for those who are directly or indirectly affected by sustainability reporting obligations			
Requirements for participation: none			
Est. Duration: 120 – 180 minutes			

Description of “Identifying and addressing challenges in sustainability reporting”:

The Corporate Sustainability Reporting Directive (CSRD) and similar new reporting requirements are drawing the attention of many companies, including small and medium-sized enterprises (SMEs), to the topic of sustainability. However, adapting to new regulations can be particularly challenging for SMEs, as it requires additional resources and presents various obstacles.

This workshop focuses on uncovering and understanding these obstacles. Participants will have the opportunity to ask questions, learn from others, and exchange ideas. In the second step, concrete recommendations for action will then be derived with which the companies can meet the identified challenges.

Value of service:

- Introduction to the topic of sustainability reporting and associated regulations
- Discussion of arising opportunities and challenges
- Determination of further steps to counter the identified challenges

Learning methods used: presentation, discussion and practical exercise using the world café method.

List of references and/or learning resources:

1. Afolabi, H., Ram, R., Hassainey, K., Nandy, M., Lodh, S. (2022): *Exploration of Small and Medium Entities' Actions on Sustainability Practices and their Implications for a Greener Economy*, in: Journal of Applied Accounting Research, Jg. 24, Nr. 4.
2. EFRAG (2024): *EFRAG IG 1: Materiality Assessment Implementation Guidance*.
3. EFRAG (2024): *EFRAG IG 2: Value Chain Implementation Guidance*.
4. Deutscher Nachhaltigkeitskodex: *EU erzielt Einigung zur Weiterentwicklung der Richtlinie für die nicht-finanzielle Berichterstattung*.
5. Lee, S.-Y. (2008): *Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives*. In: Supply Chain Management: An International Journal 13 (2008) 3, pp. 185–98.
6. Schmidt, M.; Nill, M.; Scholz, J. (2021): *Die Bedeutung der Lieferkette für den Klimafußabdruck von Unternehmen*. In: Chemie Ingenieur Technik 93 (2021) 11, pp. 1692–706.

Overview slides: see Annex 45.

Partner: TUHH		Title: Developing a future oriented business model – but how?	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: Digitization	Status: postponed
Stakeholder from SME/PAs side: for those who want to shape their business model for a long-term successful competitive advantage			
Requirements for participation: none			
est. Duration: 2 x 5 hours (Modular structure and customizable)			

Description of “*Developing a future oriented business model – but how?*”:

In the age of societal changes (e.g., health, sustainability), ever new technologies (e.g., AI, quantum computing) and new market entrants, competition is getting faster and tougher. The behavior and needs of customers have also changed in recent years as a result of new technologies and new providers on the market. The common denominator in these topics is the business model because this is where corporate strategy and business processes meet. By combining technologies in old or new application fields, industry logics can be broken, and new business model innovations can be developed.

Value of service:

- Introduction to business models
- Analysis of the current business model (Business Model Canvas)
- Developing a picture of the future – What will influence me, my customers, and my business in the future?
- Introduction of digital technologies in SMEs (Technology Evaluation Canvas)
- Develop value proposition (Value Proposition Canvas)
- Exploitation portfolio and exploration portfolio (Portfolio map)
- Innovate business model (Business Model Navigator).

Learning methods used: presentation, discussion and practical exercise.

List of references:

1. Gassmann, O.; Frankenberger, K. & Csik, M. (2017): *Geschäftsmodelle entwickeln: 55 innovative Konzepte mit dem St. Galler Business Model Navigator*. 2. Aufl., München: Hanser.
2. Linssen, O, Mikusz, M, Yigitbas, E, Volland, A, Engstler, M, Fazal-Baqaie, M & Kuhrmann, M (Hrsg.) (2019): *Einführung von digitalen Technologien in KMU – Vorgehensmodell und Technology Evaluation Canvas, Neue Vorgehensmodelle in Projekten – Führung, Kulturen und Infrastrukturen im Wandel*. gemeinsame Tagung der Fachgruppen Projektmanagement (WI-PM), Vorgehensmodelle (WI-VM) und Software Produktmanagement (WI-ProdM) im Fachgebiet Wirtschaftsinformatik der Gesellschaft für Informatik e.V. in Kooperation mit der Fachgruppe IT-Projektmanagement der GPM e.V.: 24. und 25. Oktober 2019 in Lörrach
3. Osterwalder, A. & Pigneur, Y. (2010): *Business model generation: A handbook for visionaries, game changers, and challengers*. Hoboken, NJ: Wiley.
4. Osterwalder, et al. (2014): *Value proposition design: how to create products and services customers want*. Hoboken, NJ: Wiley.
5. Rüger et al. (2018): *Geschäftsmodell-Innovationen richtig umsetzen. Vom Technologiemarkt zum Markterfolg*. Stuttgart: Fraunhofer Institut für Arbeitswirtschaft und Organisation.
6. Schallmo, D. & Lohse, J. (2020): *Digitalstrategien erfolgreich entwickeln. Grundlagen, Ansätze und Vorgehensweise*. Wiesbaden: Springer Gabler.

Overview slides: see Annex 46 and Annex 47 (English/German).

Partner: TUHH		Title: Digital technologies to enhance scope 3 carbon accounting	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: Digitization, Blockchain, Cloud	Status: completed
Stakeholder from SME/PAs side: for those with a need for digital technologies to support scope 3 carbon accounting			
Requirements for participation: none			
est. Duration: 90 - 240 minutes			

Description of “*Digital technologies to enhance scope 3 carbon accounting?*”:

Complex and sometimes non-transparent supply chain structures make it difficult to fully capture emissions. To date, the lack of resources and expertise in particular have prevented companies from establishing such climate issues strategically and operationally. By using digital technologies for scope 3 carbon accounting, companies and their value creation partners have completely new possibilities to present and evaluate emission shares in a holistic way. In this format, the topic of emissions accounting as well as possibilities for calculating the CO2 footprint will be introduced.

Subsequently, a decision support tool for the implementation of scope 3 carbon accounting will be presented. In the form of an interactive guide this tool aims to support SMEs in their decision on the target-oriented integration of digital technologies into scope 3 carbon accounting and to provide helpful tips. Based on this, SMEs can generate new impulses for addressing challenges concerning carbon accounting in their company.

Value of service:

- Introduction to the carbon footprint and its importance for SMEs
- Calculation options for the carbon footprint
- Presentation and discussion of supporting technologies for scope 3 carbon accounting
- Demonstration of the decision support tool and its purpose and application. How does it work? Which solutions can be generated using the tool and how can it support decision making?

Learning methods used: presentation, discussion and practical exercise using a micro board.

List of references:

1. Csutora, M.; Harangozo, G.: *Twenty years of carbon accounting and auditing – a review and outlook*. In: Society and Economy 39 (2017) 4, pp. 459–80.
2. Garrido-Hidalgo, C.; Olivares, T.; Ramirez, F. J.; Roda-Sanchez, L.: *An end-to-end Internet of Things solution for Reverse Supply Chain Management in Industry 4.0*. In: Computers in Industry 112 (2019), pp. 103127.
3. Huang, Y. A.; Weber, C. L.; Matthews, H. S.: *Categorization of Scope 3 emissions for streamlined enterprise carbon footprinting*. In: Environmental science & technology 43 (2009) 22, pp. 8509–15.
4. Lee, S.-Y.: Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives. In: Supply Chain Management: An International Journal 13 (2008) 3, pp. 185–98.
5. Patchell, J.: *Can the implications of the GHG Protocol's scope 3 standard be realized?* In: Journal of Cleaner Production 185 (2018), pp. 941–58.
6. Royo, B.: *Measuring and Allocating Scope 3 GHG Emissions*. In: Müller, B.; Meyer, G. (Hrsg.): Towards User-Centric Transport in Europe 2. Enablers of Inclusive, Seamless and Sustainable Mobility. Cham 2020.
7. Rusch, M.; Schöggel, J.-P.; Baumgartner, R. J.: *Application of digital technologies for sustainable product management in a circular economy: A review*. In: Business Strategy and the Environment (2022).
8. Schmidt, M.; Nill, M.; Scholz, J.: *Die Bedeutung der Lieferkette für den Klimafußabdruck von Unternehmen*. In: Chemie Ingenieur Technik 93 (2021) 11, pp. 1692–706.
9. Talbot, D.; Boiral, O.: *GHG Reporting and Impression Management: An Assessment of Sustainability Reports from the Energy Sector*. In: Journal of Business Ethics 147 (2018) 2, pp. 367–83.
10. WBCSD: *Pathfinder Framework. Guidance for the Accounting and Exchange of Product Life Cycle Emissions*.¹⁹
11. WRI; WBCSD: *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*.²⁰

Overview slides: see Annex 48 and Annex 49 (English /German).

¹⁹ URL: <https://www.wbcsd.org/contentwbc/download/13299/194600/1>, retrieved on 06.11.2022.

²⁰ URL: https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf, retrieved on 09.11.2022.

Partner: TUHH		Title: Machine Learning basics: how to create value with ML	
Service: ST-1	Target Group: all, focus on production companies		
Format: Workshop		Focused on key technologies: Machine Learning	Status: in operation
Stakeholder from SME/PAs side: everyone who can use Machine Learning to improve productivity			
Requirements for participation: none			
Duration: about 120 to 150 minutes depending on group size			

Description of “Machine Learning basics: how to create value with ML”:

The workshop consists of a presentation and two practical sessions. The presentation briefly explains the concepts of AI and ML and the differences between the two. During the first practical session small groups work through four examples that are meant to highlight the difference between the two concepts. This session mainly serves as a warmup exercise and to get to know (some) of the other participants.

The presentation continues with practical examples how to use ML in production, logistics, and product development. At that point every participant is asked to either pick one of the examples or come up with their own use case. After that the presentation goes into more detail and explains more technical concepts of AI. The idea is to start from a practical use case and then step by step increasing the resolution, effectively turning the usually method of frontal teaching upside down. Allegorically: instead of teaching letters, then words, then sentences, this presentation first shows sentences as eye catchers, then teaches words, and finally the letters. The rationale behind this being that the motivation is highest when people have in front of their eyes why they need to understand (technical) concepts.

Finally, the presentation summarizes all of the taught concepts and finishes with the final practical session, in which small groups are to create their own ML/digitalization roadmap, which will later be presented to the entire group. Participants often choose their own company for their ML example.

Value of service:

- Understanding the difference between AI in general and ML in specific
- Awareness of possibilities for ML applications in the business world
- Knowing the difference between supervised, unsupervised, and reinforcement learning
- Understanding the basic statistical principles underlying ML
- Low resolution ML implementation roadmap

Learning methods used: presentation, practical exercises, group discussions.

Overview slides: see Annex 50 and Annex 51 (English /German).

Partner: TUHH		Title: Digital Twins: The self-optimizing company	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: Digital Twins, AI	Status: in operation
Stakeholder from SME/PAs side: everyone who can use Machine Learning to improve productivity			
Requirements for participation: none			
Duration: 60 to 90 minutes			

Description of “Digital Twins: The self-optimizing company”:

The concept of Digital Twins is explained and set against Digital Models and Digital Shadows. A regional use case is presented as a hook. It is further shown that Digital Twins can take any form from modelling an entire supply chain down to a singular component of a machine. Finally, the presentation goes into detailed description how to implement artificial intelligence and thus combine AI with Digital Twins. In the practical part participants are asked to create their own roadmap for their very own AI-powered Digital Twin outlining:

- The field of application of their Digital Twin
- How to sensibly supplement the Twin with AI
- Which data to gather
- Which data is already available
- Which data has to be collected and how that could be done

Value of service:

Participants

- understand the differences between Digital Twins, Shadows, and Models
- understand that Digital Twins can be used in any scale
- know the requirements to supplement Digital Twins with AI
- know the benefit of combining Digital Twins with AI
- have created their own roadmap to set up their own Digital Twin and combine it with AI

Learning methods used: Presentation and practical exercise

List of references and/or learning resources:

Baryannis, Dani & Anoniou (2019). Predicting Supply Chain Risks Using Machine Learning: The Trade-off Between Performance and Interpretability.

Miller (2019). Predictive Maintenance mit einem digitalen Zwillings. https://de.mathworks.com/company/newsletters/articles/predictive-maintenance-using-a-digital-twin.html?s_tid=srchtitle_site_search_7_digital%2520twin

Overview slides: see Annex 52.

Partner: TUHH		Title: Navigate Uncertain Times Agile and Purposefully with OKR	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: Method work, target setting	Status: In operation
Stakeholder from SME/PAs side: For those who want to learn how to clearly define goals and measure progress to achieve them.			
Requirements for participation: none			
Duration: 120-240 minutes			

Description of “Navigate Uncertain Times Agile and Purposefully with OKR”:

OKR, or "Objectives and Key Results," is a goal-setting method that enables organizations and teams to define clear and ambitious goals and measure their progress. The method consists of overarching goals (Objectives) and specific, quantifiable steps (Key Results) that together demonstrate how well the goals are being achieved. OKR promotes clarity, transparency, and motivation by aligning work with shared goals and allowing for flexible adaptation to changes. It is widely used in many companies, particularly in agile and transparent organizations.

Value of service:

- Understand what OKRs are and why they are important.
- Learn how to formulate effective OKRs.
- Gain insights into successfully integrating OKRs into a company.
- Apply knowledge through a case study analysis for practical application.

Learning methods used: presentation, discussion, practical exercises

Overview slides: see Annex 53.

Partner: TUHH		Title: Ready to Thrive Through Crisis - Equipped with Expertise for the Future!	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Presentation		Focused on key technologies: Digitalization, Resilience	Status: In operation
Stakeholder from SME/PAs side: For those who want to learn hands-on how to build a resilient business model			
Requirements for participation: none			
Duration: 60 minutes			

Description of “*Ready to Thrive Through Crisis - Equipped with Expertise for the Future!*”:

In today’s uncertain world, businesses are constantly faced with risks and challenges. Crises such as pandemics, natural disasters, or economic upheavals can arise unexpectedly and test business models and operational capabilities. Resilience refers to a system’s ability to adapt and return to its normal state after a disruption. For businesses, this means managing crises without significantly impairing functionality.

This format provides insights into future business risks, presents tools and methods for enhancing resilience, and demonstrates through practical examples how other companies protect themselves against crises.

Value of service:

- Insights into Future Business Risks
- Tools and Methods for Enhancing Resilience
- Case Studies of Companies Successfully Navigating Crises

Learning methods used: presentation

Overview slides: see Annex 54.

Partner: TUHH		Title: Resilient Future: Strategies for Business Continuity in a Volatile World	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: Digitalization, Resilience	Status: In operation
Stakeholder from SME/PAs side: For those who want to learn hands-on how to build a resilient business model			
Requirements for participation: none			
Duration: 120-180 minutes			

Description of “Resilient Future: Strategies for Business Continuity in a Volatile World”:

The workshop is based on the Beer Game, a simulated management game originally developed by the MIT Sloan School of Management. It shows how small mistakes in communication and coordination within a supply chain can lead to large fluctuations and inefficiencies. Participants take on roles along the supply chain (e.g. brewer, wholesaler, retailer) and try to meet the demand for beer.

The developed board game helps to understand the principles of resilience in supply chains by illustrating the importance of having transparency, effective communication and a good understanding of the entire supply chain to minimize fluctuations and disruptions. It shows how delays and poor decisions in one stage of the supply chain can have a major impact on other stages and teaches how better management and coordination can build a more resilient supply chain.

Value of service:

- Understanding Resilience Principles: Improve transparency and communication
- Practical Application: Apply principles to real-world problems
- Enhancing Problem-Solving Skills: Learn effective crisis management

Learning methods used: Discussion, Game

Overview slides: to be developed.

Partner: TUHH		Title: Artificial Intelligence in Production	
Service: ST-5	Target Group: Companies with more than 10 employees, specifically producing companies		
Format: Tech Demonstration		Focused on key technologies: AI	Status: <i>(planned /in preparation)</i>
Stakeholder from SME/PAs side:			
Requirements for participation: none			
Duration: 30 minutes			

Description of “Artificial Intelligence in Production”:

The presentation reviews the three common types of Machine Learning – Supervised, Unsupervised and Reinforcement Learning – and then explains how Meta Heuristics, exemplified by a Genetic Algorithm, work in contrast. The presentation shows multiple use cases to employ Meta Heuristics, one of them being the demonstrator utilising a bin packing

algorithm. Finally, the two approaches, traditional ML and Meta Heuristics, are compared against each other to exemplify under which conditions which is to prefer.

Value of service:

The two main objectives are:

- Conveying the underlying principle of meta heuristics, so that participants understand that the bin packing algorithm is equally suited to solve e.g. a shift planning task
- Conveying when classical Machine Learning and when Meta Heuristics should be used

Learning methods used: presentation and demonstration

List of references and/or learning resources:

Russell, S. J., & Norvig, P. (2016). *Artificial intelligence: a modern approach*. Pearson.

Overview slides: see Annex 55.

Partner: HWK		Title: Current topics in digital transformation (Info event)	
Service: ST-1	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: “Info event” (online/in presence)	Focused on key technologies: AI, Digitisation, Cybersecurity		Status: in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in current topics of digital transformation			
Requirements for participation: none			
est. Duration: 60 - 120 minutes			

Description of “Current topics in digital transformation – Info event”:

Information events are specifically designed to provide small and medium-sized enterprises with a low-barrier entry to digitalization topics. The scope of topics covered in these events is wide-ranging and dynamic, reflecting the evolving nature of digital technologies and their application in business processes. The info events are designed to keep businesses informed about the latest developments in digitalization, offering practical solutions to implement these technologies in their operations. This service not only helps SMEs keep pace with the digital era but also provides the necessary tools and knowledge to excel in it.

Value of service:

The HWK information events service aims to offer quick and efficient overviews of relevant digitalization topics in an engaging manner. Not only do these events provide valuable insights, but they also create an open platform for SMEs to discuss and exchange ideas, fostering a collaborative environment to drive digital transformation. Examples of the areas covered include:

- Paperless office transformation
- Implementation of ERP (Enterprise Resource Planning), CRM (Customer Relationship Management) and DMS (Document Management System) software
- Agile project management

- Automation of office tasks such as automated billing, digital fabrication including 3D printing, and AI usage in office tasks

By attending these events, companies can enhance their digital competency, improve operational efficiency, and gain a competitive edge in today's digital marketplace.

Overview slides: see Annex 56.

Partner: HWK		Title: Current topics in digital transformation (Experience exchange)	
Service: ST-1		Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)	
Format: “Experience Exchange” (in presence)		Focused on key technologies: AI, Digitisation, Cybersecurity	Status: in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in current topics of digital transformation			
Requirements for participation: none			
est. Duration: 1 - 3 hours			

Description of “*Current topics in digital transformation – Experience exchange*”:

Experience Exchange creates a valuable forum for small and medium-sized enterprises (SMEs) and craftspeople to share insights, ideas, and best practices around digitization topics. The service is designed to facilitate the sharing of knowledge and experiences in the context of digital transformation. It presents a unique opportunity for businesses to discuss common interests, challenges, and potential projects while networking with like-minded peers in their sector.

Value of service:

The Experience Exchange Service covers a wide variety of digitalization topics, allowing participants to delve into specific areas of interest or explore new digital trends. The format typically involves in-person meetings with around 20 attendees, primarily targeting crafts businesses, often represented by their managing directors. During the 2-3 hour event, participants are engaged through a variety of interactive formats. They may be challenged with provocative ideas, prompted to take a stance on various statements, or participate in a “World Café” setting where different tables host discussions on distinct topics. These methods are designed to provoke thought, foster debate, and ensure active participation. Whether the discussion revolves around the implementation of AI in office tasks, the transformation towards a paperless office, or the integration of digital fabrication techniques such as 3D printing, this platform provides a vibrant space for collaborative learning and idea generation. Moreover, these events enable participants to learn more about the range of services and resources available as part of the EDIH project. By facilitating direct exchanges within the community of SMEs and craftspeople, this service fosters a community of digital learners and innovators. Ultimately, the goal of the Experience Exchange Service is to support businesses in their digital journey by providing a platform where they can gain insights, share experiences, and collectively contribute to the evolving narrative of digital transformation in the SME and craft sectors.

Learning methods used: Discussion.

Source: Mittelstand-Digital Zentrum (MDZ) Hamburg²¹.

Materials: Example Service Experience Exchange with the topic time recording software (see Annex 56).

Partner: HWK		Title: Digitalization Consultation	
Service: ST-1	Target Group: Small and medium-sized enterprises (SME), Crafts-people		
Format: Consultation/Coaching		Focused on key technologies: broad spectrum of topics	Status: in operation
Stakeholder from SME/PAs side: managers			
Requirements for participation: none			
Duration: 4 - 18 hours			

Description of “Digitalization Consultation”:

The Hamburg Chamber of Skilled Crafts (HWK) offers tailored digitalization consultations. These consultations aim to help craft businesses optimize and streamline their digital transformation. The digitalization consultations cover a broad spectrum of topics, including enhancing the digital basic skills of employees, the introduction of a paperless office, digital time recording, improved file management, IT security, data protection, resource management through ERP systems, CRM systems, file management DMS systems, and substitutive scanning. Furthermore, the use of AI products in administration and digital and additive manufacturing, including 3D printing, CAD (Computer Aided Design), and 3D scanning, are considered.

The consultations are tailored to the individual needs of the businesses and follow a “help to self-help” approach, adapting flexibly to the diverse range of business models and sizes within the SME spectrum. After an initial discussion with the SME to understand their vision and challenges, a comprehensive mind map of the business structure is created, which visually organizes the main processes and outlines the project scope. This step is crucial as it provides a clear blueprint of the business’s operations and identifies key areas for digital enhancement.

Given that many SMEs may not be accustomed to project-based communication, a structured project plan based on the waterfall model is usually recommended for collaboration. This traditional project management approach offers a linear, straightforward progression that can be easier for SMEs to follow, ensuring clarity and predictability in project milestones.

Once the initial interview is conducted and the project plan is laid out, a thorough research phase is undertaken to identify solutions that are sensitive to the size of the SME. It is acknowledged that a smaller company, for instance with fewer than 20 employees, will have different resources and capacities compared to larger ones. Their processes tend to be more organic and potentially less efficient, thus any proposed software or digitalization measures need to be carefully calibrated to enhance efficiency without overwhelming the existing business infrastructure. In this way, our digitalization consultations ensure that the

²¹ <https://www.kompetenzzentrum-hamburg.digital>, retrieved November 2023

recommended strategies are not only technically sound but also realistically implementable, respecting the unique operational rhythms and cultural dynamics of each SME.

Over time, after offering a comprehensive range of digitalization topics, trends have been observed in the areas most frequently sought after by SMEs: Key topics that have emerged as in-demand include ERP software selection and implementation, digital time recording solutions, additive manufacturing, and IT security. In response to this demand, a collection of guides and instructional materials focusing on these primary fields was initiated and continuously refined. Among them, ERP software selection has taken precedence due to its critical role in optimizing business operations. In collaboration with a local partner, a three-part workshop was developed specifically on the topic of ERP systems, which has since become a model for our other consulting services.

Understanding the constraints of SMEs, where it is often not feasible for staff to be absent for extended workshop durations, this workshop has been designed to integrate seamlessly into daily business activities. The structured plan of the workshop entails:

Example: ERP Software Consultation

1. Modeling Business Processes: Identifying and mapping out core business operations.
2. Identifying Pain Points: Analyzing the processes to pinpoint areas that could benefit from digital optimization.
3. Software Exploration: Generating a longlist of 5-8 potential ERP software suppliers based on the business's specific needs.
4. Detailed Research: Evaluating each software option in-depth to develop a shortlist of 2-4 candidates.
5. Live Demonstrations: Arranging for demonstrations from the shortlisted suppliers to offer insight into the software's functionality and compatibility with the SME's requirements.
6. Decision Making: Selecting the most suitable ERP package by weighing up its features against its cost.
7. Implementation Assistance: Facilitating the implementation process with the support of the chosen software supplier.

At the implementation phase, advice is often also provided on applying for external funding, which may be available through local funding programmes for digitalization in order to alleviate the financial burden for the SME. This comprehensive workshop structure and the consultation process ensure that the digital transformation is not only strategic but also economically viable for the SMEs.

Example: IT Security Consultation:

In the digital era, IT security is a critical aspect that underpins the integrity and reliability of business operations. As cyber threats evolve, it is crucial for SMEs to strengthen their digital resilience. An IT Security Consultation is designed to build robust defenses against such vulnerabilities through a comprehensive, step-by-step approach:

1. Risk Assessment: Conducting a thorough analysis of the business's current IT infrastructure to identify vulnerabilities.
2. Security Policy Development: Collaborating to develop or refine the company's IT security policies, ensuring they are comprehensive and up-to-date.
3. Solution Exploration: Creating an extensive list of IT security solutions tailored to the size and nature of the business.

4. Focused Research: Narrowing down the options to a curated selection of tools and services that align with the business's specific security needs.
5. Vendor Demonstrations: Arranging sessions with vendors to showcase how their solutions can safeguard the business's assets.
6. Strategic Selection: Assisting in choosing the most appropriate security measures considering both functionality and cost-efficiency.
7. Implementation Roadmap: Outlining a clear and structured plan for the integration of the selected IT security measures.
8. Training and Awareness: Offering workshops to increase employee awareness about security best practices and the importance of compliance.

Example: Additive Manufacturing Consultation:

Additive manufacturing stands at the forefront of industrial innovation, offering unparalleled flexibility in design and production. The consultation services in this field are aimed at harnessing the potential of 3D printing and related technologies to revolutionize SMEs' manufacturing processes, from concept to creation:

1. Technology Assessment: Evaluating the SME's current manufacturing processes to determine the applicability of additive technologies.
2. Design and Prototyping: Assisting in understanding the design constraints and possibilities of additive manufacturing, including material selection and product prototyping.
3. Equipment and Supplier Evaluation: Compiling a detailed list of appropriate additive manufacturing equipment and suppliers.
4. Cost-Benefit Analysis: Analyzing the potential ROI (Return on Investment) and the long-term benefits of adopting additive manufacturing technologies.
5. Practical Demonstrations: Facilitating demonstrations with technology providers to illustrate the capabilities of additive manufacturing in a real-world setting.
6. Strategic Planning: Developing a tailored strategy for integrating additive manufacturing into the SME's production line.
7. Funding and Incentives Guidance: Providing information on potential financial support options, such as government incentives for adopting new manufacturing technologies.
8. Ongoing Support and Training: Offering continuous support and training opportunities to ensure the SME can fully exploit the advantages of additive manufacturing.

Example: Digital Time Recording Software Consultation:

Digital time recording is an essential tool for enhancing the efficiency of SME operations, providing accurate insights into employee productivity and business time allocation. The consultations aim to implement intuitive and efficient time management systems, which are vital for contemporary workforce management:

1. Workflow Analysis: Mapping out the SME's workflow to understand the dynamics of time tracking requirements.
2. System Requirement Specification: Identifying key features needed in a time recording system based on the SME's operational needs.
3. Software Options Collation: Gathering a comprehensive list of digital time recording software that fits the identified criteria.
4. In-Depth Software Evaluation: Diving deeper into the functionalities of each system to ensure a good fit for the SME.

5. Interactive Software Demos: Organizing interactive demos to provide a hands-on experience with the shortlisted time recording solutions.
6. Decision Assistance: Helping the SME choose the most efficient and user-friendly system.
7. Setup and Customization: Aiding in the setup and customization of the chosen software to align with the SME's business processes.
8. Training Sessions: Conducting training sessions for employees to familiarize them with the new time recording system and ensuring a smooth transition.
9. Each sector-specific consultation is meticulously structured to enable SMEs to integrate new technologies effectively, ensuring they are well-positioned to meet the challenges of the digital landscape.

Value of service:

This service helps to strengthen the digital competencies of craft businesses and enables them to effectively master the challenges and opportunities of digitalization.

Learning methods used: Lecture, Discussion, Demonstration

Materials: Example Slide showing the consultation process (Annex 57), Infographic ERP Software selection (Annex 58), List process inventory for initial interview with SME (Annex 59).

Partner: ARIC		Title: ARIC Insights	
Service: ST-3		Target Group: all (Startups, Craft, Public Administration, Logistics, Industry)	
Format: Workshop		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: those with a need for improving their skills in current topics of AI			
Requirements for participation: none			
est. Duration: 120 - 240 minutes			

Description of “ARIC Insights”:

In this format a partner with deep insight holds a workshop in current AI topics and technologies and their applications. For conducting seminars on a specific topic, specialists and researchers in the relevant field are invited. The duration of each seminar is determined individually by its speaker based on the volume, content and complexity of the material being presented.

Value of service:

Insights are provided for a variety of relevant questions, e.g.:

- **Ethics and AI Bias:** Artificial intelligence has no prejudices, feelings or emotions and yet we hear again and again about AI systems that discriminate against or even favour groups of people. It seems that AI acts in a discriminatory and racist way, but where does this come from and how can it be changed? In this workshop, we will show you why AI is never completely unbiased, when a so-called bias is desired and when it is not. The workshop will highlight what can and must be done in AI projects to counteract unwanted bias and what else we need to consider to train as ethically as possible.

- ChatGPT²²: Hardly any AI development in recent years has made as many waves as ChatGPT, the textbot developed by OpenAI²³ that is supposed to solve pretty much any task: whether it is school essays, technical lectures or the development of executable computer programs. The product promise, like any disruptive technology, borders on magic: A request is simply typed into the chat window and ChatGPT spits out the solution. Within the first 5 days of its release in November 22, 2022, over 1 million people worldwide signed up to rub shoulders with the magic lamp of knowledge for once and (another concomitant of mass success) caused the OpenAI servers to overload. Is this more than an ingenious marketing coup? Is the super chatbot that is supposed to open up the land of knowledge for us the expected breakthrough of an easy-to-use AI for the masses? And: Does OpenAI threaten the quasi-monopoly of global knowledge organization that Google has built up over the past decades? These are the questions that are addressed in the ARIC workshop: Is ChatGPT the ultimate disruption for Artificial Intelligence?
- Who is liable for AI errors? Even an AI can make mistakes. Under which circumstances the provider is liable has been controversial so far. The EU Commission has now presented a draft AI liability directive that should provide clarity. Experts explain the new set of rules and the consequences for companies.
- Framework conditions for AI projects: What executives need to know. What are the expectations and what is the understanding? Which tasks can be solved with AI and which are better left unsolved? What are the evolutionally steps, efforts and teams for AI Project? What are the principles and importance of each component of AI project: PoC (Proof of Concept), MVP (Minimal Valuable Product), Data, IT landscape, ROI (Return of Investment), 'Make or buy' strategic, etc.?
- The tension between AI and Cybersecurity: in the field of cybersecurity, both attackers and defenders utilize "artificial intelligence" to achieve their opposing goals. Additionally, AI systems themselves are vulnerable and need protection. What are the points of the intersection between AI and cybersecurity? What is the current state of research and development in this area?

Learning methods used: lecture, discussion, demonstration, case studies.

Slides and other materials: each seminar utilizes slides, demonstrators, and other proper materials provided by the seminar speaker.

²² <https://openai.com/blog/chatgpt>, retrieved in May 2023

²³ <https://openai.com>, retrieved in May 2023

Partner: ARIC		Title: LLMs in logistics – opportunities and risks of Bard, ChatGPT & Co	
Service: ST-3	Target Group: all (Startups, Craft, Public Administration, Logistics, Industry)		
Format: Masterclass		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: those with a need for improving their skills in current topics of AI			
Requirements for participation: none			
est. Duration: 30 minutes			

Description of “*LLMs in logistics – opportunities and risks of Bard, ChatGPT & Co*”:

This masterclass is designed to give an insight into why, where and how one can get started with AI in the company. It consists of four thematic parts:

- AI & LLMs – how does it actually work? (What are the foundational principles from computer science and statistics that form the basis of AI technology? How do these principles contribute to the development and functionality of AI systems? How does ChatGPT work?)
- Where does AI make sense? (AI application domains: generation, recognition, prediction, optimization; use cases)
- Risks & recommendations. (Possible risks and issues when using AI; a check box for legal aspects of the implementation of AI; recommendations on “Why, where and how to start with AI in the company?”)
- Discussion (The potential risks that companies must take into account when implementing AI and the best practices for responsibly integrating AI into their daily operations).

Value of service: This service helps to

- unlock the transformative power of LLMs in logistics industry
- explore the vast opportunities and potential risks associated with advanced technologies like Bard, ChatGPT, and others
- understand how these cutting-edge tools can revolutionize logistics operations
- gain insights into practical applications and navigate potential challenges.

Learning methods used: lecture, case studies.

Overview slides: see Annex 60.

Partner: ARIC		Title: Workshop for Startup Support Programs: How to identify AI in Startups?	
Service: ST-3	Target Group: Startups		
Format: workshop		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: those with a need for improving their skills in current topics of AI			
Requirements for participation: none			
Duration: 90 minutes			

Description of “*Workshop for Startup Support Programs: How to identify AI in Startups?*”:

This session supports institutions that are either accelerators, incubators or financing partners for startups by providing them with both technical as well as practical content. While more and more companies claim to have AI as a part of their business model, this is very often only used to please investors. The session will first give the target group (which usually have a good business background, but no technical experience) a hands-on overview of AI, followed by top 5 questions to ask companies to discover how far AI is being used by them. The workshop is designed for a basic level of knowledge on AI technology.

Value of service:

This service helps to:

- get known und understand the basic terms of AI technology
- explore variety of the AI types, tasks and learning methods
- get an overview of technical possibilities and ethical limitations of AI implementation
- understand how much useful AI is in an own startup.

Learning methods used: lecture, demonstration, role-playing.

Overview slides: see Annex 61.

Partner: ARIC		Title: Introduction to Generative AI	
Service: ST-1	Target Group: all (Startups, Craft, Public Administration, Logistics, Industry)		
Format: webinar		Focused on key technologies: AI	Status: in operation
Stakeholder from SME/PAs side: those with a need for improving their skills in current topics of AI			
Requirements for participation: none			
Duration: 60-70 min			

Description of “*Introduction to generative AI*”:

Since the introduction of language models such as ChatGPT, image generators such as Dall-E and Midjourney, and Sora, the new video generation tool from OpenAI, Generative AI has been all the rage. This format is designed to convey an understanding of the basic functions and potential of Generative AI technology and does not require any prior knowledge from the participants. It consists of four thematic parts:

- What is Generative AI?
- How does Generative AI work?
- How are good prompts written?
- What Generative AI tools are available?

Value of service: This format helps to

- unlock the basic principles of Generative AI;
- understand how Generative AI differs from previous AI applications;
- get insights into methodology and functionality of Generative AI;
- explore which tools and applications of Generative AI already exist.

Learning methods used: lecture, discussion.

List of references and learning resources:

- 1) About Generative and Discriminative models | by Jordi Esteve Sorribas | Medium²⁴ .
- 2) Tokenizer²⁵.
- 3) Marco Ramponi, How ChatGPT actually works²⁶ .
- 4) Best LLM 2024²⁷ .

Overview slides: see Annex 62.

Partner: ARIC		Title: Responsible AI	
Service: ST-2	Target Group: all (Startups, Craft, Public, Administration, Logistics, Industry)		
Format: Workshop		Focused on key technologies: AI	Status: in operation/in development
Stakeholder from SME/PAs side: developers, data scientists, managers, executives, leaders			
Requirements for participation: none			
Duration: up to 3 hours			

Description:

This comprehensive workshop provides an essential understanding of the ethical principles, regulatory frameworks and technical implementations that underpin responsible AI. It aims to equip audiences with insights to navigate the complex landscape of Responsible AI regulations and governance effectively.

As AI technologies are developing very rapidly and the global context is constantly changing, the workshop's content is continuously updated und supplemented to address the latest challenges and advancements.

The workshop generally consists of three parts:

- 1) Theoretical part, which includes a lecture and discussion. Participants will explore the theoretical principles of responsible AI, including concepts such as fairness, transparency, explainability, robustness and governance, as well as the basic aspects of AI regulations.
- 2) Hands-on part, in which the participants have a possibility to experience practical examples of the AI technology usage. This part of the workshop take place in the ARIC AI-Showroom lab, which accommodates multifaceted collection of AI-powered exhibits and demonstrators.
- 3) Self-study part. Materials suggested for self-study include freely available books, articles, podcast and video lecture by modern authors (see List of references and learning resources). These enable participants to continue learning after the on-site workshop independently.

²⁴ <https://medium.com/@jordi299/about-generative-and-discriminative-models-d8958b67ad32>, retrieved in November 2024.

²⁵ <https://platform.openai.com/tokenizer>, retrieved in November 2024.

²⁶ <https://www.assemblyai.com/blog/how-chatgpt-actually-works/>, retrieved in November 2024.

²⁷ <https://www.linkedin.com/pulse/best-llm-2024-top-models-speed-accuracy-price-genai-works-qe49f/?trackingId=YGoOFDs98u1TSg1sz2yygA%3D%3D> , retrieved in November 2024.

Value of service: The participants of the training will

- gain a deep understanding of the ethical and societal impacts of AI;
- be equipped with the knowledge to navigate and comply with AI regulations;
- enhance their ability to identify and mitigate biases in AI systems.

This workshop will be of value to developers, data scientists, managers, executives, leaders and anyone involved in the development or deployment of AI technologies who wants to ensure their work aligns with responsible AI practices in the time when AI Act has been deployed in EU.

Learning methods used: lecture, discussion, demonstrators.

List of references and learning resources:

- 1) Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024²⁸.
- 2) AI Act²⁹.
- 3) Voenekey S, Kellmeyer P, Mueller O, Burgard W, eds. *The Cambridge Handbook of Responsible Artificial Intelligence: Interdisciplinary Perspectives*. Cambridge University Press; 2022.³⁰
- 4) Müller, Vincent C., "Ethics of Artificial Intelligence and Robotics", *The Stanford Encyclopedia of Philosophy* (2023), Edward N. Zalta & Uri Nodelman (eds.).³¹
- 5) Friedrich-Joachim Mehmél, *European AI law explained*.³²
- 6) Alois Krtil, *Hamburg potentially a safe AI hub*.³³
- 7) Forbes K. *Opening the path to ethics in artificial intelligence*. *AI and Ethics*, 2021.
- 8) Hickok M. Lessons learned from AI ethics principles for future actions. *AI and Ethics*. 2021;1(1):41-7.
- 9) Eitel-Porter R. Beyond the promise: implementing ethical AI. *AI and Ethics*. 2021;1(1):73-80.
- 10) Strobel M, Shokri R. Data Privacy and Trustworthy Machine Learning. *IEEE Security & Privacy*. 2022; 20(5):44-9.³⁴
- 11) Morley, Jessica and Elhalal, Anat and Garcia, Francesca and Kinsey, Libby and Mökander, Jakob and Floridi, Luciano, *Ethics as a service: a pragmatic operationalisation of AI Ethics* (2021).³⁵

²⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1689>, retrieved in November 2024.

²⁹ <https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai>, retrieved in November 2024.

³⁰ <https://www.cambridge.org/core/books/cambridge-handbook-of-responsible-artificial-intelligence/EF02D78934D18B9A22A57A46FF8FFAFC>, retrieved in November 2024.

³¹ <https://plato.stanford.edu/entries/ethics-ai/>, retrieved in November 2024.

³² <https://hamburg-business.com/en/news/european-ai-law-explained>, retrieved in November 2024.

³³ <https://hamburg-business.com/en/news/hamburgs-potential-as-a-safe-ki-hub>, retrieved in November 2024.

³⁴ <https://ieeexplore.ieee.org/document/9802763/>, retrieved in November 2024.

³⁵ <http://dx.doi.org/10.2139/ssrn.3784238>, retrieved in November 2024.

- 12) Floridi L, Cowls J, Beltrametti M, Chatila R, Chazerand P, Dignum V, et al. *AI4People—an ethical framework for a good AI society: opportunities, risks, principles, and recommendations*. Minds and Machines. 2018;28(4):689-707.³⁶
- 13) Shneiderman B. *Bridging the Gap Between Ethics and Practice: Guidelines for Reliable, Safe, and Trustworthy Human-Centered AI Systems*. ACM Trans Interact Intell Syst. 2020;10(4).³⁷
- 14) Besa Bauta, *Responsible AI Governance: Ethical Considerations, Bias Mitigation, and Explainability in AI Systems*, video lecture³⁸
- 15) *The European Perspective on AI Governance*, podcast.³⁹

Overview slides: see Annex 63.

2.4 General certificate of participation

Upon completion of the training, participants can receive a Certificate of Attendance issued by *EDIH Academy*. Certificate of attendance includes the following elements:

- Title of the course
- Full name of participant attending the course
- A clear statement confirming the participant's attendance at the specified training
- Name and logo of the institution providing the training
- Signature of an authorized representative of the organizing institution
- EDIH-Hamburg logo
- The date of issue of the certificate

An example of a certificate of attendance issued by *EDIH Academy* is given in Annex 1.

2.5 Continuous Improvement Process

To ensure the content and delivery methods of the Skills & Training formats developed remain relevant and effective, an iterative feedback loop will be undertaken. Tailoring training formats to the identified preferences and needs of the project's target groups, namely the SMEs and the private sector, aims to enhance the overall learning experience and encourage active engagement.

There are several stages in the process of iterative feedback loop:

- 1) Developing a questionnaire for the participants
- 2) Conducting surveys
- 3) Collecting and segregating the responses from participants
- 4) Processing and analysing the responses

³⁶ https://www.researchgate.net/publication/329192820_AI4People-An_Ethical_Framework_for_a_Good_AI_Society_Opportunities_Risks_Principles_and_Recommendations, retrieved in November 2024.

³⁷ <https://dl.acm.org/doi/abs/10.1145/3419764>, retrieved in November 2024.

³⁸ <https://www.youtube.com/watch?v=DA7ldX6OIG4>, retrieved in November 2024.

³⁹ <https://www.youtube.com/watch?v=nudNBQLABO0>, retrieved in November 2024.

- 5) Summarising the results and outcomes
- 6) Survey results integration

At the present stage, a questionnaire for the customer feedback is developed and given in Annex 1 (German) and 1 (English). The survey-management system *EUSurvey*⁴⁰ will be used to access the developed questionnaire. This will ensure that the feedback mechanism is user-friendly and easily accessible.

Other stages of the feedback loop will be conducted in the next year of the project implementation. The implementation of the survey will be carried out on the participants of the Skills & Training formats. Those attending will be asked to complete a questionnaire. The feedback data collected will be analysed to extract meaningful insights to be integrated into *EDIH Academy* vision. This analysis will also help to understand which of the developed and provided Skills & Training formats have the potential to be transformed into a certified course.

⁴⁰ <https://ec.europa.eu/eusurvey/>, retrieved November 2023

3. Certificate Courses for Key Technologies

Rapid advances in technology require companies to adapt quickly. Many SMEs and PSOs may face a lack of skills and knowledge on actual key technologies within their workforce. Offering learning courses helps to address skills gaps by equipping employees with the knowledge they need to effectively implement innovative solutions that give organisations a competitive edge.

A certificate course will benefit from the application-oriented approach: problem and project-based learning helps to focus on transfer of knowledge, strengthening practical relevance and competencies that are needed in the real world.

After completing the course, its participants will be facilitated to implement each-one-teach-one and train-the-trainer methods for company empowerment. Each-one-teach-one method can contribute to the reinforcement and consolidation of the learning outcomes achieved.⁴¹ Train-the-trainer method helps to disseminate knowledge and skills across the organisation, reduce training costs, and increase employee engagement and retention.⁴²

3.1 Methodology of a Certificate Course

A certificate course offered by *EDIH Academy* will be based on blended-learning^{43, 44} concept. It provides a well-rounded and adaptable approach to education, offering the benefits of both traditional and online learning.

Key features of blended learning include:

- Face-to-face sessions: traditional classroom sessions where students and instructors meet face-to-face for direct interaction and instruction.
- Online learning: the use of digital resources such as e-learning modules, videos, discussion forums and other online materials to supplement and enhance face-to-face instruction.
- Flexibility: blended learning offers flexibility in terms of time, place and pace of learning. Students can access online content at their convenience, while still attending scheduled face-to-face sessions.
- Individualised learning paths: the combination of face-to-face and online components allows for a more personalised learning experience that accommodates different learning styles and preferences.
- Technology integration: blended learning often incorporates technology tools and platforms to enhance the learning process.

The following structure of the training course with certification will be proposed:

- I. General Introduction (Kick-off). This is the first session of the course where participants get to know each other, the trainer and the objectives of the course. The trainer will explain the course outline, learning objective, the expected outcomes and assessment

⁴¹ https://nmssanctuaries.blob.core.windows.net/sanctuaries-prod/media/archive/management/pdfs/Day10_H8_Eachoneteachone.pdf, retrieved November 2023.

⁴² <https://www.sessionlab.com/blog/train-the-trainer-model/> retrieved November 2023

⁴³ Michael B. Horn and Heather Staker, *Blended: Using Disruptive Innovation to Improve Schools*: Jossey-Bass, 2014.

⁴⁴ Jennifer Hofmann, *Blended Learning*, in: What Works in Talent Development, ATD series, 2018.

criteria. Students will also have the opportunity to ask questions and share their motivations and goals for attending the course.

- II. Essential material. The course content will be divided into several modules, each covering a specific topic or skill related to the course theme. The modules will consist of different learning materials such as videos, readings, quizzes and assignments.

Module 1: will contain the theoretical foundations of the topic. The trainer will state the name of the module, its aim, the key concepts and terms that will be used and the learning methods that will be employed (e.g. lecture, demonstration, discussion etc.), indicate how participants' understanding of this module (e.g. test, survey, exercise, etc.) will be assessed.

Module 2: will contain the practical application of the topic. The trainer will use the same format as for Module 1, but focus on activities that allow participants to apply their knowledge and skills to real-life situations (e.g. simulation, project, group work, etc.). The trainer will indicate the assessment of participants' performance for this module (e.g. feedback, portfolio, presentation, etc.).

- III. Practical Exercises & Tasks with Solutions. In addition to the theoretical material, the course will also include practical exercises and tasks that will allow participants to apply what they have learned and demonstrate their competencies. The exercises and tasks are designed to simulate real-life scenarios and challenges related to the course topic. Participants will receive feedback and solutions from the trainer and their peers on their performance and progress.
- IV. Examination & Certification. At the end of the course, participants will be required to take a final exam to assess their knowledge and skills acquired throughout the course. The exam consists of multiple-choice questions, short answer questions and case studies. The exam is timed and proctored to ensure the validity and reliability of the results. Participants who pass the exam with a score of 60% or higher will receive a certificate of completion attesting to their proficiency and qualification in the course topic. The certificate will include the course name, date, duration and instructor.
- V. Feedback & Reflection. After the exam, participants are asked to provide feedback on the course design, delivery and outcomes. They are also encouraged to reflect on their own learning experiences, achievements and challenges. The feedback and reflection will help the trainer and *EDIH Academy* to improve the quality and effectiveness of the course and identify areas for further development and improvement.

3.2 Testing of a Certificate Course

To equip project's target groups with the best tools to thrive in a digital age, one (or several) of available online courses with certification will be tested in *EDIH Academy*.

The *EDIH Academy* will offer its target groups a testing certification course in one of the most relevant and fastest expanding technologies – AI. Why AI technologies? This choice of the topic is based on its relevance, examples of experience of rapid adaptation of acquired knowledge to practical application, and the availability of representatives of the AI expert community in the project partner organisations who can contribute to assess the quality of the proposed course. Access to AI training enables SMEs to remain competitive in a rapidly

evolving business landscape, whereas PSOs – to improve efficiency, optimise processes and gain to innovative solutions, that is in line with the goals of the project.

There is a range of commercial courses for key AI technologies with generally recognised certificates on the market. As a possible provider of a certificate course the following sources will be taken into consideration:

1.	MinnaLearn ⁴⁵
2.	Elements of AI ⁴⁶
3.	KI-Campus ⁴⁷
4.	HKBiS Handelskammer Hamburg Bildungs-Service ⁴⁸
5.	Initiative for Applied Artificial Intelligence ⁴⁹
6.	Udacity ⁵⁰
7.	Fraunhofer. Big Data AI ⁵¹
8.	Iversity ⁵²
9.	edX ⁵³
10.	PUNK (by WBS) ⁵⁴
11.	Digital Learning Institute ⁵⁵

Table 2: Certificate courses sources

By considering these different sources, we are aiming to provide a well-rounded and time-relevant certificate course that meets the specific needs of the project's target groups, while ensuring the high quality of training in key AI technologies.

The evaluation of the selected course aims to analyse the actual AI training needs of the project's target groups, namely the SMEs and the private sector, and also helps to understand which other formats may be worth developing and offering in the project at next project stage and could be demanded by the target group of the project. Tailoring the courses to the identified preferences and needs of the project's target groups aims to ensure the provision of the most

⁴⁵ <https://www.minnalearn.com/elements-of-ai-for-business/>, retrieved in November 2023

⁴⁶ <https://www.elementsofai.com/>, retrieved in November 2023

⁴⁷ <https://ki-campus.org/>, retrieved November 2023

⁴⁸ <https://hkbis.de/ihk-weiterbildung-kuenstliche-intelligenz/>, retrieved in November 2023

⁴⁹ <https://www.appliedai.de/loesungen-services/weiterbildung>, retrieved in November 2023

⁵⁰ <https://www.udacity.com/school/artificial-intelligence>, retrieved in November 2023

⁵¹ <https://www.bigdata-ai.fraunhofer.de/de/data-scientist/schulungssuche/kompakteinstieg-kuenstliche-intelligenz.html>, retrieved in November 2023

⁵² <https://iversity.org/de/courses/kunstliche-intelligenz-und-maschinelles-lernen>, retrieved in November 2023

⁵³ https://www.edx.org/certificates/professional-certificate/databricks-large-language-models?irclickid=2L7R7K1QxxyPUa3TYZ22JS2OUkFQdvWlg28bWM0&utm_source=affiliate&utm_medium=Edukatico&utm_campaign=Online%20Tracking%20Link_&utm_content=ONLINE_TRACKING_LINK&irgwc=1, retrieved in November 2023

⁵⁴ <https://www.punkbywbs.de/>, retrieved in November 2023

⁵⁵ <https://www.digitallearninginstitute.com/course/ai-for-learning-certificate/>, retrieved in November 2023

relevant and updated certified courses, give a positive learning experience and, as a result, increase confidence in the use of AI technologies, thereby giving organisations a competitive edge.

3.3 Providing and evaluating of the Certificate Course

As a pilot certificate course offered by the *EDIH Academy*, one of the available commercial courses was selected, made available to the project's target audience and evaluated for the relevance through a developed questionnaire (Annex 69 (German) and 68 (English)).

Certificate course "*Elements of AI for Business*", see Annex 65 is an online course from the University of Helsinki supplied by Minnalearn, that introduces the basic concepts of Artificial Intelligence in a business context and gives the opportunity to acquire practical skills in using it. The course is delivered on a subcontracting basis as part of the EDIH project (ST-4). A license for the facilitation of 50 participants during 2024 has been purchased. In 2024, four groups (batches) of 12-14 participants were guided by a facilitator from ARIC.

The description of the course as well as a learning programme are given on the course website⁵⁶. It includes theoretical lectures, group discussions, practical exercises and self-learning. The study process is carried out with the help of Miro board framework (Annex 68). An ARIC course instructor guides each participant through the entire learning process. The duration of the course is four-five weeks. Upon successful completion of the course, participants receive a certificate (Annex 70).

The survey was conducted among the participants of the course, who were asked to complete a questionnaire. The developed questionnaire was accessed by the course participants through survey management system *EUSurvey*⁵⁷, ensuring a user-friendly and easily accessible feedback mechanism. The feedback data collected was analysed to extract meaningful insights.

The feedback highlights the positive aspects of the course, focusing on the following key points:

1. **Engagement and Interaction:** The exchange of ideas and the attention given to participants' questions were highly appreciated. Participants enjoyed the open and supportive learning environment.
2. **Course Leadership:** ARIC course instructor was praised for his calm and composed approach to teaching complex topics, with participants noting his competence and ability to guide discussions effectively. His moderation was described as highly engaging and knowledgeable.
3. **Practical Exercises:** The hands-on exercises were a major highlight, helping participants engage with the content actively. The mix of theoretical knowledge and practical application, particularly the real-world use cases, was seen as a strong point of the course.
4. **Group Dynamics:** The collaborative atmosphere, including exchanges with other professionals, was seen as valuable. The group was well-composed, which contributed to productive discussions and teamwork.

⁵⁶ <https://www.minnalearn.com/>, retrieved in November 2024

⁵⁷ <https://ec.europa.eu/eusurvey/>, retrieved November 2023

5. **Course Structure:** The course was well-structured, with a good balance between theory and practice. The theoretical sections were described as well-prepared, and participants found the content relevant and useful for their daily work.
6. **Learning Environment:** The overall learning atmosphere created by the trainer was appreciated, with the course being described as engaging and motivating. The balance of interactive discussions, group work, and expert insights from the instructor helped foster a positive learning experience.

Overall, the feedback highlights the course's success in delivering knowledge in a practical, engaging, and well-organized manner. 100% of participants would recommend this course to others.

The main emphasis of topics demanded by the participants lies in Artificial Intelligence, Digitalization, and Sustainability, reflecting a strong focus on integrating advanced digital technologies in a way that supports sustainable growth and innovation in the workforce.

4. Summary

This document provides a final overview of the formats developed for the pillar Skills & Training in EDIH4UrbanSAVE after two years of the project running. It presents the overall curriculum of the developed formats as well as concept of joint applied academy (*EDIH Academy*), which includes offering of application-oriented certificate courses for key technologies and the ST-formats developed. The format's concepts, topics, scope, objectives and especially the value of service for the participants are highlighted.

Most of ST-formats are already up and running, while others are still being developed. For services in trial and operation as well as for the certificate course, feedback is being collected and analysed in order to go through a continuous service improvement process. The analysis of the real training needs of the project's target audience by means of the developed questionnaire will enable the project to deliver highly relevant, targeted and impactful training initiatives that promote the successful integration of key technologies into the routine work of companies.

Glossary

Notions defined in this glossary are specific for this document only.

Notion	Meaning
ADCH	AI, Digitisation, Cybersecurity, and HPC
AI	Artificial Intelligence
AR	Augmented Reality
ARIC	Artificial Intelligence Center Hamburg
CAD	Computer Aided Design
CEO	Chief Executive Officer
ChatGPT	Chat Generative Pre-trained Transformer
CIP	Continuous Improvement Process
CNN	Convolutional Neural Networks
CRM	Customer Relationship Management
DBSCAN	Density-Based Spatial Clustering of Applications with Noise
DigiHub	Digital Hub Logistics GmbH
DMS	Document Management System
EDIH	European Digital Innovation Hub
EDIH4UrbanSAVE	European Digital Innovation Hub for urban interconnected supply and value Ecosystems
ERP	Enterprise Resource Planning
EU	European Union
FLOPS	Floating Point Operations Per Second
GA	Grant Agreement
HAW	University of Applied Science
HITeC	Hamburger Informatik Technologie-Center
HPC	High-Performance Computing
HWK	Handwerkskammer Hamburg
ICT	Information and Communication Technologies
ISTQB	International Software Testing Qualifications Board
KPI	Key Performance Indicator
LLM	Large Language Model
LSP	LEGO® SERIOUS PLAY®
MDZ	Mittelstand-Digital Zentrum
ML	Machine Learning
MLP	Multi Layer Perceptron Network
MVP	Minimal Valuable Product
OGD	Open Government Data
PA	Public Authority
PeCoH	Performance Conscious HPC
PKI	Public Key Infrastructure
PoC	Proof of Concept
PSO	Public Sector Organization
Q&A	Questions & Answers

RFID	Radio Frequency Identification
ROI	Return of Investment
SEO	Search Engine Optimization
SME	Small and Medium Enterprises
ST	Skills & Training
TMS	Transportation Management System
TUHH	Technical University of Hamburg
VPN	Virtual Private Network
VR	Virtual reality
2FA	Two-Factor Authentication
3D	three-dimensional

Table 3: Glossary

Annex

Annex 1. Overview slides for “*An insight into the field of HPC*”

Overview

- ▶ Introduction
- ▶ System Architectures
- ▶ Hardware Architectures
- ▶ I/O Architectures
- ▶ Performance Frontiers
- ▶ Parallelization Overheads
- ▶ Domain Decomposition
- ▶ Job Scheduling
- ▶ Use of the Command Line Interface
- ▶ Using Shell Scripts
- ▶ Selecting the Software Environment
- ▶ Use of a Workload Manager
- ▶ Benchmarking

Introduction

What is HPC?

- ▶ tautological definition
 - ▶ “You are doing HPC when you are using HPC hardware.”
- ▶ traditional definition
 - ▶ run *computer simulations in natural sciences and engineering* as fast as possible
 - ▶ performance metric: FLOPS or Flop/s (double-precision floating-point operations per second)
- ▶ other performance metrics
 - ▶ time-to-solution
 - ▶ time to get a task done
 - ▶ search operations per second
 - ▶ ...
- ▶ common denominator
 - ▶ powerful hardware

Introduction

HPC software environment

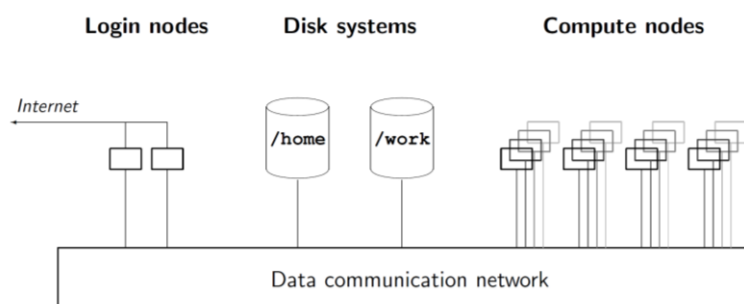
- ▶ the operating system is GNU/Linux
- ▶ interactive access is limited
 - ▶ graphical user interfaces are unusual
 - ▶ the command line has to be used
- ▶ a *batch system* has to be used
 - ▶ batch jobs are being prepared and managed from the command line
 - ▶ batch jobs have to be formulated as shell scripts
 - ▶ job inputs must be prepared beforehand

Introduction

Need for parallel processing

- ▶ *parallelization* is needed in order to significantly speed up computations
 - ▶ the basics of parallel computing must be understood
 - ▶ parallel performance needs to be checked: is the runtime (almost) n times shorter when n times as many compute cores are used?

HPC cluster architecture



HPC cluster architecture

What the user sees

- ▶ login nodes
- ▶ compute nodes
- ▶ special nodes (e.g. for pre- and post-processing)
- ▶ disk systems
- ▶ data communication network

Nodes that work in the background

- ▶ admin/management nodes
- ▶ system services nodes
- ▶ disk nodes

Parallel computer architectures (1)

Components of a parallel computer

- ▶ compute units
- ▶ main memory
- ▶ high speed network

Compute units

- ▶ CPUs
- ▶ GPUs / GPGPUs
- ▶ FPGAs
- ▶ vector computing units

Figure 2: Slide insight into “*An insight into the field of HPC*”

Annex 2. Overview slides of “Introduction to the AI Act”

EU AI Act

EU AIA - European Union Artificial Intelligence Act

- Formally adopted March 13 in the EU parliament (523-46) and EU council on May 21
- Most visible changes will take effect in 12 months
- Long and difficult process, many “late” additions (foundation models, scientific advisory boards) and exceptions
- Application is still figured out
- visible but limited real-life impact on most users and developers

What is “AI”?

“AI system” means a **machine-based system** designed to operate with **varying levels of autonomy** and that **may exhibit adaptiveness** after deployment and that, for explicit or implicit objectives, **infers**, from the input it receives, how to generate **outputs such as predictions, content, recommendations, or decisions** that can influence physical or virtual environments.

Who is affected?

- Regulates access to EU market
- Regulates providers and products: does not confer rights of/on individuals!

Exemptions

- Military, defence, national security
- AI used by international orgs or public authorities outside EU - if an international agreement is in place
- Models/systems developed for scientific research & development
- Research and testing of models/systems
- Personal non-professional use
- AI systems released under free and open source licenses (exceptions for “risky” systems)

Classification of AI systems

Unacceptable risk	prohibited	
High risk	conformity assessment obligation	social scoring, cognitive behavioural manipulation, emotion recognition (workplace/school), biometric identification (exceptions apply)
General purpose AI (GPAI) (new!)	transparency obligations	toys, aviation, cars, medical devices, scoring by insurances, critical infrastructure (energy/transportation)
Limited risk (new!)	transparency obligations	ChatGPT, GPT-4, Sora, CLIP
Minimal risk	no obligations, code of conduct	Chatbots, Deep Fakes
		Spam filters, video games

Figure 3: Insights in slides of “The AI Act”

Annex 3. Overview slides for “AI for deciders”


Künstliche Intelligenz für Entscheider

Dr. Sven Magg



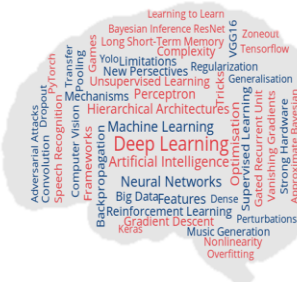


Hamburgische
Investitions- und
Förderbank



Fragen die wir beantworten wollen

- Begriffe und **Konzepte der KI** verständlich machen
- Was ist datengetriebene KI (a.k.a **Machine Learning**)?
- Wie lernt so eine KI?
- Welche **Probleme** kann sie lösen?
- Welche **Anforderungen** müssen Daten erfüllen?
- Wie kann ein erfolgreiches **KI-Projekt** aussehen?

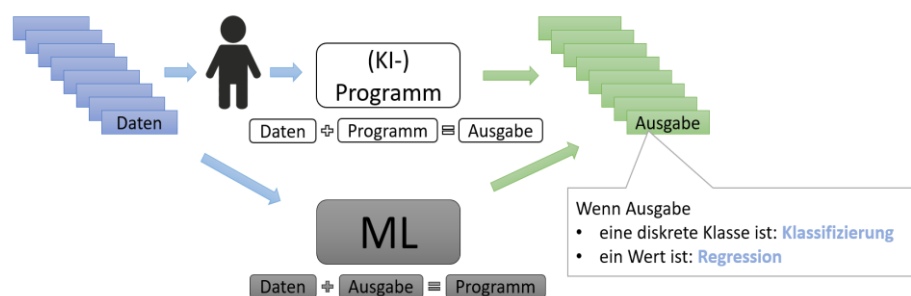


HITEC

KI ⇔ Machine Learning

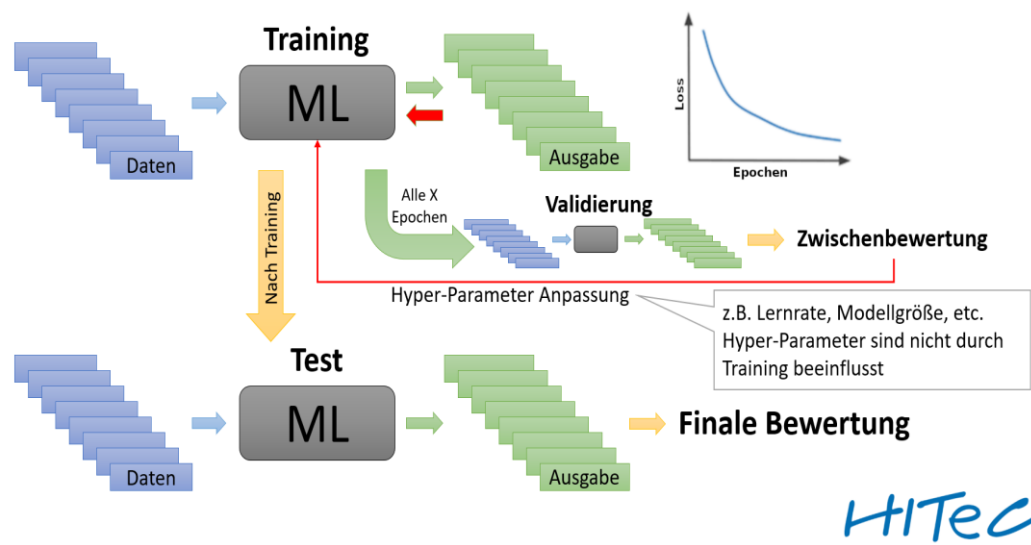
Machine Learning ist **ein** Gebiet der KI

Machine Learning (ML)= „Datengetriebenes Lernen“



HITEC

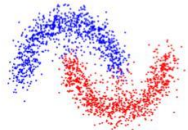
Wie kann ich das Ergebnis evaluieren?



Verschiedene Trainingsmöglichkeiten

Unüberwacht / Unsupervised

- Keine Zielausgabe
- ML sucht Eigenschaften, die die Daten gemeinsam haben (Korrelation)



- Daten werden gruppiert nach Eigenschaften

Semi-supervised / Reinforcement Learning

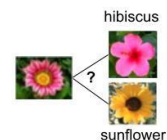
- Keine Daten □ System interagiert mit einer Umwelt



- Feedback durch Belohnung/Bestrafung
- ML lernt, welche Aktion welche Auswirkung hat

Überwacht / Supervised

- Zielausgabe für jeden Datenpunkt
- ML lernt Muster in den Daten, um diese zu unterscheiden



HITec

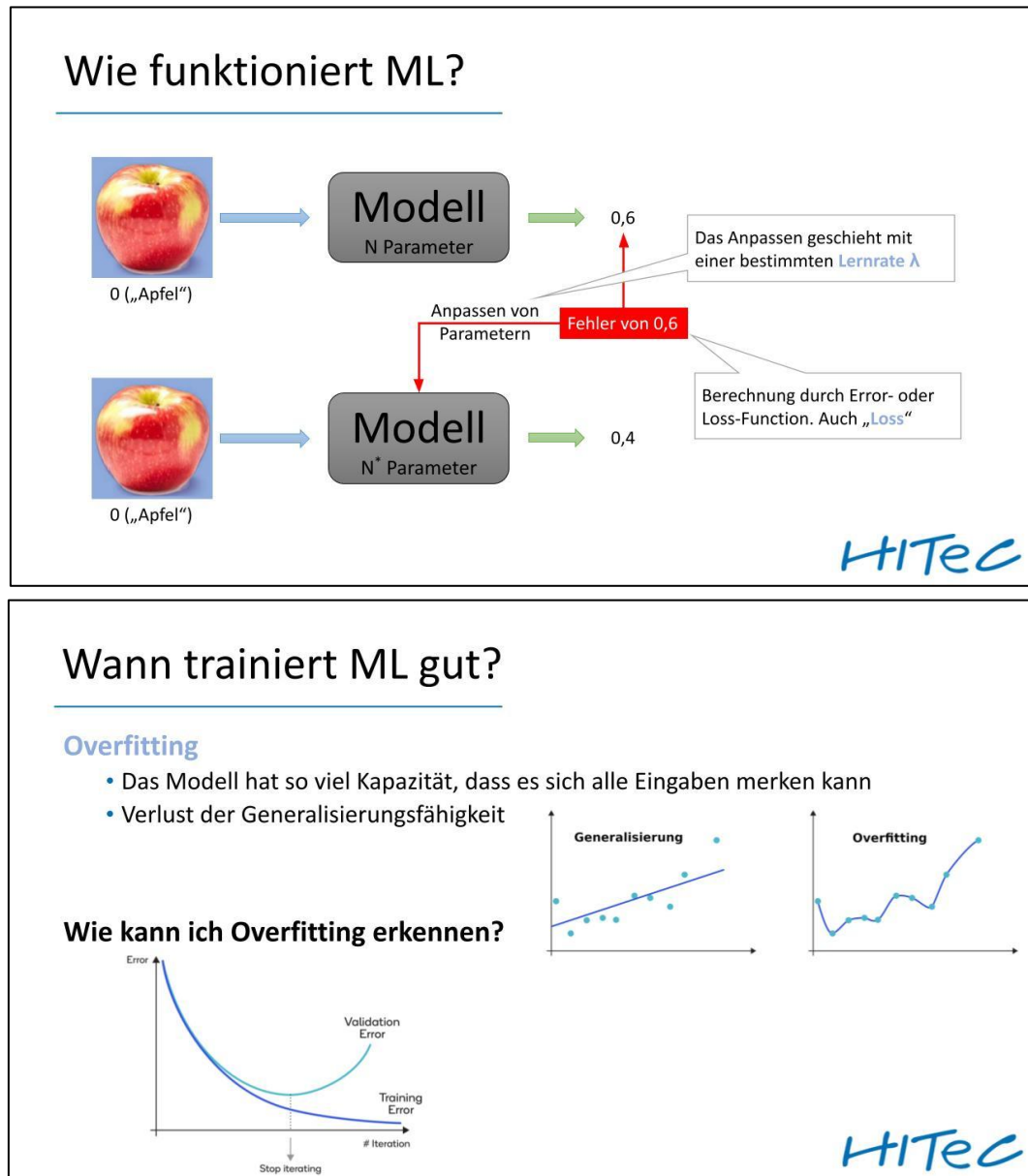
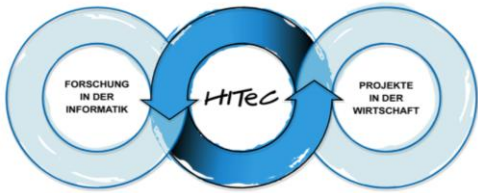



Figure 4: Slide insight into “AI for Deciders”


Annex 4. Overview slides for “An introduction to Machine Learning”




**Einführung in
Machine Learning**

Dr. Sven Magg & Mohammad Zamani





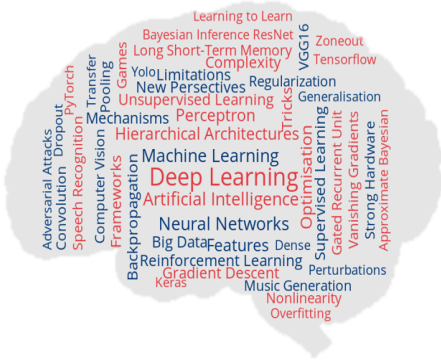
Hamburgische
Investitions- und
Förderbank



Funded by
the European Union

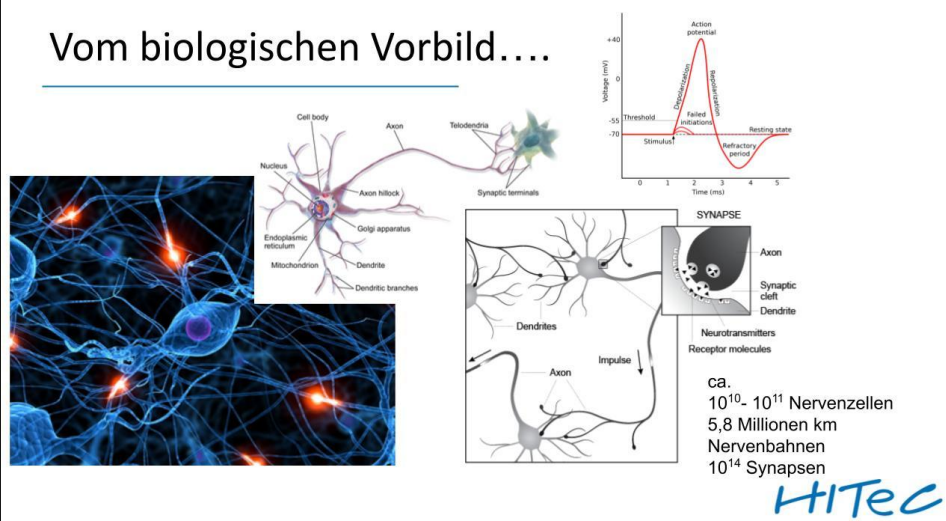
Inhalt

- **Session 1 (Heute)**
 - Einführung in die KI
 - Datenvorverarbeitung
 - Unüberwachtes Lernen, Clustering
- **Session 2 (?)**
 - Überwachtes Lernen
 - Lineare Trennbarkeit, Regression
 - Multilayer Perceptron (MLP)
- **Session 3 ()**
 - Reinforcement Learning
 - Q-Learning, Actor-Critic Learning



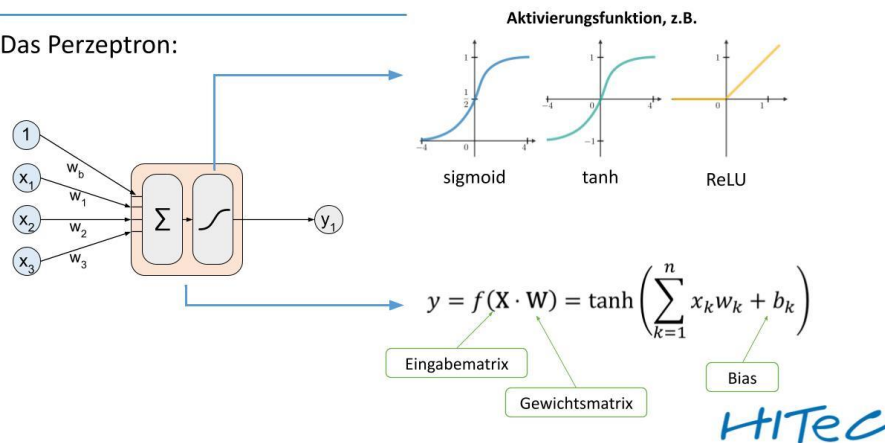
HITEC

Vom biologischen Vorbild....



...zum künstlichen Neuron

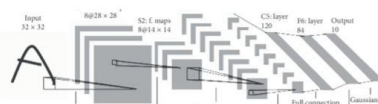
Das Perzeptron:



War war passiert....?

“Deep” learning war schon vor 2000 bekannt.....?

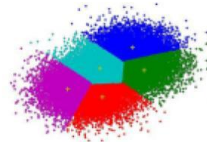
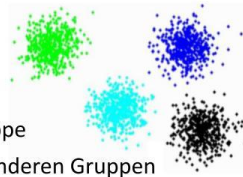
1. Mehrere Entwicklungen haben zusammen gefunden (Modelle, effizientere Lernverfahren, ...)
2. Rechenpower durch GPU Computing
 - GPUs eignen sich hervorragend für die Berechnung von neuronalen Netzwerken
3. Frameworks
 - Effiziente Implementierungen für GPUs und Parallelisierung
4. Daten! Viele, viele Daten....



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Was ist Clustering?

- **Cluster:** Eine Gruppe von Datenobjekten
 - ähnlich (oder verwandt) zu Objekten der gleichen Gruppe
 - unterschiedlich (oder nicht verwandt) zu Objekten in anderen Gruppen
- **Cluster Analyse**
 - Finden von Ähnlichkeiten zwischen Daten anhand ihrer Charakteristika und Einordnen ähnlicher Objekte in „Cluster“
- **Unüberwachtes Lernen:** Keine vordefinierten Klassen
 - Die Anzahl der Klassen muss nicht vorher bekannt sein



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Partitionierung

Partitioniere einen Datensatz D von Objekten x in eine Menge von k Clustern und minimiere die Summe der quadrierten Distanzen zu den Durchschnitten m_i

$$E = \sum_{k=1}^k \sum_{N_i} (x_p - m_i)^2$$

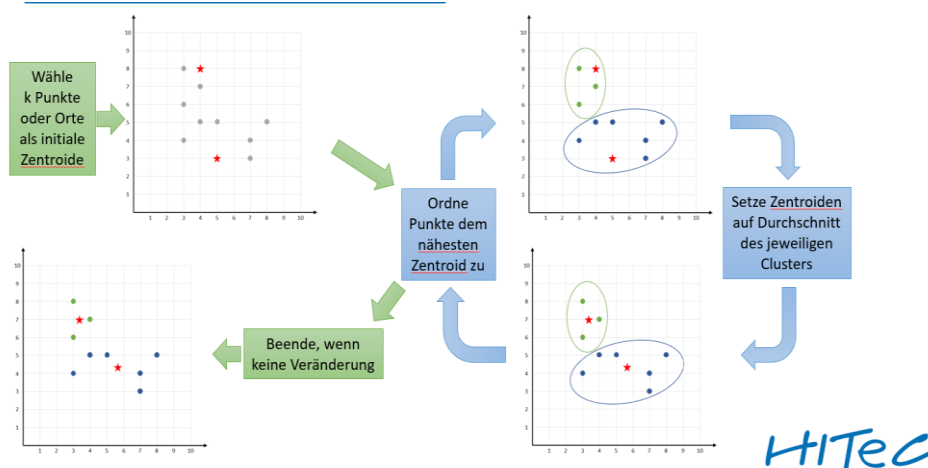
Labels for the equation components:

- Gesamtfehler** (Total Error) points to the entire equation.
- Summe über alle Cluster** (Sum over all clusters) points to the outer summation index k .
- Zahl der Punkte in Cluster i** (Number of points in cluster i) points to the inner summation index N_i .
- Summe über alle Punkte in Cluster i** (Sum over all points in cluster i) points to the term $(x_p - m_i)^2$.
- Quadrierte Distanz zu Clusterdurchschnitt** (Squared distance to cluster mean) points to the term $(x_p - m_i)^2$.

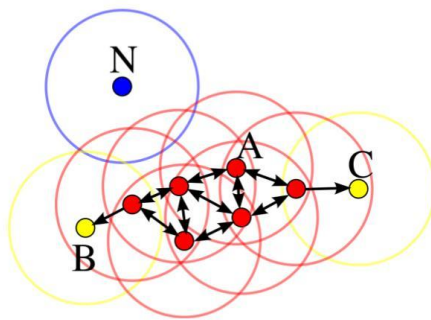
Gegeben k **Zentroide**, finde eine Partitionierung in k **Cluster** die den Fehler E minimiert

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k-Means Clustering



DBSCAN - Definitionen



Core Point: Ein Punkt p ist ein Core Point wenn $\min_samples$ Punkte innerhalb einer Distanz ϵ liegen

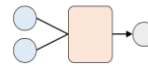
Ein Punkt q ist **erreichbar** von p wenn er innerhalb einer Distanz ϵ von p liegt, oder ein **erreichbarer Pfad** p_1, \dots, p_n, q existiert (=alle roten & gelben Punkte)

Alle Punkte die nicht von einem Core Point erreichbar sind, sind **Outlier**

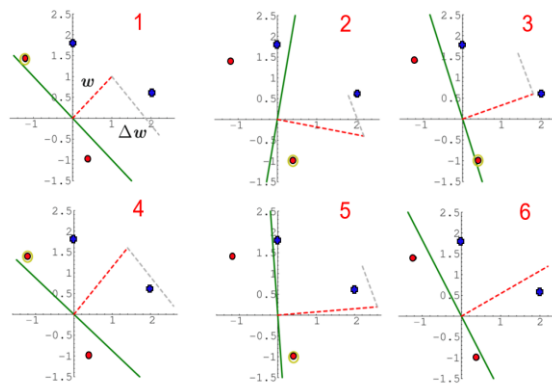
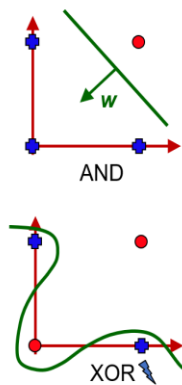
Zwei Punkte p and q sind **Dichte-verbunden** wenn beide von einem dritten Punkt o erreichbar sind.

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Was kann ein Perzeptron?



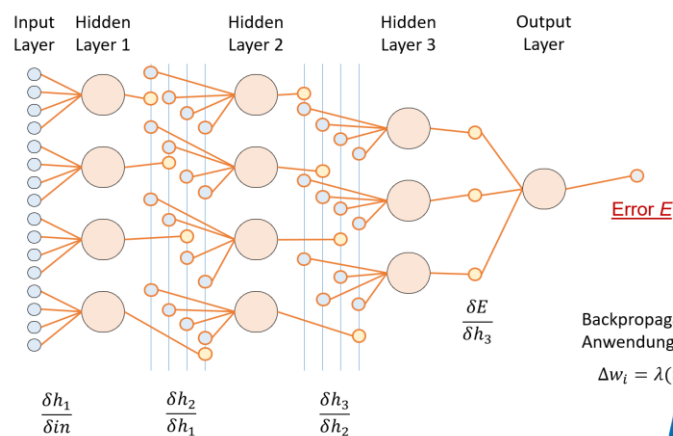
Lineare Klassifikation!



[Ertel 2009]

HITec

Tiefe Netzwerke - Backpropagation



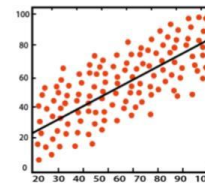
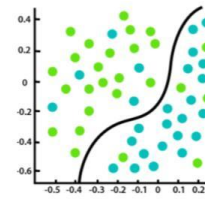
Backpropagation durch Anwendung der Kettenregel!

$$\Delta w_i = \lambda(t - y)f'(h)x_i$$

HITec

Supervised Learning

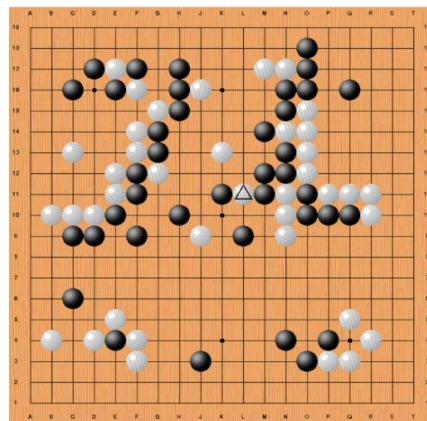
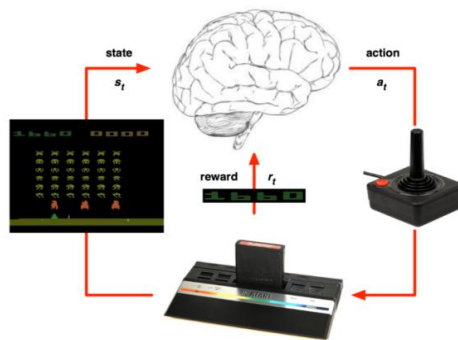
- Datenpunkte sind Paare aus Eingabe und Ausgabe
- Welche Probleme kann ich damit lösen?
 - Klassifikation: Zuordnen von „Labels“ zu ungesehenen Datenpunkten
 - Regression: Vorhersage von Ausgabewerten für neue Eingaben
 - Transkription: Unstrukturiert -> Text (Spracherkennung)
 - Übersetzen: Sequenzen von Symbolen -> Andere Sequenz
 - De-Noising: Fehler in Bildern/Signalen ausbessern
 - Vorhersagen: Monitoring, Predictive Maintenance
 -



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Machine Learning - An Introduction Reinforcement Learning

Mohammad Ali Zamani
zamani.github.io
HiTec



	Supervised Learning	Unsupervised Learning	Reinforcement Learning
Given	(x, y) input \leftarrow label	x input \leftarrow	(S, A, R) reward \leftarrow instead of y
Approach	$\begin{array}{c c} x_1 & x_2 & y \\ \hline 38 & 90 & 1 \\ 35 & 95 & \\ 365 & 93 & \end{array}$ $\hat{y} = f_w(x)$ e.g. $\hat{y} = w_1 x_1 + x_2 x_2 + w$	$x \rightarrow c$ independent $\textcircled{1}$ passive $\textcircled{2}$	$\textcircled{2}$ Active $\textcircled{1}$ reward instead of y $\textcircled{3}$ $\frac{S}{t_0 \rightarrow (0,0) \uparrow}$ $t_1 \rightarrow (0,1) \uparrow$ - notion of time $S \rightarrow A \rightarrow \text{env}$ called Agent max Expected reward in the future
Goal:	$\min_w \text{Loss}_{\text{given } (x,y)_i}$ $\mathcal{L} = \frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2$		

Online oder Batch Learning?

- **Online Learning:** Update nach jeder Eingabe
→ Lernen folgt schnell dem zick-zack Kurs
- **Batch Learning:** Ein Update nach einer *Epoche*
→ Lernen folgt langsam dem steilsten Gradienten
- **Mini-Batch Learning:** Ein Update nach k Eingaben

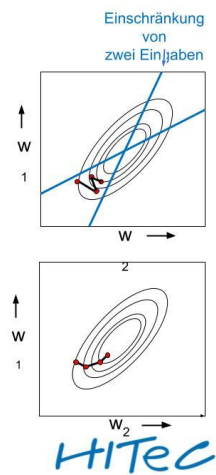


Figure 5: Slide insight into “An introduction to Machine Learning”

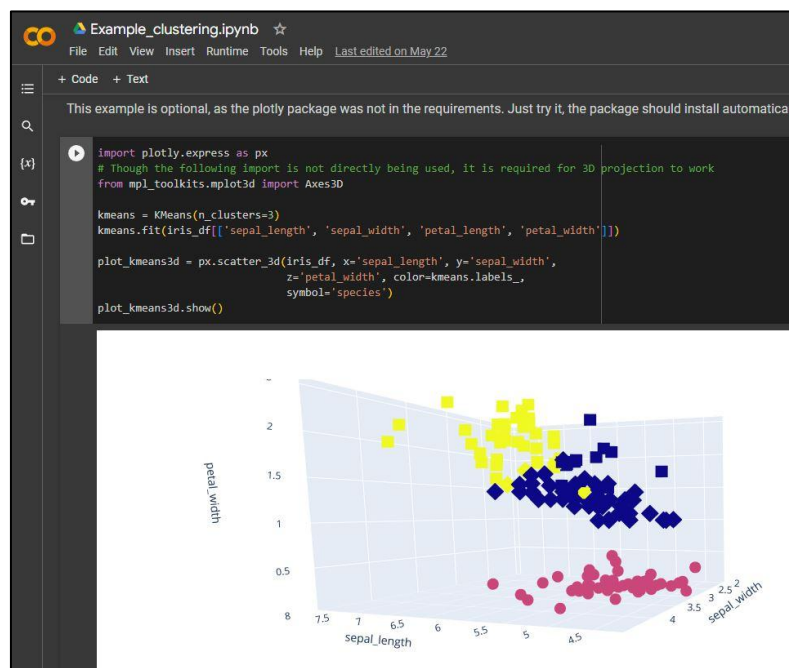






Figure 6: Insights in practical session of workshop

Annex 5. Overview slides for “Convolutional Neural Networks”


Convolutional Neural Networks

Mohammad Zamani

Type of problems:
We focus on classification.

Input	Output
[1 10 3 ... 4]	0
[4 5 7 ... 10]	1
...	...

Temporal or spacial relation in input space

1D example:


- feature detection
- sequence of sensor data
- Audio / Text over fixed period

The location of the feature in the segment of data is not important.




Loss (classification)

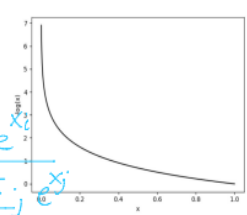
1. Negative log likelihood (how bad is the prediction)
torch.nn.NLLLoss $L(y) = -\ln(y)$

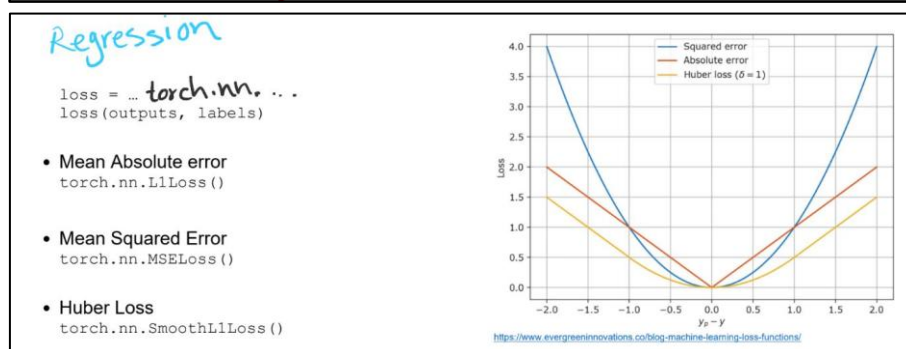
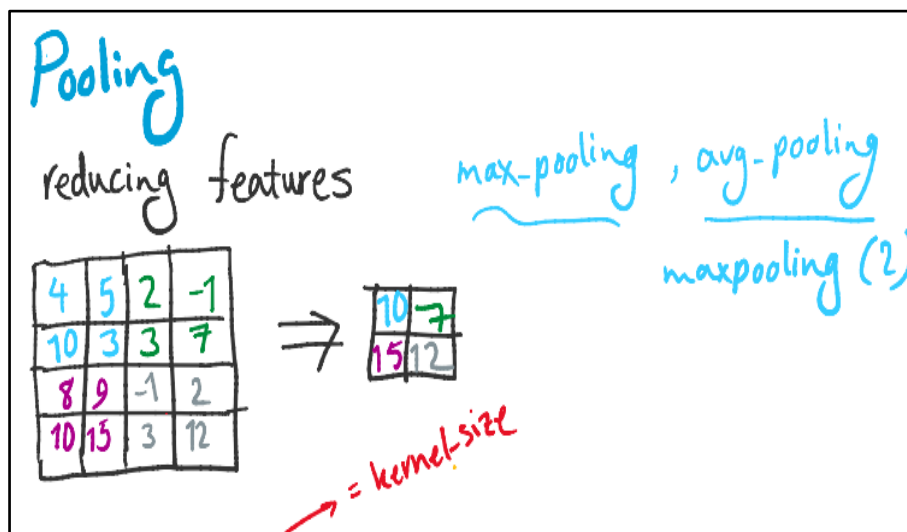
example:



$$S(x_i) = \frac{e^{x_i}}{\sum_j e^{x_j}}$$

	cat	dog	horse	
	<u>0.71</u>	0.26	0.04	$L(0.71) = -\ln(0.71) = 0.34$
	0.02	0.00	<u>0.98</u>	$L(0.98) = -\ln(0.98) = 0.02$
	0.49	<u>0.49</u>	0.02	$L(0.49) = 0.71$ <i>lower confidence</i> <i>unhappy</i>





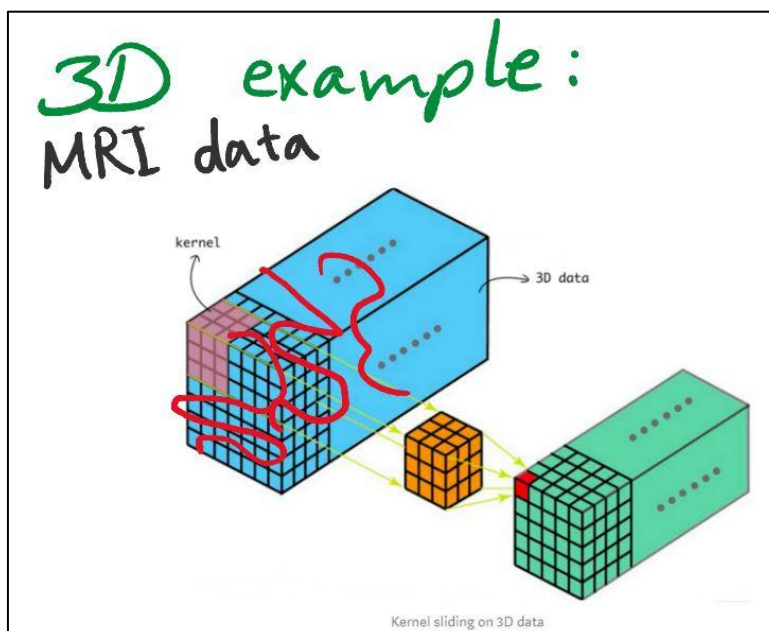
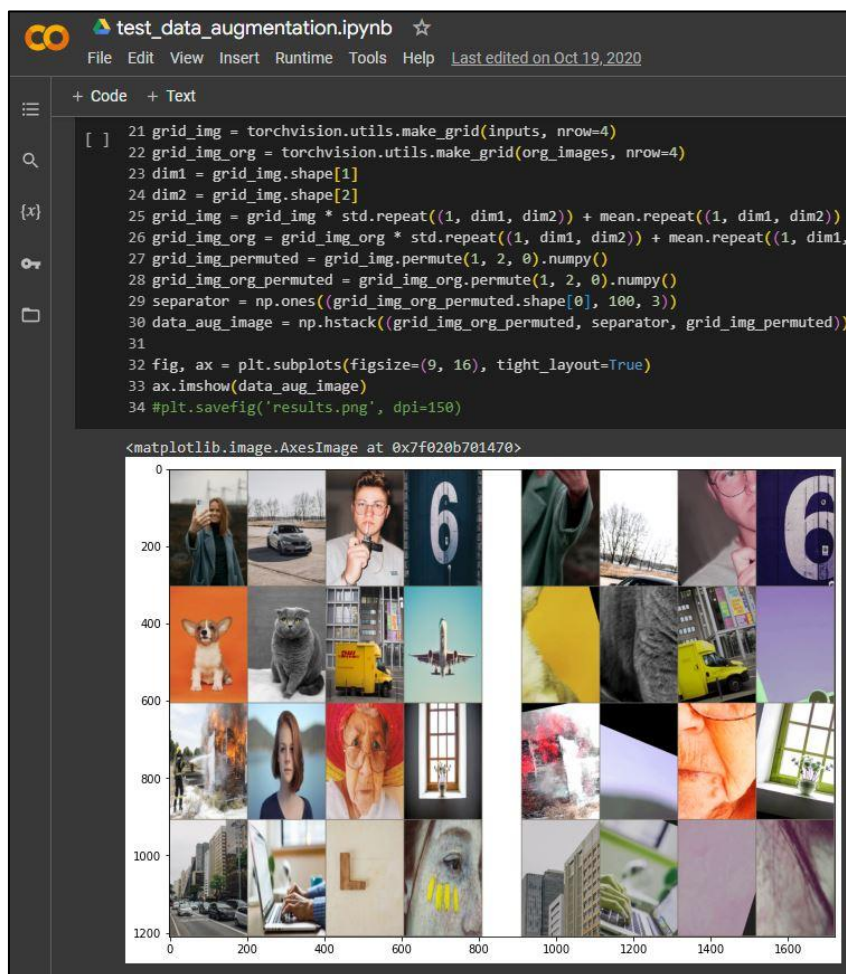
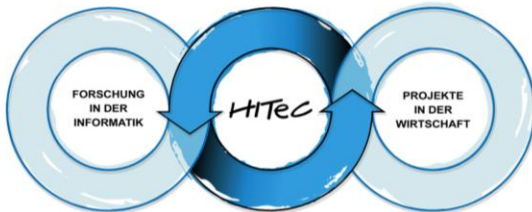



Figure 7: Insights in the hands-on session, live development session “Convolutional Neural Networks”

Annex 6. Overview slides for “*AutoML and Hyperparameter Optimisation*”

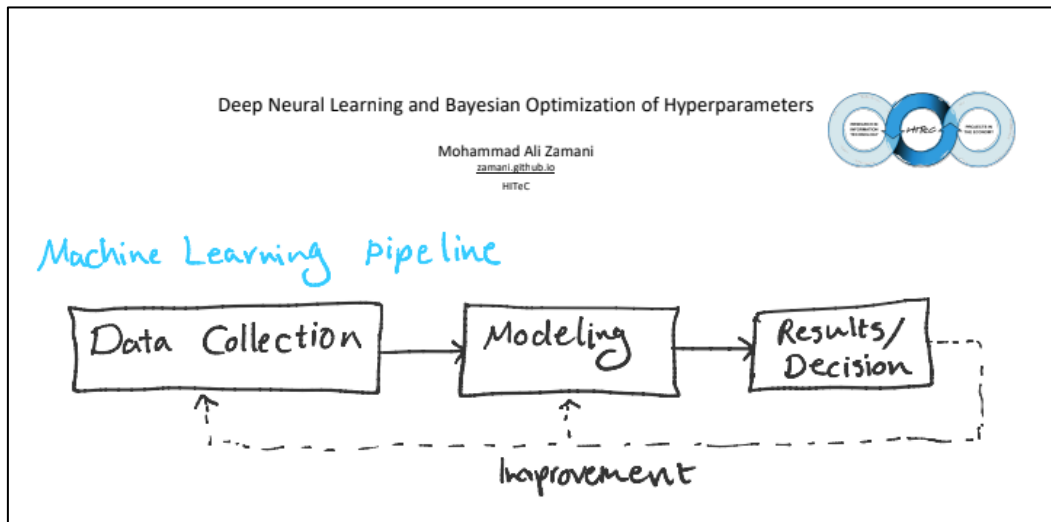
The diagram consists of three overlapping circles. The left circle is light blue and contains the text 'FORSCHUNG IN DER INFORMATIK'. The right circle is light blue and contains the text 'PROJEKTE IN DER WIRTSCHAFT'. The central circle is dark blue and contains the text 'HITEC'. Arrows point from the left circle to the central circle and from the central circle to the right circle.

AutoML and Hyperparameter Optimisation

Mohammad Zamani



The footer contains three logos. On the left is the EDIH HAMBURG logo, which includes a blue circle with a white 'E' and a red dot, followed by the text 'EDIH HAMBURG' in blue and red. In the middle is the IFB HAMBURG logo, which includes the text 'IFB HAMBURG' in blue and red, followed by a vertical line and the text 'Hamburgische Investitions- und Förderbank' in blue. On the right is the European Union flag logo, which includes the text 'Funded by the European Union' in blue.



Topics

- Hyper Parameters Optimization (HPO)
 - Model Free
 - Random Search
 - Grid Search
 - Evolutionary Algorithms, RL
 - Successive Halving, HyperBand
 - Model Based
 - Bayesian Optimization
- Architecture Search
 - Neural Architecture Search (NAS)

Global Optimization:

$f: \mathbb{R}^D \rightarrow \mathbb{R}$, well behaved, bounded domain

$$x_M = \arg \min_{x \in \mathbb{R}^D} f(x)$$

f unknown \rightarrow only evaluation
expensive evaluation
noisy

In our case \rightarrow loss function

How?

1- Grid Search

A lot of evaluations

2- Random Search

Good benchmark

vs ~~0.1~~ 0.05, 0.001
16 32 64 128

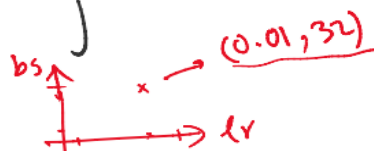
Hyperparameter
 $\leftarrow \eta, \text{batch size, SGD, Adam}$

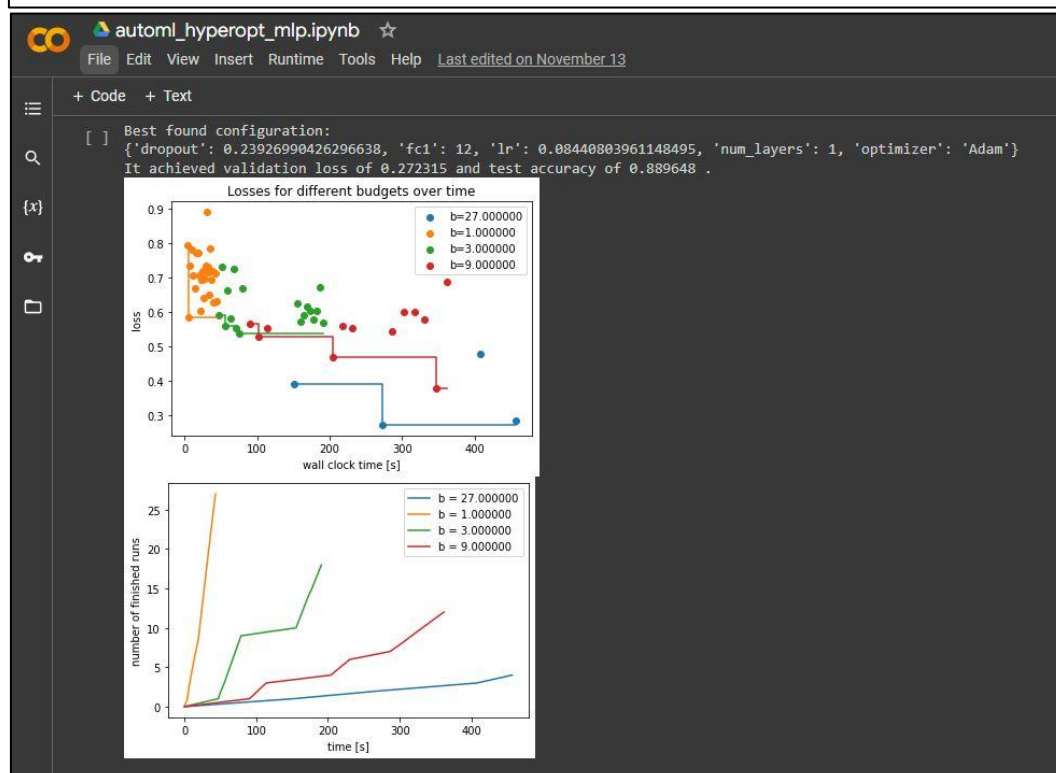
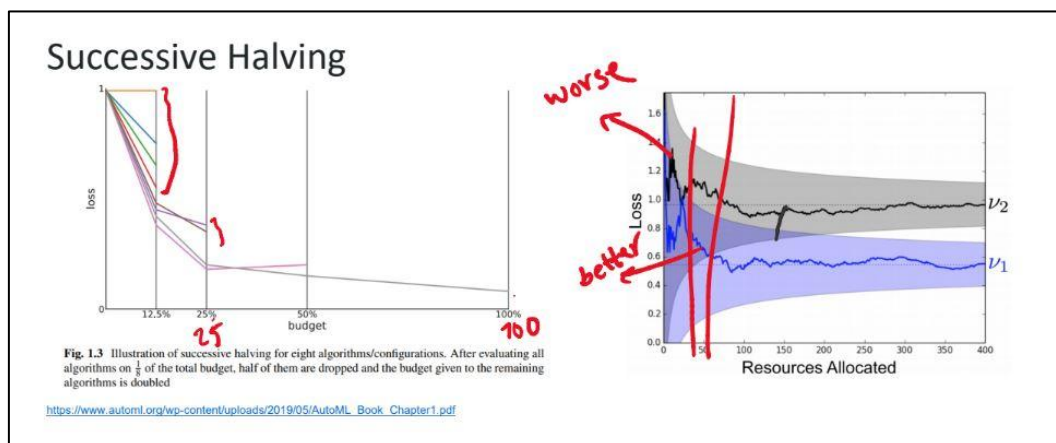
Architecture

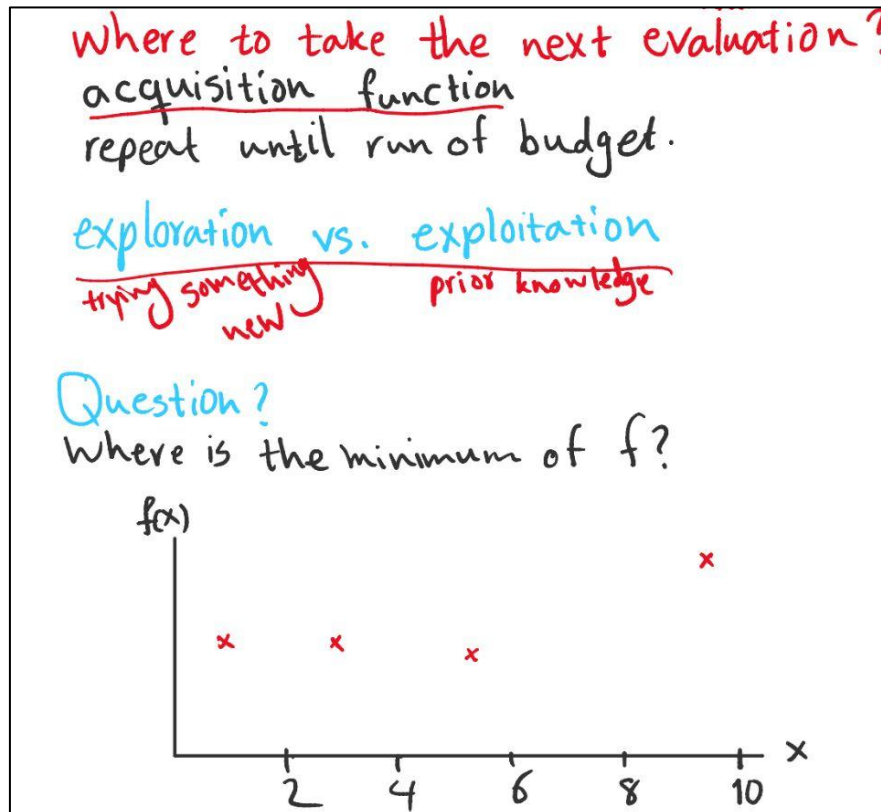
Search

How many layers, kernel size, ...

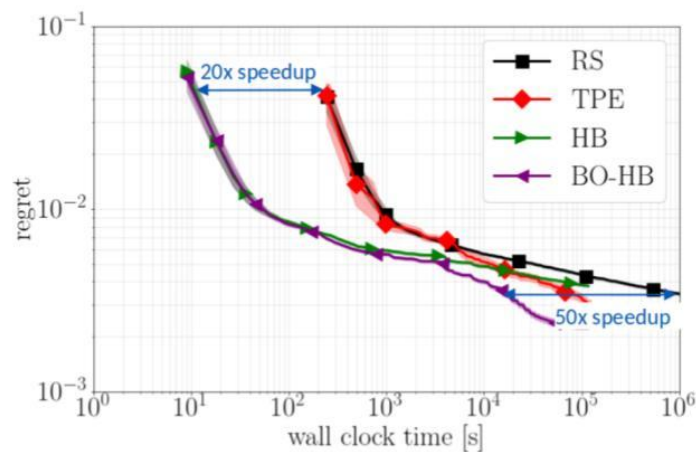
which one is better?







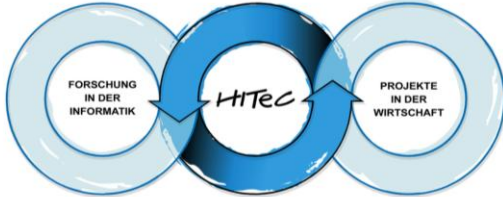
BOHB



http://ais.informatik.uni-freiburg.de/teaching/ws18/deep_learning_lab/presentation_automi.pdf




6

Figure 8: Glimpse into “AutoML and Hyperparameter Optimisation”, workshop with accompanying live development

Annex 7. Overview slides for “*Embedded AI*”


Embedded AI

Mohammad Al Zamani

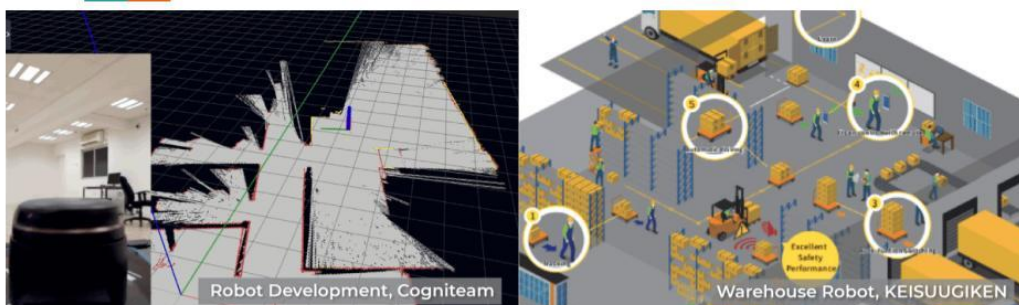
  Hamburgische Investitions- und Förderbank  **Funded by the European Union**

Content

- Applications
- List of Embedded Systems
- Hardware Selection
- Deep Learning Training for Embedded AI
- Deployment of Model
- Demo
- Summary



Applications



<https://www.seeedstudio.com/Jetson-10-1-A0-p-5336.html>



Applications



<https://www.seeedstudio.com/Jetson-10-1-A0-p-5336.html>



Applications

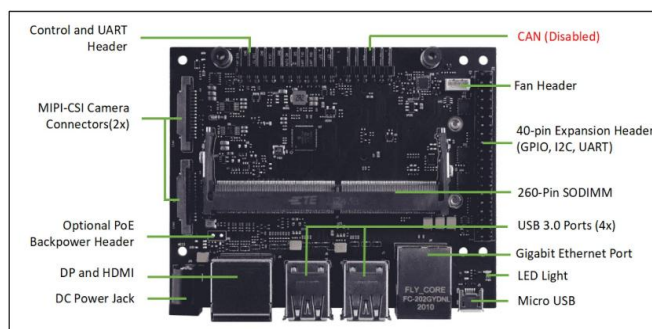


<https://www.seeedstudio.com/Jetson-10-1-A0-p-5336.html>



Nvidia Jetson Nano Developer Kit

- 2 MIPI-CSI Camera Connectors
- Control and UART Header
 - for flashing and recovering
- M.2 Key M
 - for installing SSD memory



The Board for reComputer J1020 (Side A)

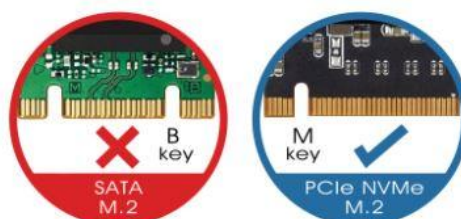


Figure 5. Compatible SSD memory for reComputer J1020



Figure 6. An example of an SSD card inserted in reComputer J1020.⁷

Nvidia Jetson Nano Developer Kit

- reComputer J1020- Edge AI Device with Jetson Nano module.
- Jetson Nano 4GB module
- 128 NVIDIA CUDA® cores.



reComputer J1020- Edge AI Device with Jetson Nano module.



Flashing JetPack OS via NVIDIA SDK Manager

- Install NVIDIA SDK Manager on the Linux Host PC.
- Open NVIDIA SDK Manager and login.
- Select the target device.
- Install the system.

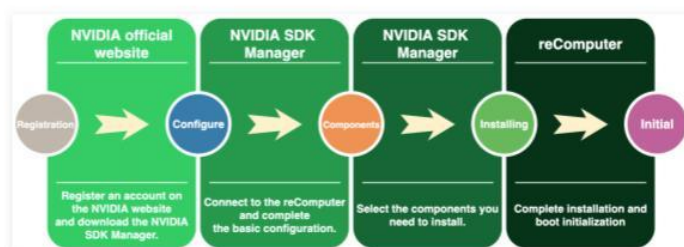


Figure 11. Overall Steps for flashing Nvidia Jetson



Figure 9: Insights in slides of “*Embedded AI*”

Annex 9. Overview slides for “Introduction on Image Generation with AI”?





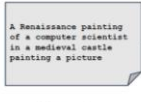

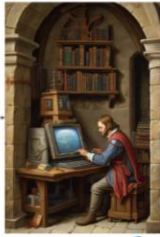




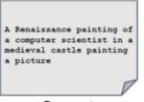

	 <p>Generative AI Bildgenerierung mit Stable Diffusion</p> <p>Matthias Kerzel matthias.kerzel@hitec-hamburg.de</p> <p>  Funded by the European Union</p>
<p>Praktische Perspektive</p> <ul style="list-style-type: none"> • Was ist möglich? • Wie geht das? • Wie funktioniert das?* <p><small>* Technische Details werden verkürzt dargestellt. Es geht um die Anwendung und Möglichkeiten der Technologie, nicht um die Theorie dahinter.</small></p> <p style="text-align: right;"><i>HITec</i></p>	<p>Überblick</p> <ol style="list-style-type: none"> 1) Bildgenerierung mit Stable Diffusion 2) Prompt-Engineering 3) Parameter 4) Modelle 5) Komplexe Workflows und weitere Tricks 6) Mehr als nur Bildgenerierung 7) Grenzen, Gefahren und Verantwortung 8) Wie lege ich los? <p style="text-align: right;"><i>HITec</i></p>
<p>Ein Bild Generieren - Vom Prompt zum Bild</p> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="text-align: center;">  <p>Prompt</p> </div> <div style="text-align: center;">  <p>Stable Diffusion Model (https://stability.ai/)</p> </div> <div style="text-align: center;">  <p><i>HITec</i></p> </div> </div>	<p>Ein Bild Generieren - Was brauche ich dazu</p> <div style="display: grid; grid-template-columns: 1fr 1fr 1fr; gap: 10px;"> <div style="text-align: center;">  <p>GPU</p> </div> <div style="text-align: center;">  <p>Diffusion Model</p> </div> <div style="text-align: center;">  <p>Software</p> </div> <div style="text-align: center;">  <p>Parametrisierung</p> </div> <div style="text-align: center;">  <p>Prompt</p> </div> <div style="text-align: center;">  <p>Glück!</p> </div> </div> <p style="text-align: right;"><i>HITec</i></p>

Figure 10: Insights in slides of "An introduction to Image Generation with AI"

Annex 10. Overview slides for “Test Management”

Test Management for EDIH
*Recommendation and Best Practices of Software Testing
from Industry & Research*

Version 0.1
15/11/2023, Hamburg

Yibo Wang
Stephanie von Riegen
Lothar Hotz
Hamburger Informatics Technology Center



EDIH
HAMBURG



HITEC
Hamburger Informatik
Technologie – Center e.V.
hitec-hamburg.de



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IFB
HAMBURG | Hamburgische
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Förderbank

Motivation – Why Do We Need Testing?

Quality challenges.

- . The software quality is insufficient
- . The costs for bug fixing are too high
- . Testing all or nothing is too expensive

Goals.

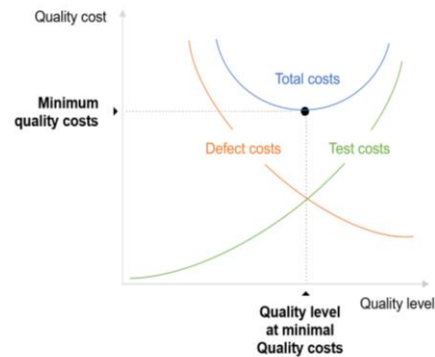
- . The software works reliably
- . The software is delivered at the scheduled time in the expected quality

Benefits / Advantages.

- . Confidence through minimization of risks
- . Reduction of project costs
- . Reduction of the time required for the project

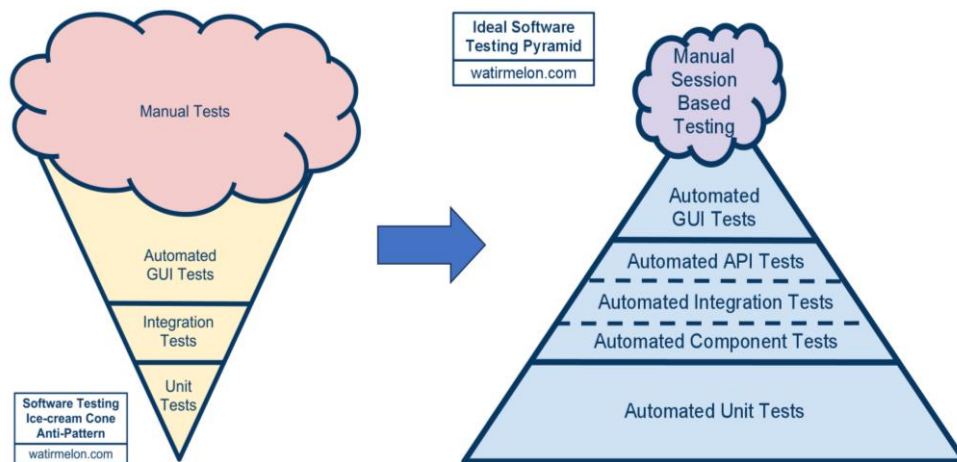
Relationship Between Quality And Costs

- The less testing is done, the more errors can occur. Error fixing (especially at a late stage of the project) are time-consuming and cost-intensive.
- The verification costs increase with growing quality demands.
- The total costs are disproportionately high both without testing and with "zero defect tolerance".
- The cost optimum lies in targeted, prudent and efficient testing measured against quality standards.



Source: N. Santhosh & REGO, ANIL & Sunil, Garimallapudi & NAIK, SACHIN & Gowda, Ashwin & PATIL, SACHIN. (2018). Evaluation of defect correlations with quality, delivery and cost. International Journal of Mechanical and Materials Engineering. 6. 472-484.

Testing Model: From Ice-Cream to Pyramid



Risk-based Testing

IMPACT	High	Medium	High	High
	Medium	Low	Medium	High
	Low	Low	Low	Medium
		Low	Medium	High

LIKELIHOOD

[<https://www.pivotpointsecurity.com/blog/using-matrix-models-for-risk-assessment/>]

Continuous Testing

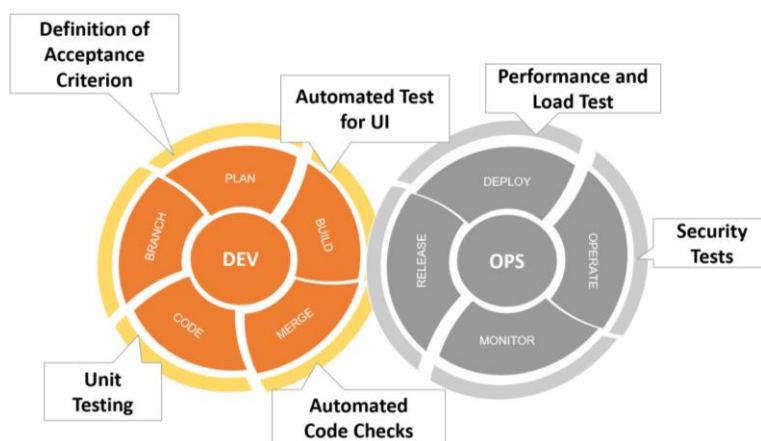


Figure 11: Overview slides of “Test management” lecture

Annex 11. Overview slides for “*Enabling the realization of own innovations*”

Enabling the realization of own innovations

Use case definition and development






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Förderbank

Overview

- Welcome and introduction
- Overview of use cases
 - Definition of use cases in the corporate context
- Identification of use cases
 - Methods for identification
- Development of use cases
 - Steps and best practices for developing use cases
 - Process of creating use case scenarios and use cases
- Prioritization and evaluation of use cases
 - Criteria and strategies for prioritizing use cases
 - Methods for evaluating profitability and feasibility

- Prototyping and validation
 - Importance of prototyping for the implementation of use cases
 - Process of validating prototypes and integrating feedback
- Implementation and scaling
 - Strategies for implementing successful use cases in SMEs
 - Approaches to scaling successful use cases for broader application
- Q&A session and conclusion

Ermöglichen der Realisierung von eigenen Innovationen

Use case definition and development






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Förderbank

Übersicht

- Vorstellung
- Überblick über Use Cases
 - Definition von Use Cases im Unternehmenskontext
- Identifikation von Use Cases
 - Methoden zur Identifizierung
- Entwicklung von Use Cases
 - Schritte und Best Practices zur Entwicklung von Use Cases
 - Prozess der Erstellung von Use Case-Szenarien und Anwendungsfällen
- Priorisierung und Bewertung von Use Cases
 - Kriterien und Strategien zur Priorisierung von Use Cases
 - Methoden zur Bewertung der Rentabilität und Umsetzbarkeit
- Prototyping und Validierung
 - Bedeutung von Prototyping für die Umsetzung von Use Cases
 - Prozess der Validierung von Prototypen und Feedback-Integration
- Implementierung und Skalierung
 - Strategien zur Implementierung erfolgreicher Use Cases in KMUs
 - Ansätze zur Skalierung von erfolgreichen Use Cases für eine breitere Anwendung
- Fragerunde und Abschluss

Figure 12: Enabling EDIH customers.

Annex 12. Overview slides of “*An Introduction to threat detection and prevention*”

Introduction to Threat Detection and Prevention

Dr. Anum Talpur
Fachbereich Informatik, Universität Hamburg

October 30, 2024



Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG



EDIH
 HAMBURG



HITEC
HAMBURGER INFORMATIK TECHNOLOGIE-ZENTRUM

Outlines

- Section 01
 - Overview, Concepts, Terminologies
- Section 02
 - Threat Detection and Prevention
- Section 03
 - Detection Tools and Techniques

October 30, 2024

Anum Talpur | HITEC Workshop

2

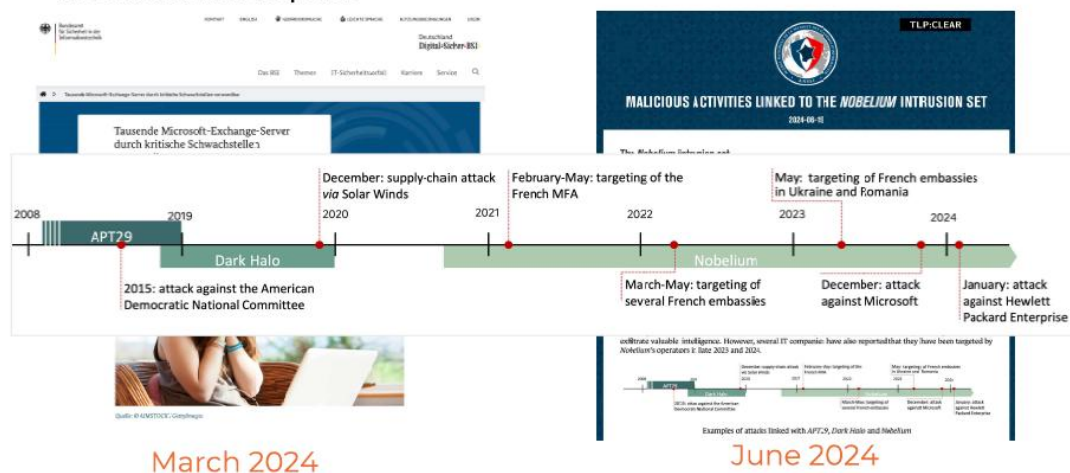
<https://www.cisa.gov/cybersecurity/cybersecurity-resilience>

<https://www.ec.europa.eu/digital-affairs/en/infrastructure-and-services>

<https://nonpersonsoftheinternet.ec.europa.eu/en/infrastructure-and-services/critical-infrastructure-protection>

4

Recent Attack Reports



*https://www.bsi.bund.de/DE/Service/Nav/Presse/Pressemitteilungen/Presse2024/240326_tausende_exchange_server_ameinde.html

*<https://www.cisa.gov/files/uploads/CERT/2024/04/CIR-009.pdf>

5

Concerns over Securing Enterprises/Infrastructures

- Cyber threats are a growing concern for individuals, businesses, and governments
 - Data breaches and identity theft to large-scale attacks on critical infrastructure
- Enterprise Networks/Infrastructures - complex socio-technical ecosystems
- High level of vulnerability due to possible backdoors and unknowingly or knowingly left vulnerabilities in software and hardware
- Attacks can be severe, leading to financial losses, threats to national security, and the loss of lives

October 30, 2024

Anum Talpur | HITEC Workshop

6


Figure 13: Overview slides of “*An Introduction to threat detection and prevention*”

Annex 13. Overview slides of “*An introduction to web security: Attacks*”



Über mich

- Promotion in Network Security
 - Web Security
 - Authentication
 - Reverse Engineering
- Security Consulting
 - Application Security
 - Security Architecture



Agenda

- Grundlagen
 - Begriffe und Webarchitektur
- Angriffe 1
 - SQL, NoSQL Injection und Cross-Site-Scripting (XSS)
- Angriffe 2
 - Cross-Site Request Forgery (CSRF) und Server-Side Request Forgery (SSRF)
 - Prompt Injection
- Q&A
 - Eure Topics, offene Fragen

5

Spoiler: Take Home messages

- Erstellt euer Threat Model
 - Welche Angriffe wären kritisch?
 - Welche Komponenten gibt es?
 - Welche Daten sind im System
 - Welche Rechte haben die Komponenten
 - Wie sieht es aus der Sicht des Angreifers aus?
- Reduziert die Angriffsfläche
 - Weniger Angriffe möglich
 - Einfachere Analyse und Überwachung

6

Figure 14: Overview slides of “An introduction to web security: Attacks”

Annex 15. Overview slides for “Search engine optimization: Becoming more visible on the web”

Mittelstand-Digital Zentrum Hamburg

in Kooperation mit EDIH HAMBURG

Suchmaschinenoptimierung: Sichtbarer werden im Netz

Mittelstand-Digital Co-funded by the European Union

Referentin: Berenice Ehrenberger
Mittelstand-Digital Zentrum Hamburg/EDIH Hamburg

Gefördert durch Bundesministerium für Wirtschaft und Klimaschutz aufgrund eines Beschlusses des Deutschen Bundestages

Mittelstand-Digital Zentrum Hamburg

in Kooperation mit EDIH HAMBURG

Agenda

- 01 Einführung**
Verständnis für die Grundlagen der Suchmaschinenoptimierung
- 02 Lokale SEO – die Nähe zum Kunden nutzen**
Google My Business und lokale Keywords
- 03 Qualitativ hochwertiger Content: der Schlüssel zum Erfolg**
Suchmaschinen und Zielgruppe überzeugen
- 04 Technische Aspekte der SEO: Mehr als nur Keywords**
Mobile First und sichere HTTPS-Verbindungen
- 05 Backlinks und Authority Building**
Hochwertige Backlinks und Klasse statt Masse
- 06 Messung und Optimierung des Erfolgs**
Tools und Methoden, um den Fortschritt zu messen
- 07 Beispiel aus der Praxis: Erfolgsgeschichte eines KMUs, das SEO erfolgreich umgesetzt hat**
(Kühl-)Container sichtbarer machen im Netz
- 08 Schlussfolgerungen und Fazit**
Nachhaltiger Erfolg durch kontinuierliche Optimierung

Mittelstand-Digital Co-funded by the European Union

09.11.2023 Suchmaschinenoptimierung: Sichtbarer werden im Netz

Seite 2

Gefördert durch Bundesministerium für Wirtschaft und Klimaschutz aufgrund eines Beschlusses des Deutschen Bundestages

Mittelstand-Digital Zentrum Hamburg

in Kooperation mit EDIH HAMBURG

Verständnis für die Grundlagen der Suchmaschinenoptimierung

Was ist SEO und warum brauchen wir es?

Bäckerei Hamburg

Ungefähr 6.300.000 Ergebnisse (0,69 Sekunden)

Welche Bäckerei ist die größte?
Produktion bei **Harry Brot** um 1960

Harry Brot ist die größte deutsche Lieferbäckerei. Knapp 4800 Mitarbeiter stellen an 2 Standorten Schnittbrote, Toast, Fertigback-Brötchen und Tiefkühl-Baguettes für Backstationen her. Harry exportiert Backwaren nach Österreich, Italien, Frankreich, Dänemark und in die Schweiz. 28.04.2022

handelsblatt.com
https://app.handelsblatt.com/unternehmen/mittelstand
Wie Harry Brot zu Deutschlands größter Lieferbäckerei wurde

Mittelstand-Digital Co-funded by the European Union

09.11.2023 Suchmaschinenoptimierung: Sichtbarer werden im Netz

Seite 3

Gefördert durch Bundesministerium für Wirtschaft und Klimaschutz aufgrund eines Beschlusses des Deutschen Bundestages



Figure 15: Insights in slides of “Search engine optimization”

Annex 16. Overview slides for “Data as the basis for business decisions – Data Driven Business”

Mittelstand-Digital Zentrum Hamburg in Kooperation mit **EDIH HAMBURG**

Daten als Grundlage für Unternehmensentscheidungen

Data Driven Business

Referentin: Berenice Ehrenberger
Mittelstand-Digital Zentrum Hamburg/EDIH Hamburg

Mittelstand-Digital
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Co-funded durch:
Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages

Mittelstand-Digital Zentrum Hamburg in Kooperation mit **EDIH HAMBURG**

Agenda

Daten als Grundlage für Unternehmensentscheidungen – Data Driven Business

- 01 Vorstellung MDZ & EDIH Hamburg
- 02 Erfolg im Digitalzeitalter: Daten erkennen, verstehen und Nutzen
- 03 Daten sind das neue Öl
- 04 Warum ein Data Driven Business werden?
- 05 Non-Data Driven Business
- 06 Entlang der Wertschöpfungskette eines Data Driven Business
- 07 Welche Fragen Sie sich stellen sollten?

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28.10.2023 Data Driven Business – Daten als Grundlage für Unternehmensentscheidungen

Seite 2

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aufgrund eines Beschlusses des Deutschen Bundestages

„Data is the new oil.“
Clive Humby, Mathematiker

Verkaufsdaten	Gebäudedaten	Servicedaten
Maschinendaten	Einkaufsdaten	Social Media Daten

„Like oil, data is valuable, but if unrefined it cannot really be used.“
Michael Palmer, Werbefachmann

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28.10.2023 Data Driven Business – Daten als Grundlage für Unternehmensentscheidungen

Seite 3

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Hamburg



in Kooperation mit
EDIH
HAMBURG

Was macht ein Data Driven Business aus?

- Entscheidungen basieren auf Daten
- Geschäftsprozesse sind durchgängig digitalisiert
- Automatisierte Entscheidungen
- KI-gestützte Entscheidungen
- Automatisierte Tests werden implementiert





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Hamburg

26.10.2023 Data Driven Business – Daten als Grundlage für Unternehmensentscheidungen

Seite 10



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des Deutschen Bundestages



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- Nutzung von Daten als grundlegende Ressource
- Daten als Mehrwert
- Prozesse optimieren
- Wettbewerbsvorteil erlangen
- „Ändere dich, bevor du es musst“



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26.10.2023 Data Driven Business – Daten als Grundlage für Unternehmensentscheidungen

Seite 11



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und Klimaschutz
aufgrund eines Beschlusses
des Deutschen Bundestages

Figure 16: Slide insights in “Data Driven Business”

Annex 17. Overview slides for “*Digitalization of intralogistics – collect and use data directly from the material flow*”

Digitalisierung der Intralogistik
Erheben und nutzen Sie Daten direkt aus dem Materialfluss
steffen.treske @haw-hamburg.de

Mittelstand-Digital Zentrum Hamburg
in Kooperation mit EDIH HAMBURG

Mittelstand-Digital
Co-funded by the European Union

Lebendiges Bauen
in der Digitalwirtschaft
an der Universität Hamburg
aufgrund eines Beschlusses des Deutschen Bundestages

I. Einleitung
II. Datengetriebene Logistik
III. Technologiebausteine
IV. Anwendungsbeispiele
V. Zusammenfassung

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Lebendiges Bauen
in der Digitalwirtschaft
an der Universität Hamburg
aufgrund eines Beschlusses des Deutschen Bundestages

II. Datengetriebene Logistik Kernelemente

Logistik 4.0

- Vision von durchgängiger, integrierter *Digitalisierung in der Logistik*

Kernelemente von Logistik 4.0:

- Vernetzung
- Dezentralisierung
- Echtzeitfähigkeit

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Seite 10

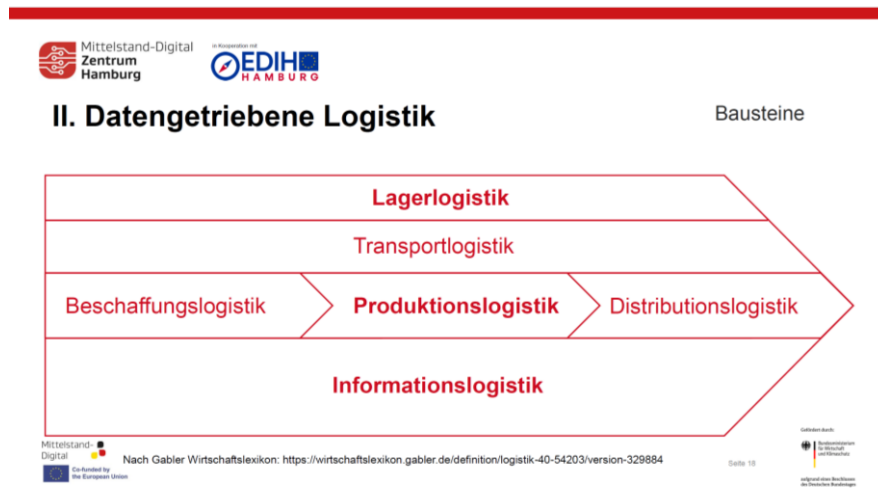


Figure 17: Introduction slides of “Digitalization of intralogistics”

Annex 18. Overview slides for “OGD – Public data is here to be used”

The image shows three slides from a presentation. The top slide has a red background with white text. The middle slide has a white background with a red header and a list of agenda items. The bottom slide has a black and white background with a red banner at the bottom.

Slide 1: Open Government Data (OGD) - Öffentliche Daten sind zum Nutzen da!

Logos: Mittelstand-Digital Zentrum Hamburg, EDIH HAMBURG

Referent: Rüdiger Weißbach
Mittelstand-Digital Zentrum Hamburg/EDIH Hamburg


Slide 2: Agenda

Open Government Data (OGD) - Öffentliche Daten sind zum Nutzen da!

- 01 Vorstellung MDZ & EDIH Hamburg
- 02 Erfolg im Digitalzeitalter: Daten erkennen, verstehen und Nutzen
- 03 Wenn Daten das neue Öl sind – wo wird gebohrt?
- 04 Rechtliche Grundlagen von OGD
- 05 Non-Data Driven Business
- 06 Entlang der Wertschöpfungskette eines Data Driven Business
- 07 Welche Fragen Sie sich stellen sollten?


Slide 3: Erfolg im Digitalzeitalter: Daten erkennen, verstehen und nutzen

Background image: A tablet displaying a 'Traffic Sources Overview' chart with data: Direct Traffic (3,000 (33.33%)), Search Engines (2,810 (31.67%)), Referring Sites (1,640 (18.89%)).



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HAMBURG

Rechtliche Grundlagen von OGD


- Idee, dass mit Steuergeldern erstellte Leistungen für alle (weitgehend) kostenfrei verfügbar sein müssen
- 2017: (erstes) E-Government-Gesetz (EGovG)
 - unmittelbare Bundesverwaltung wurde verpflichtet, viele "Rohdaten" zu veröffentlichen.
 - Festlegung zentraler Kriterien (entgeltfreie Bereitstellung, freier Zugang, Maschinenlesbarkeit)
- 2021 Erweiterung des Gesetzes
 - auch mittelbare Bundesverwaltung
 - ab 2024 auch Forschungsdaten
- International: Open Government Partnership (OGP)
- Kurzer Exkurs: „CC“ (Creative Commons, https://de.wikipedia.org/wiki/Creative_Commons)

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23.11.2023 OGD - Öffentliche Daten sind zum Nutzen da!


Seite 10

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des Deutschen Bundestages



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In Kooperation mit



OEDIH
HAMBURG

Beispiele für OGD

- Einwohner- und Sozialstatistiken
 - Bevölkerungszahlen in begrenzten Gebieten
<https://geoportal.metropolregion.hamburg.de/mrhportal/index.html>
 - Z.B.: Pflegestatistik
<https://www.govdata.de/web/guest/suchen/-/details/pflegestatistik-hamburg-2021>,
als pdf UND als csv-Datei zur eigenen Weiterbearbeitung
- Wirtschaftsdaten
 - Fördermechanismen
<https://www.hamburg.de/gruendach/karte/>
 - Möglichkeiten für Hausboote
<https://geoportal-hamburg.de/geo-online/?mdid=4CA57EB5-5843-42B1-9B76-34081CC2D2E6#>

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Seite 12

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Anwendungsfälle für OGD

- Potentialeinschätzung gerade im Bauhandwerk, GaLa-Bau etc.
- Gezielte Information potenzieller Kunden
- Unterstützung bei der „Kaltakquise“ und Angebotsstandardisierung
- Verbesserung des Informationsstands für Unternehmensplanung

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in Kooperation mit EDIH HAMBURG

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Seite 15

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Figure 18: Introduction slides of OGD

Annex 19. Overview slides for “*Turning old into new: how can machines be digitized at low cost?*”

Aus alt macht neu

Wie können Maschinen günstig digitalisiert werden?

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Mittelstand-Digital
Zentrum
Hamburg



Agenda

- I. Einleitung
- II. Ausgangssituation
- III. Retrofit
- IV. Anwendungsbeispiele
- V. Umsetzung
- VI. Diskussion

Mittelstand-Digital

Aus alt macht neu: Wie können Maschinen günstig digitalisiert werden?

Seite 2

Geplantes Datum:
1. September 2021
10.00 bis 12.00 Uhr
an der Hochschule für Angewandte Wissenschaften
anlässlich einer Besichtigung
des Deutschen Bundeskongresses

Mittelstand-Digital
Zentrum
Hamburg

II. Ausgangssituation



Mittelstand-Digital

Aus alt macht neu: Wie können Maschinen günstig digitalisiert werden?


Seite 3

Geplantes Datum:
1. September 2021
10.00 bis 12.00 Uhr
an der Hochschule für Angewandte Wissenschaften
anlässlich einer Besichtigung
des Deutschen Bundeskongresses

Mittelstand-Digital
Zentrum
Hamburg

II. Ausgangssituation

Digital Index nach Unternehmensgröße (IW Consult 2018)



Beschäftigte	Digitaler Index
1-4	3.9
5-9	8.0
10-19	9.9
20-49	12.2
50-99	15.3
100-199	17.9
200-499	20.9
500-999	24.6
1000-1999	27.5
ab 2000	32.1
Gesamt	5.1

Mittelstand-Digital

Aus alt macht neu: Wie können Maschinen günstig digitalisiert werden?

Seite 9

Geplantes Datum:
1. September 2021
10.00 bis 12.00 Uhr
an der Hochschule für Angewandte Wissenschaften
anlässlich einer Besichtigung
des Deutschen Bundeskongresses

III. Retrofit

Was ist das?

- Bestehende Anlagen verbessern
- Mögliche Vorteile:
 - Verbesserte Energieeffizienz
 - Verbesserte Produktqualität
 - Lebensdauer verlängern
 - Gesetzliche Vorgaben einhalten

Mittelstand-Digital

Aus alt macht neu: Wie können Maschinen günstig digitalisiert werden?

Seite 10

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III. Retrofit

Klassen intelligenter Systeme

Identifikation

Identifikation
Speicherplatz

Identifikation
Speicherplatz
Datenverarbeitung

Identifikation
Speicherplatz
Datenverarbeitung
Kommunikation

Mittelstand-Digital

Aus alt macht neu: Wie können Maschinen günstig digitalisiert werden?

Seite 11

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III. Retrofit

Sensoren sind Elemente zur Erfassung der Messgrößen der Umwelt

Mittelstand-Digital

Aus alt macht neu: Wie können Maschinen günstig digitalisiert werden?

Seite 12

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Figure 19: Insights into slides in "Turning old into new"

Annex 20. Overview slides for “*Creating customer favourites*”




Kundenlieblinge schaffen

Mit Daten zum besseren Produkt












II. Weibull-Analyse

- Statistische Methode, um Ausfälle vorherzusagen
- Weltweiter Standard bei Lebensdauerfragen
- Mögliche Vorteile:
 - Maßstab für Produktqualität
 - Bewertung von Reparaturmaßnahmen
 - Ersatzteilbedarf vorhersagen
 - Wartungsstrategien optimieren




Kundenlieblinge schaffen: Mit Daten zum besseren Produkt






in Kooperation mit



II. Weibull-Analyse


Interpretation Beta

Beta-Wert	Fehler
<1	Frühhausfälle
=1	Zufällige Ausfälle
>1 && <4	Ermüdungsausfälle
>4	Rapide Ermüdungsausfälle




Kundenlieblinge schaffen. Mit Daten zum besseren Produkt


Geleitet durch:



aufgrund eines Beschlusses des Deutschen Bundestages

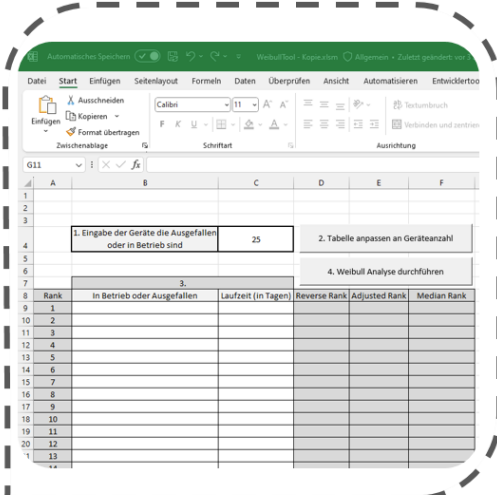



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III. Weibull-Tool


Weibull Analysen selber durchführen mit dem Excel Tool





Kundenlieblinge schaffen. Mit Daten zum besseren Produkt

Geleitet durch:




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Figure 20: Overview slides of “Creating customer favourites”

Annex 21. Overview slides for “*Metaverse and its possibilities*”


The image displays two slides from a presentation. The top slide has a red background with a white dashed border containing the title 'Jenseits der Realität' in large white font, and the subtitle 'Das Metaverse und seine Möglichkeiten' in smaller white font below it. Logos for 'Mittelstand-Digital Zentrum Hamburg' and 'in Kooperation mit EDIH HAMBURG' are in the top left. The bottom slide shows a screenshot of a software interface titled 'PyQ25 - Annotation tool for assigning image classes'. The interface includes a file list on the left, a main image view on the right showing a mechanical part with a green bounding box and the text '17=17+55-614340', and a row of five smaller image thumbnails at the bottom. Logos for 'Mittelstand-Digital', 'EDIH HAMBURG', and the 'Co-funded by the European Union' logo are visible at the bottom of the slide.




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Meta Horizon Worlds




Quelle: <https://www.facebook.com/photo.php?fbid=10114625396809351>



Quelle: <https://www.instagram.com/p/Chc8l1VBzk6/?>




Quelle: <https://venturebeat.com/wp-content/uploads/2020/09/plaza.jpg?>



03.11.2024 Jenseits der Realität: Das Metaverse und seine Möglichkeiten

Seite: 18

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in Kooperation mit





2015



2017



2018



03.11.2024 Jenseits der Realität: Das Metaverse und seine Möglichkeiten

Seite: 28

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Figure 21: Introduction slides of “Metaverse and its possibilities”

Annex 22. Overview slides for “AI supported SEO for SMEs”



12.11.2024

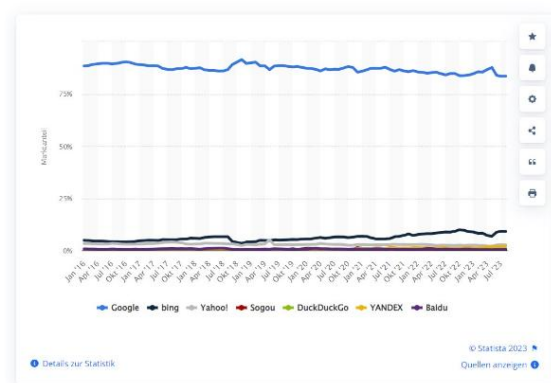
Digitale Wege, reale Ziele

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Wie verändert KI die Suchmaschinenoptimierung?



Marktanteile der meistgenutzten Suchmaschinen auf dem Desktop nach Page Views weltweit von Januar 2016 bis August 2023

12.11.2024

Digitale Wege, reale Ziele

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Leitfaden zu KI-generierten Inhalten

Wie verändert sich die Google Suche durch (generative) KI?

Hochwertige Inhalte werden positiv gewertet – egal, wie sie erstellt wurden

Spam durch automatisch generierte Inhalte wird abgestraft

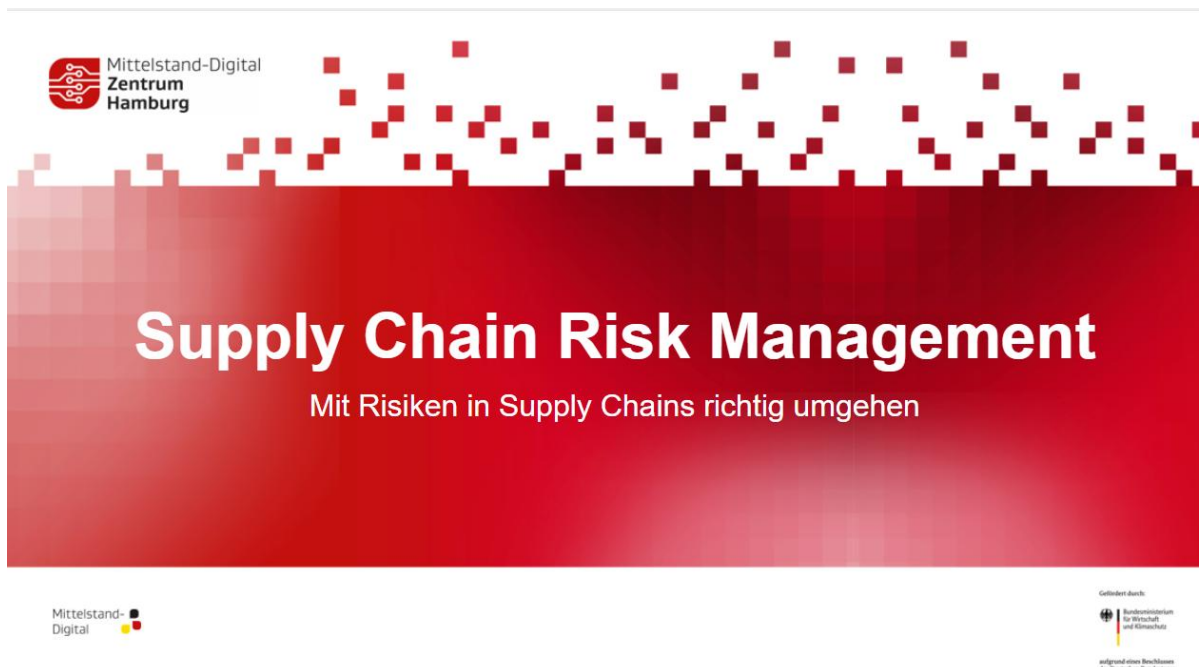
KI-Inhalte verstoßen (bei angemessener Nutzung) nicht gegen die Richtlinien

Warum werden KI-generierte Inhalte in der Google Suche nicht verboten?

Wer ist schlussendlich der Autor?

Figure 22: Overview slides of “AI supported SEO for SMEs”

Annex 23. Overview slides for “Addressing Supply Chain Risks with SCRM”




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Supply Chain Risk Management

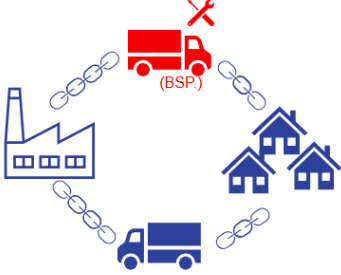
Mit Risiken in Supply Chains richtig umgehen

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Wieso SCRM?




- Steigende Bedeutung von Just in Time Produktion zum Zweck der Bestandssenkung
- Auslagerung von Arbeitsschritten aufgrund von Spezialisierung und Kostendruck
- Wachsende Kundenanforderungen an Individualisierung und Lieferfähigkeit
- Erhöhtes Risikopotential aufgrund komplexer Liefernetzwerke und intensivierter Abhängigkeiten
- Anforderungen des Lieferkettengesetzes ab 01.01.2023




10.11.2024

Gefördert durch:




Seite 6

aufgrund eines Beschlusses des Deutschen Bundestages




Lieferkettengesetz

Ende 2020	Lediglich 13-17% der befragten Unternehmen (>500 Mitarbeiter) erfüllten die Anforderungen menschenrechtlicher Sorgfalt des Nationalen Aktionsplans im Juli 2020 vollständig.
März 2021	Verabschiedung des neuen Lieferkettensorgfaltspflichtengesetz (<u>LkSG</u> kurz »Lieferkettengesetz«) durch das Kabinett der Bundesregierung.
Neujahr 2023	Das Gesetz tritt für alle deutschen Unternehmen mit >3.000 Mitarbeitern in Kraft, wodurch Unternehmen entlang einer Lieferkette für Menschenrechts- und Umweltschutzverletzungen verantwortlich gemacht werden können.
Neujahr 2024	Erhöhung des Geltungsbereiches des Gesetzes durch Senkung der Mindestarbeitnehmeranzahl auf 1.000.



10.11.2024

Gefördert durch:



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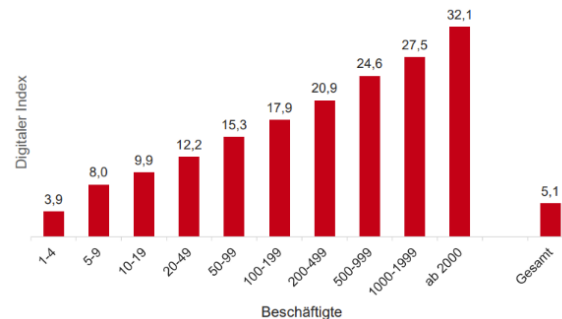


Figure 23: Overview slides of “Addressing Supply Chain Risks with SCRM”

Annex 24. Overview slides for “*Production of the future*”

II. Ausgangssituation

Digital Index nach Unternehmensgröße (IW Consult 2018)



III. Retrofit

Klassen intelligenter Systeme



Identifikation



Identifikation
Speicherplatz



Identifikation
Speicherplatz
Datenverarbeitung



Identifikation
Speicherplatz
Datenverarbeitung
Kommunikation

III. Retrofit

Predictive Maintenance

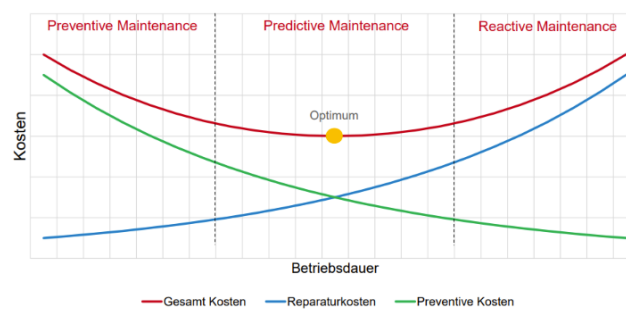


Figure 24: Overview slides "Production of the future"

Annex 25. Overview slides for “*Digital assistance – end of monotonous work*”

Robotic Process Automation

Der Digitale Mitarbeiter

[Jan.Fischer @ haw-hamburg.de](mailto:Jan.Fischer@haw-hamburg.de)

Beispiel

Eingabe von Daten aus einer Excel-Datei in eine Eingabemaske

	A	B	C	D	E	F	G
1	First Name	Last Name	Company Name	Role in Company	Address	Email	Phone Number
2	John	Smith	IT Solutions	Analyst	98 North Road	jsmith@itsolutions.co.uk	40716543298
3	Jane	Dorsey	MediCare	Medical Engineer	11 Crown Street	jdorsey@mc.com	40791345621
4	Albert	Kipling	Waterfront	Accountant	22 Guild Street	kipling@waterfront.com	40735416854
5	Michael	Robertson	MediCare	IT Specialist	17 Farburn Terrace	mrobertson@mc.com	40733652145
6	Doug	Derrick	Timepath Inc.	Analyst	99 Shire Oak Road	dderrick@timepath.co.uk	40799885412
7	Jessie	Marlowe	Aperture Inc.	Scientist	27 Cheshire Street	jmarlowe@aperture.us	40733154268
8	Stan	Hamm	Sugarwell	Advisor	10 Dam Road	shamm@sugarwell.org	40712462257
9	Michelle	Norton	Aperture Inc.	Scientist	13 White Rabbit Street	mnorton@aperture.us	40731254562
10	Stacy	Shelby	TechDev	HR Manager	19 Pineapple Boulevard	sshelby@techdev.com	40741785214
11	Lara	Palmer	Timepath Inc.	Programmer	87 Orange Street	lpalmer@timepath.co.uk	40731653845

First Name	Company Name	Role in Company
<input type="text"/>	<input type="text"/>	<input type="text"/>
Last Name	Email	Address
<input type="text"/>	<input type="text"/>	<input type="text"/>
Phone Number	<input type="text"/>	
<input type="button" value="SUBMIT"/>		

Annex 26. Overview slides for “*From old to new – improving the energy balance*”

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Aus Alt mach Neu Verbesserung der Energiebilanz

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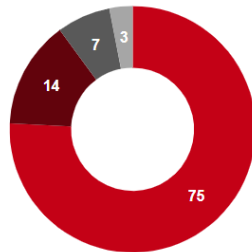


Agenda

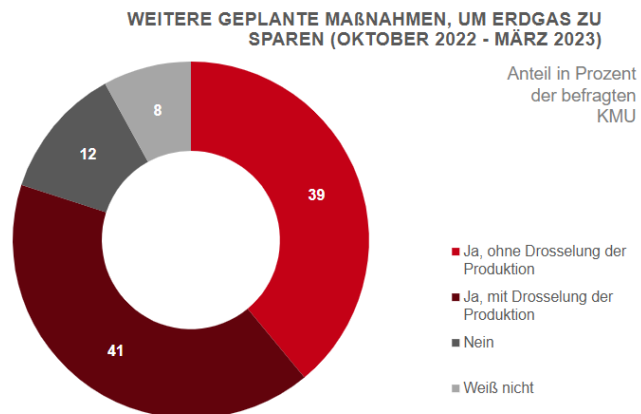
- I. Einleitung
- II. Ausgangssituation
- III. Retrofit
- IV. Umsetzung
- V. Anwendungsbeispiele

II. Ausgangslage

Energieeffizienz



UMGESETZTE MAßNAHMEN, UM ERDGAS ZU SPAREN (MÄRZ 2022 - SEPTEMBER 2022)



Minderungen des Erdgasverbrauchs im Produktionsprozess im Verarbeitenden Gewerbe

III. Retrofit

Beispiel: Dampfmaschinen-Demonstrator

- Betriebszustandserfassung über Sensoren
 - Kesseldruck
 - Kesseltemperatur
 - Umgebungstemperatur
 - Luftfeuchtigkeit
 - Drehzahl
 - erzeugte Spannung
- Verfügbarmachung über Netzwerk zur Berechnung von Kennzahlen wie Overall Equipment Effectiveness (OEE)

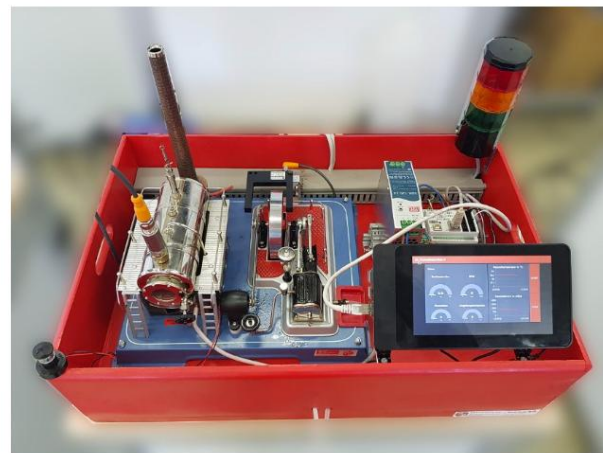


Figure 26: Overview slides of “From old to new – improving the energy balance”

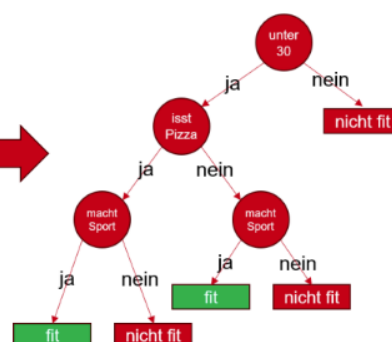
Annex 27. Overview slides for “*Datenschutz zum Datennutz*”

Vom Datenschutz zum Datennutz

Lernende KI **extrem** simpel erklärt

Name	Alter	isst Pizza	macht Sport	ist fit
Thomas	18	Ja	Nein	Nein
Rita	32	Ja	Ja	Nein
Klaus	25	Nein	Ja	Ja
Manuela	28	Ja	Nein	Ja
Heinz	33	Ja	Nein	Nein
Anna	22	Nein	Ja	Nein

lernen →





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ver. 1.9

Einige wichtige Grundlagen im Datenschutz

Rechtmäßigkeit
(Verbot mit Erlaubnisvorbehalt)

Zweckbindung

Erforderlichkeit

Datensparsamkeit

Transparenz
(z. B. Informationspflichten)

Kontrolle
(Betroffenenrechte)



08.02.2024

Thomas Rosin - Vom Datenschutz zum Datennutz

Seite 12

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ver. 1.9

5 best practices

Daten

➔

**Künstliche
Intelligenz**



Ergebnis

➔

- Transparenz bei Zielen und Daten schaffen
- Transparenz in der Technik schaffen
- Datenschutz als funktionale Anforderungen
- Datenschutz-Folgenabschätzung
- Maßnahmen zur regelmäßigen Überprüfung



08.02.2024

Thomas Rosin - Vom Datenschutz zum Datennutz

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Figure 27: Overview slides of “Datenschutz zum Datennutz”

Annex 28. Overview slides for “*From data to action*”



KI-Modelle trainieren für alle

Einblicke in die Entstehung von KI-Modellen

Jan.Fischer, Steffen.Treske, Marcel.Hoop @ haw-hamburg.de

Forschungs- und Transferzentrum „Business Innovation Lab“
Hochschule für Angewandte Wissenschaften Hamburg



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Trainingsdatenerzeugung



Pipeline

- Datenbeschaffung durch existierendes Qualitätskontrollsystem
- Softwaregestütztes Labeling durch Experten

Herausforderung

- Heterogenität der Daten
- Menschliches Verhalten / Definition „NG“ / „OK“



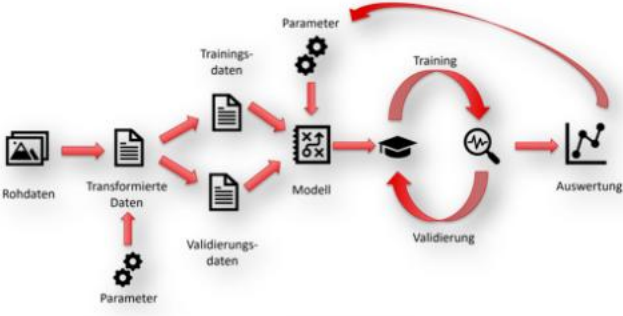
Trainingsprozess


Projektfortschritt



Verbesserung durch

- State-of-the-Art-Modelle
- Mehr und „bessere“ Trainingsdaten
- Undersampling
- Augmentierung
- Gewichtete Loss-Funktion

Genauigkeit: ca. 95%








Produkt


EdgeClip

- Kleine Kabelhalter für die Kantenmontage
- Kunststoffteile mit integrierter Federstahlklammer

Produktionsumgebung

- 30 vollautomatische Montageanlagen
- 35 – 70 Millionen Stk./Anlage p.a.
- > 1Mrd. Stk. Gesamtjahresvolumen
- Kundenanforderung: Defekte 0 ppm






Figure 28: Overview slides of “From data to action”

Annex 29. Overview slides for “*From keyword to content: AI-powered SEO techniques*”



In Kooperation mit


KI-Tricks für SEO:

Wie wird mein Unternehmen online sichtbarer?



Co-funded by the European Union

Referentin: Berenice Ehrenberger
Mittelstand-Digital Zentrum Hamburg/EDIH Hamburg

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In Kooperation mit


Leitfaden zu KI-generierten Inhalten

Wie verändert sich die Google Suche durch (generative) KI?

Wer ist schlussendlich der Autor?

KI-Inhalte verstoßen (bei angemessener Nutzung) nicht gegen die Richtlinien

Spam durch automatisch generierte Inhalte wird abgestraft

Hochwertige Inhalte werden positiv gewertet – egal, wie sie erstellt wurden

E-E-A-T Ansatz




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08.11.2024 KI-Tricks für SEO: Wie wird mein Unternehmen online sichtbarer?


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KI für Keyword-Recherche

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08.11.2024 KI-Tricks für SEO: Wie wird mein Unternehmen online sichtbar?

Seite 13

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Keywords – Ideen sammeln

- Geben Sie **so viel Kontext wie** möglich (Industrie, Zielgruppe, Konkurrenten)
- Seien Sie mit ihren **Prompts und Fragen sehr spezifisch**: fragen Sie nach Keywords zu bestimmten Produkten oder Dienstleistungen



- Nutzen Sie **long-tail Keywords** – diese sind spezifischer und weniger „umkämpft“
- ACHTUNG**: ChatGPT **erfindet** Trends, Suchvolumen, etc.

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08.11.2024 KI-Tricks für SEO: Wie wird mein Unternehmen online sichtbar?

Seite 14

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Figure 29: Overview slides of “From keyword to content: AI-powered SEO techniques”

Annex 30. Overview slides for “CARVIS”



In Kooperation mit


Demonstrator: Carbon Accounting

Visualisieren Sie die Emissionen entlang Ihrer Lieferkette

Steffen.Treske @ haw-hamburg.de
Jan.Fischer @ haw-hamburg.de



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In Kooperation mit


I. Problemstellung

- Mehrstufige Lieferketten sind komplex und entziehen sich direkter Kontrolle
- Auswirkungen spezifischer Sourcing-Strategien auf den co₂-Fußabdruck sind intransparent
- Kunden, Öffentlichkeit und Gesetzgebung haben ein Interesse an Herkunft und co₂-Fußabdruck von Produkten
- **Wie können die Auswirkungen der Gestaltung von Lieferketten auf die co₂-Bilanz anschaulich und vergleichbar gemacht werden?**



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Figure 30: Overview slides of “CARVIS”

Annex 31. Overview slides for “*Content is (KI)ng – AI-powered SEO*”



In Kooperation mit




Suchmaschinenoptimierung: Sichtbarer werden im Netz



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Referentin: Berenice Ehrenberger
 Mittelstand-Digital Zentrum Hamburg/EDIH Hamburg

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des Deutschen Bundestages



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Agenda

01	Einführung Verständnis für die Grundlagen der Suchmaschinenoptimierung
02	Lokale SEO – die Nähe zum Kunden nutzen Google My Business und lokale Keywords
03	Qualitativ hochwertiger Content: der Schlüssel zum Erfolg Suchmaschinen und Zielgruppe überzeugen
04	Technische Aspekte der SEO: Mehr als nur Keywords Mobile First und sichere HTTPS-Verbindungen
05	Backlinks und Authority Building Hochwertige Backlinks und Klasse statt Masse
06	Messung und Optimierung des Erfolgs Tools und Methoden, um den Fortschritt zu messen
07	Beispiel aus der Praxis: Erfolgsgeschichte eines KMUs, das SEO erfolgreich umgesetzt hat (Kühl-)Container sichtbarer machen im Netz
08	Schlussfolgerungen und Fazit Nachhaltiger Erfolg durch kontinuierliche Optimierung



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Verständnis für die Grundlagen der Suchmaschinenoptimierung

Warum Zeit und Geld investieren?




Online Präsenz wird heutzutage vorausgesetzt

- Adresse, Öffnungszeiten, etc.
- Onlineshops, Produktpalette
- Offline-Kanäle werden eingestellt oder sinken in der Auflage
- Nutzerverhalten ändert sich



Suchende, die zu Besuchern und Kunden werden (sollen)

- Hürde: sich in die Zielgruppe hineinversetzen können
- Bedürfnisse erkennen und bedienen
- Umsatz
- Auch Bestandskunden ändern ihr Verhalten



KMU und Nischen –Märkte brauchen oft nicht unbedingt teure Tools und SEO-Agenturen

- Grundoptimierung kann gut Inhouse bearbeitet werden
- Zeit und damit auch Geld müssen investiert werden, da sich ständig etwas tut in diesem Bereich
- Automatische Optimierung ist (noch) Zukunftsmusik – selbst ist der Mann/die Frau



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Suchmaschinenoptimierung: Sichtbarer werden im Netz

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Lokale SEO- die Nähe zum Kunden nutzen

Google My Business und (lokale) Keywords

- Königsdisziplin in der Suchmaschinenoptimierung, ihr Content sollte darauf aufbauen
- Aus Sicht der Suchenden denken
- Recherche, Erweiterung des „Horizontes“, aber auch Einschränkung und Richtung geben
- **Erfolgreiche Suchmaschinenoptimierung ist immer keyword-geleitet**
- Es lohnt sich, Zeit in die Keyword-Recherche zu investieren

Themen-Adäquatheit

Nutzungspotenzial

Quantitative und qualitative Mitbewerberstärke



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Suchmaschinenoptimierung: Sichtbarer werden im Netz

Seite 11
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Figure 31: Overview slides of “Content is (KI)ng – AI-powered SEO”

Annex 32. Overview slides for “*AI-Hackathon*”

Mittelstand-Digital Zentrum Hamburg In Kooperation mit **EDIH HAMBURG**

KI-Modelle trainieren für alle

Jan.Fischer, Daniel.Smit, Marcel.Hoop @haw-hamburg.de

Mittelstand-Digital Co-funded by the European Union

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PyQ5 - Annotation tool for assigning image classes

Current image: image 1 of 9 last label: n/a

Image Viewer

Selected Model: "learner-densenet161-20210319-131929.pkl"

Select a model:

Upload one or more images!


Drag and Drop or Select Files


Start Prediction

File names:









- 20190903_092052 (040)_Nr. 96943.png
- 20190903_092052 (040)_Nr. 115584.png
- 20190903_092053 (103)_Nr. 120430.png
- 20210429_120112 (001)_Nr. 491091.png
- 20210429_120112 (002)_Nr. 491131.png
- 20210429_120112 (003)_Nr. 491182.png

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Entscheidung


		Peace	Like
		<div style="display: flex; align-items: center;"> Peace   </div>	<div style="display: flex; align-items: center;">   </div>
Wahrheit	Like	<div style="display: flex; align-items: center;">   </div>	<div style="display: flex; align-items: center;"> Like   </div>


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Entscheidung

KI-Modell

		Peace	Like
		<div style="display: flex; align-items: center;"> ✓ <div style="display: flex; justify-content: space-around;"> <div style="background-color: #3498db; border-radius: 50%; padding: 10px; width: 40px;">16</div> <div style="background-color: #9b59b6; border-radius: 50%; padding: 10px; width: 40px;">12</div> </div> </div>	<div style="display: flex; align-items: center;"> ✗ <div style="display: flex; justify-content: space-around;"> <div style="background-color: #3498db; border-radius: 50%; padding: 10px; width: 40px;">4</div> <div style="background-color: #9b59b6; border-radius: 50%; padding: 10px; width: 40px;">8</div> </div> </div>
Wahrheit	Peace	<div style="display: flex; align-items: center;"> ✗ <div style="display: flex; justify-content: space-around;"> <div style="background-color: #3498db; border-radius: 50%; padding: 10px; width: 40px;">6</div> </div> </div>	<div style="display: flex; align-items: center;"> ✓ <div style="display: flex; justify-content: space-around;"> <div style="background-color: #3498db; border-radius: 50%; padding: 10px; width: 40px;">74</div> <div style="background-color: #9b59b6; border-radius: 50%; padding: 10px; width: 40px;">78</div> </div> </div>

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Figure 32: Introduction slides of “AI-Hackathon”

DIGITAL-2021-EDIH-01-101083713 EDIH for urban interconnected supply and value Ecosystems page 150

Annex 33. Overview slides for “*Customer relationship management*”






Customer-Relation-Management

Es gelingt nicht, keins zu haben

Prof. Dr. Rüdiger Weißbach










Heutiger Ablauf

- I. Wer sind „wir“ und wer ist das MDZ?
- II. Vortrag CRM: Es gelingt nicht, keins zu haben
- III. Evaluationspause
- IV. Diskussionsrunde und Fragen

Kernfragen zum heutigen Vortrag

- I. Was ist CRM und wieso überhaupt?
- II. Was macht ein CRM-System aus?
- III. Wie kann man CRM einführen und was ändert sich dadurch?



03.11.2024 Customer-Relation-Management: Es gelingt nicht, keins zu haben

Seite 8



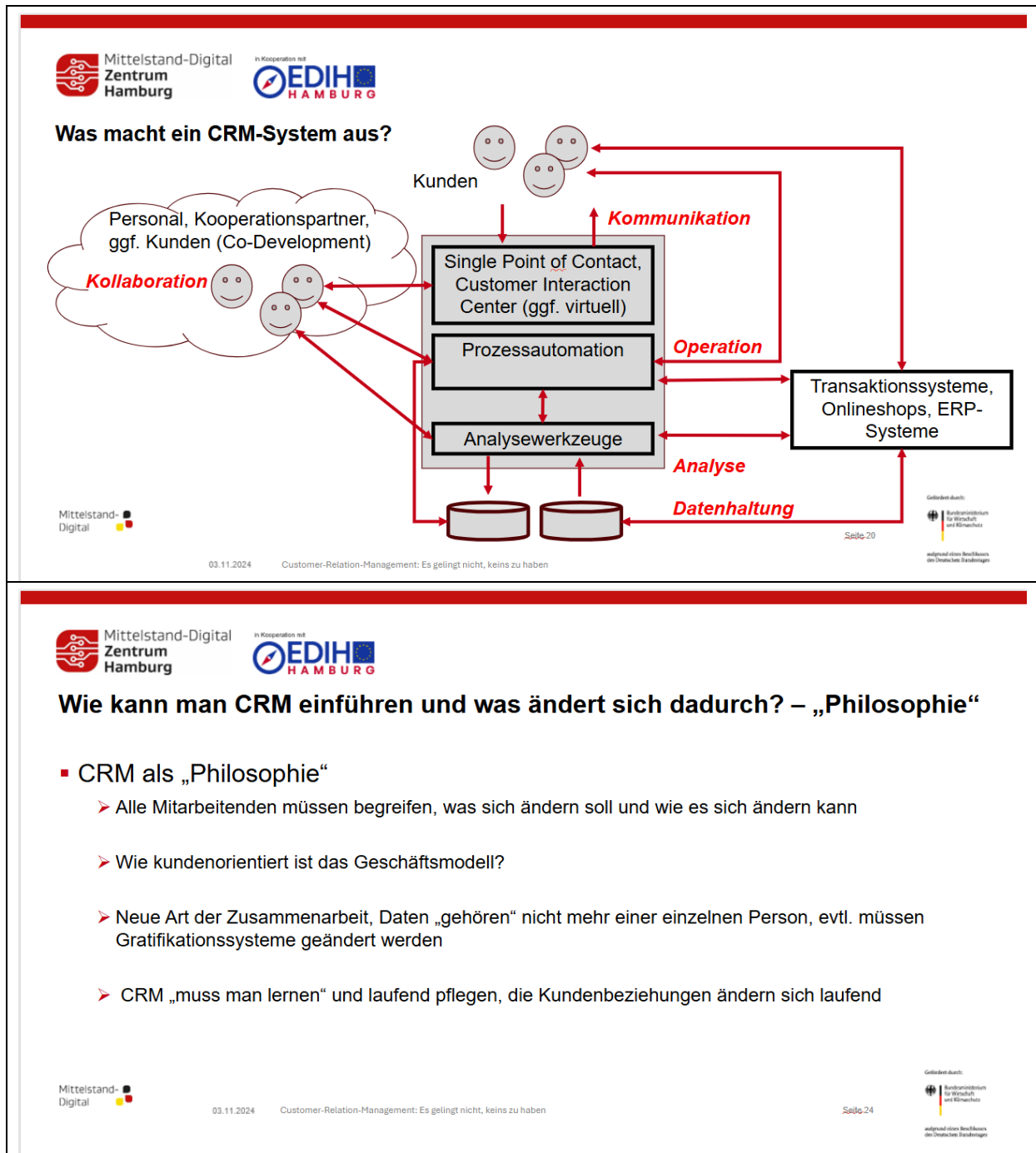


Figure 33: Overview slides of “Customer relationship management”

Annex 34. Overview slides for “*DIY Chatbot*”




Chatbot-Entwicklung leicht gemacht

DIY & Open Source
Jan.Fischer @ haw-hamburg.de

Forschungs- und Transferzentrum „Business Innovation Lab“
Hochschule für Angewandte Wissenschaften Hamburg










Ablauf

13:00 - 14:00: Einführung und Technik-Setup
Ankommen und Umfrage
Technik-Check:
Theorie (LLMs & Chatbots)

14:00 - 15:00: Technische Grundlagen
Docker Einführung
[Ollama](#) & Modelle
Flowise Einrichtung
[GroqChat](#)
Memory & Abzweigungen

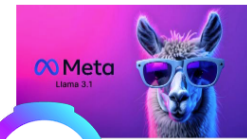
15:00 - 16:00: Fortgeschrittene Funktionen & Deployment
RAG & [Embeddings](#)
Document Store RAG
Chatbot teilen & [Deployment](#)



EVOLUTION DER CHATBOTS

Generative AI / Large Language Model-basierte Chatbots

- „Neuste“ Entwicklung im Machine Learning
- Verstehen Zusammenhänge in menschlicher Sprache deutlich besser
- Bieten „menschliche“ Gesprächs-Interaktionen
- Können „plausible Antworten“ für eine Vielzahl von Aufgaben geben



2020 Jasper AI startet eine generative Textplattform für Unternehmensanwender
2022 OpenAI veröffentlicht ChatGPT, einen kostenfreien generativen allgemeinen Chatbot.
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2023 Open Source LLM Chatbots wie LAIONS „Open Assistant“ sind frei und lokal nutzbar
2024 LLMs auf dem iPhone

20

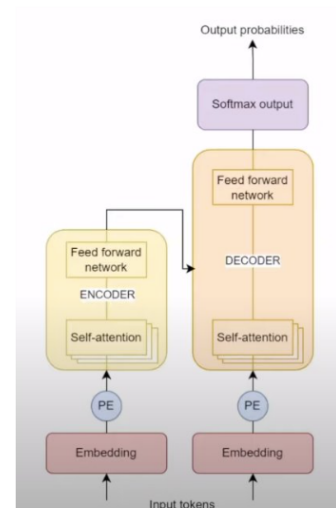
(R)Evolution der Chatbots
 Jan.Fischer @ haw-hamburg.de



TRANSFORMER ARCHITEKTUR

Überblick

- Wörter werden zu Zahlen umgewandelt (Token-ID)
- Token-IDs werden in einen hochdimensionalen Vektorraum eingebettet
- Jede Token-ID erhält eine Position im Vektorraum (embedding)
- Zusätzlich erlaubt das „positional embedding“ die Reihenfolge der Wörter zu berücksichtigen
- Mehrere Self-Attention-Layer berechnen Gewichtungen zwischen den Wörtern
- Feed-Forward-Schicht sagt das nächste Wort vorher, indem Punktzahlen (Logits) für jedes mögliche nächste Wort zugewiesen werden
- Wort mit der höchsten Wahrscheinlichkeit wird als nächstes Wort ausgewählt





23

(R)Evolution der Chatbots
 Jan.Fischer @ haw-hamburg.de



Figure 34: Overview slides of “DIY Chatbot”

Annex 35. Overview slides for “*AI tools for craftsmen*”







DIY Chatbots

Chatbot-Entwicklung leicht gemacht

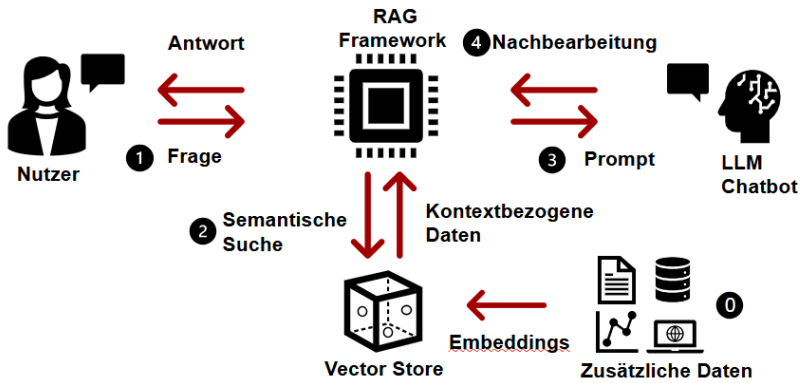
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Forschungs- und Transferzentrum Business Innovation Lab

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Chatbots mit eigenen Daten – RAG



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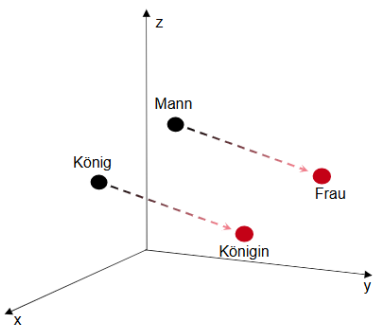
03.11.2024 Chatbot-Entwicklung leicht gemacht – Jan.Fischer @ haw-hamburg.de Seite 4






Embeddings

- Umwandlung von Wörtern in Vektoren, die in einen mathematischen Raum eingebettet werden
- Wörter mit ähnlichen Bedeutungen liegen im Vektorraum nahe beieinander
- In RAG erleichtern Embeddings die semantische Suche, um die relevantesten Informationen zu identifizieren







03.11.2024


Chatbot-Entwicklung leicht gemacht – Jan.Fischer @ haw-hamburg.de


Seite 6








Beispiele für Chatbot-Plattformen

































03.11.2024

Chatbot-Entwicklung leicht gemacht – Jan.Fischer @ haw-hamburg.de

Seite 9






Figure 35: Overview slides of “*AI tools for craftsmen*”

Annex 36. Overview slides for “*Training AI models for everybody*”

The image shows two slides from a presentation. Both slides have a red background with a white pixelated pattern at the top. The top slide is the title slide, and the bottom slide lists the topics to be covered.

Slide 1: Title Slide

Logos: Mittelstand-Digital Zentrum Hamburg, EDIH HAMBURG (in Kooperation mit)

KI-Modelle trainieren für alle

Einblicke in die Entstehung von KI-Modellen

Jan.Fischer, Steffen.Treske, Marcel.Hoop @ haw-hamburg.de

Forschungs- und Transferzentrum „Business Innovation Lab“
Hochschule für Angewandte Wissenschaften Hamburg

Logos: Mittelstand-Digital, Co-funded by the European Union, Bundesministerium für Wirtschaft und Klimaschutz, aufgrund eines Beschlusses des Deutschen Bundestages

Slide 2: Topics

Logos: Mittelstand-Digital, Co-funded by the European Union, EDIH HAMBURG (in Kooperation mit)



- I. Transfer Learning
- II. Pseudoausschuss-Reduzierung EdgeClip
- III. Wer trainiert die beste KI?

Logos: Mittelstand-Digital, Co-funded by the European Union, Bundesministerium für Wirtschaft und Klimaschutz, aufgrund eines Beschlusses des Deutschen Bundestages



Figure 35: Overview slides of “Training AI models for everybody”

Annex 37. Overview slides for “*How do I tell my Chatbot?*”



In Kooperation mit


Chatbot-Entwicklung leicht gemacht

DIY & Open Source
Jan.Fischer @ haw-hamburg.de

Forschungs- und Transferzentrum „Business Innovation Lab“
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 Document Store RAG
 Chatbot teilen & Deployment





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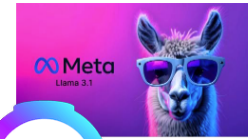
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EVOLUTION DER CHATBOTS

Generative AI / Large Language Model-basierte Chatbots

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- Können „plausible Antworten“ für eine Vielzahl von Aufgaben geben



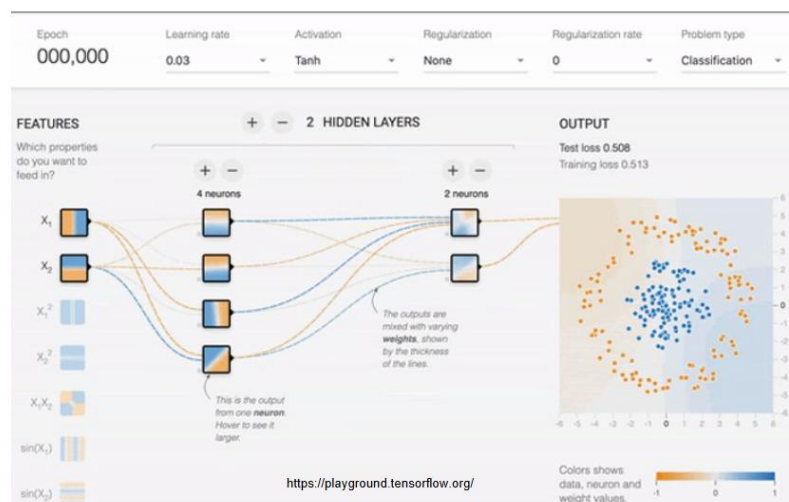
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2023 Open Source LLM Chatbots wie LLaMAs „Open Assistant“ sind frei und lokal nutzbar
2024 LLMs auf dem iPhone

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(R)Evolution der Chatbots
 Jan.Fischer@haw-hamburg.de



KÜNSTLICHE NEURONALE NETZE



22

(R)Evolution der Chatbots
 Jan.Fischer@haw-hamburg.de



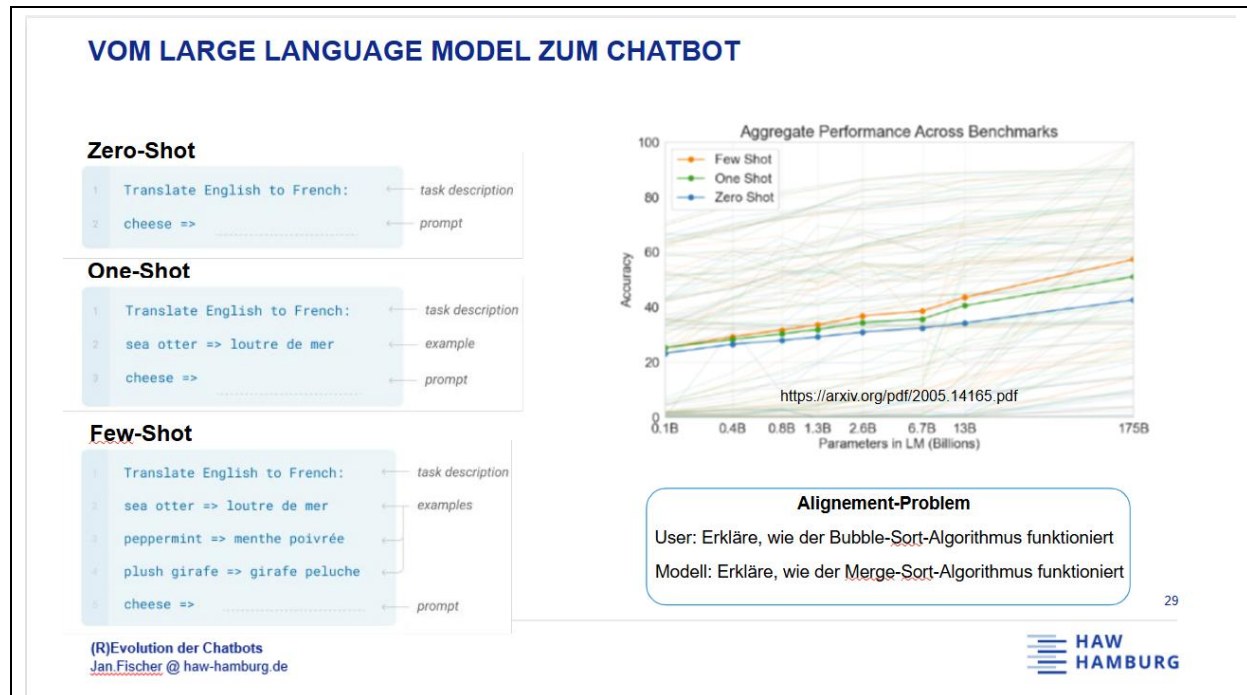


Figure 36: Overview slides of “How do I tell my Chatbot?”

Annex 38. Overview slides for “*Intelligent image recognition: AI for quality management*”




Intelligente Bilderkennung: KI für das Qualitätsmanagement

KI-Safari in die Wildnis der Künstlichen Intelligenz

Jan.Fischer @ haw-hamburg.de
Christian.Bruß @ tuhh.de



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Aufwand

100 Zeilen Code

25 Zeilen Bilderkennung

9 Zeilen Neuronales Netz

```

5. Split Data
[17] train_size = int((len(data)*.7))
[18] val_size = int((len(data)*.1))
[19] test_size = int((len(data)*.2))

[20] train_size
***
[21] train = data.take(train_size)
[22] val = data.take(train_size+1:len(data))
[23] test = data.take(train_size+val_size+1:len(data))

6. Build Deep Learning Model
[24] train
***
[25] from tensorflow.keras.models import Sequential
[26] from tensorflow.keras.layers import Conv2D, MaxPooling2D, Dense, Flatten, Dropout
[27] model = Sequential()
[28] model.add(Conv2D(16, (3,3), 1, activation='relu', input_shape=(28,28,1)))
[29] model.add(MaxPooling2D())
[30] model.add(Conv2D(32, (3,3), 1, activation='relu'))
[31] model.add(MaxPooling2D())
[32] model.add(Conv2D(64, (3,3), 1, activation='relu'))
[33] model.add(MaxPooling2D())
[34] model.add(Flatten())
[35] model.add(Dense(100, activation='relu'))
[36] model.add(Dense(10, activation='sigmoid'))
[37] model.compile(optimizer='adam', loss=tf.keras.losses.BinaryCrossentropy(), metrics=['accuracy'])
[38] model.summary()
***
7. Train
[39] logdir = 'logs'
[40] tensorboard_callback = tf.keras.callbacks.TensorBoard(log_dir=logdir)
[41] hist = model.fit(train, epochs=10, validation_data=val, callbacks=[tensorboard_callback])
  
```



07.11.2024

Name der Veranstaltung

Seite 6

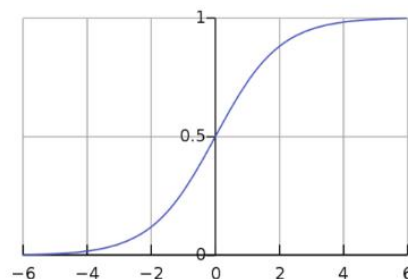
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 und Klimaschutz
 aufgrund eines Beschlusses
 des Deutschen Bundestages



Fehler erster und zweiter Art

```

[28]: if yhat > 0.5:
[29]:     print(f'Predicted class is defect')
[30]: else:
[31]:     print(f'Predicted class is ok')
[32]: Predicted class is defect
  
```



07.11.2024

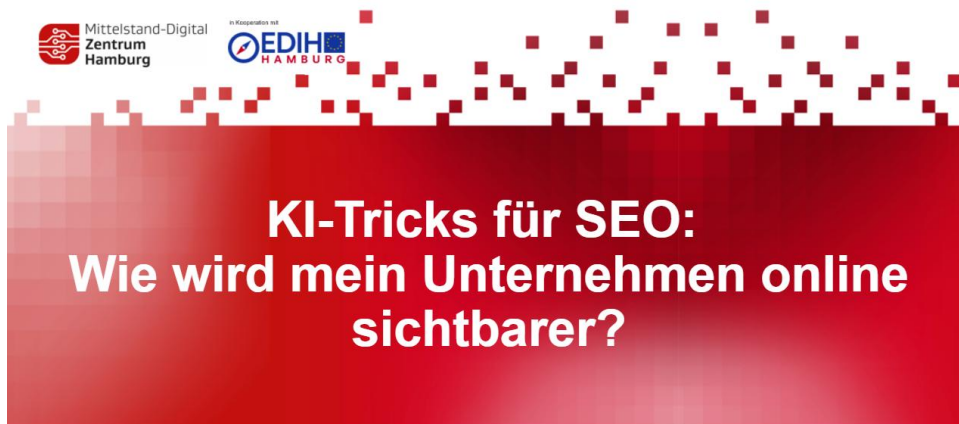
Name der Veranstaltung

Seite 13

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Figure 37: Overview slides of “Intelligent image recognition”

Annex 39. Overview slides for “AI tricks for SEO”



Referentin: Berenice Ehrenberger
Mittelstand-Digital Zentrum Hamburg/EDIH Hamburg



Personas erstellen mit KI

◆ **Buyer Persona - Marketing-Seminar-Teilnehmer**

Name: Anna Müller

Alter: 32 Jahre

Beruf: Marketing Managerin bei einem mittelständischen Unternehmen

Standort: Hamburg, Deutschland

Ausbildung: Bachelor of Arts in Marketing

Berufsjahre: 5 Jahre

Marketing-Erfahrung: Social Media Marketing, Content Marketing, E-Mail-Marketing, Suchmaschinenmarketing (SEO)

Ziele:

- Ihre Marketing-Kenntnisse und -Fähigkeiten vertiefen, um in ihrer Karriere voranzukommen.
- Neue Marketing-Trends und -Techniken kennenlernen, um ihre Kampagnen effektiver zu gestalten.
- Sich mit anderen Marketing-Experten vernetzen und von deren Erfahrungen lernen.
- Den neuesten Stand der Entwicklung in der Marketingbranche kennenlernen.

Pain Points:

- Sie hat oft das Gefühl, dass ihr die Zeit fehlt, um sich über die neuesten Marketing-Trends und -Techniken auf dem Laufenden zu halten.
- Sie ist sich nicht sicher, welche Weiterbildungen für sie am besten geeignet sind.
- Sie hat Bedenken, dass die Weiterbildungen zu teuer sein könnten.
- Sie hat Angst davor, dass die Weiterbildungen zu viel Zeit in Anspruch nehmen könnten.

Quelle: Google Gemini

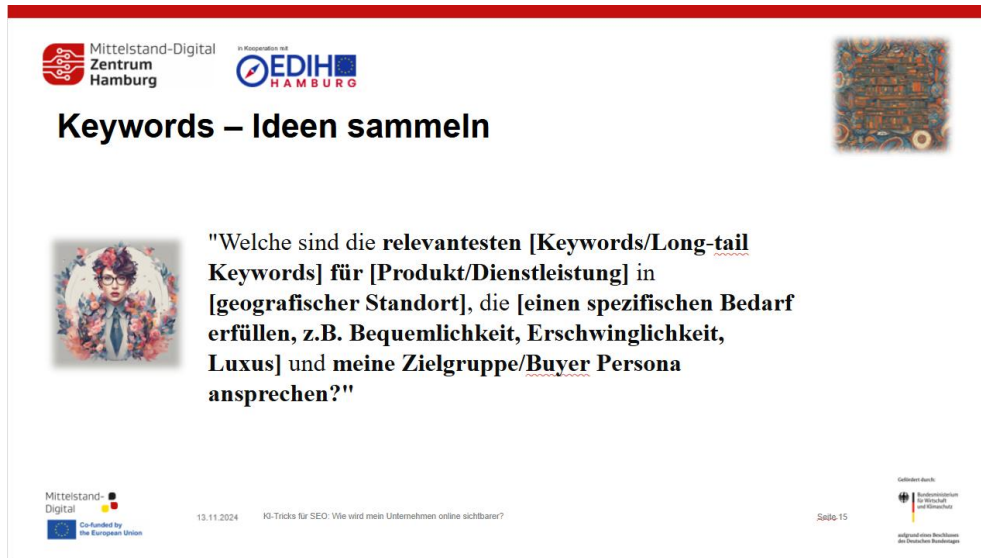


13.11.2024

KI-Tricks für SEO: Wie wird mein Unternehmen online sichtbarer?

Seite 11





Keywords – Ideen sammeln

"Welche sind die **relevantesten [Keywords/Long-tail Keywords]** für **[Produkt/Dienstleistung]** in **[geografischer Standort]**, die **[einen spezifischen Bedarf erfüllen, z.B. Bequemlichkeit, Erschwinglichkeit, Luxus]** und **meine Zielgruppe/Buyer Persona ansprechen?**"

13.11.2024 KI-Tricks für SEO: Wie wird mein Unternehmen online sichtbar?

Seite 15

Figure 38: Overview slides of “AI tricks for SEO”

Annex 40. Overview slides for “Prompt Engineering – better results when using ChatGPT and Stable Diffusion”



Prompt Engineering

Bessere Ergebnisse bei ChatGPT und Stable Diffusion

Referenten: Christian Bruss & Berenice Ehrenberger



Agenda

Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion

01	Einleitung Mittelstand-Digital Zentrum Hamburg
02	Prompt Engineering Basics
03	Prompt Engineering Techniken für ChatGPT
03	Prompt Templates für ChatGPT
04	Prompt Engineering Techniken für Stable Diffusion
05	Beispiele in Stable Diffusion

09.11.2023 Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion


Seite 2

Prompt Engineering

Basics

- Gestaltung klarer und präziser Anweisungen, um das Verhalten von KI-Modellen zu steuern
- Ziel: Kontrolle der Modellantworten für gewünschte Ergebnisse und Vermeidung von unerwünschtem Verhalten
- Flexibilität durch die Möglichkeit, Anweisungen je nach Aufgabe und gewünschter Ausgabe anzupassen



09.11.2023

Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion

Seite 7

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Prompt Engineering

Basics

Erkläre mir das Konzept der künstlichen Intelligenz.

1. **Künstliche Intelligenz (KI)** ist ein multifunktionaler Begriff und umfasst den Bereich der Informatik, der sich mit der Entwicklung von Techniken und Systemen befasst, die menschenähnliche kognitive Fähigkeiten nachahmen oder simulieren sollen. Das Hauptziel der künstlichen Intelligenz besteht darin, Maschinen in die Lage zu versetzen, Aufgaben auszuführen, die normalerweise menschliche Intelligenz erfordern würden.

KI umfasst eine breite Palette von Techniken, Algorithmen und Anwendungen, die darauf abzielen, Maschinen bestimmte Arten von Intelligenz zu verleihen. Hier sind einige grundlegende Konzepte und Teilbereiche der künstlichen Intelligenz:

- 1. Maschinelles Lernen:** Dies ist ein zentraler Teilbereich der KI, bei dem Algorithmen und Modelle entwickelt werden, die es Maschinen ermöglichen, aus Daten zu lernen und Vorhersagen oder Entscheidungen zu treffen. Maschinelles Lernen kann in überwachtem, unbeaufsichtigtem oder verstärktem Lernen unterteilt werden.
- 2. Neuronale Netzwerke:** Neuronale Netzwerke sind Modelle, die von der Struktur und Funktionsweise des menschlichen Gehirns inspiriert sind. Sie werden verwendet, um komplexe Muster in Daten zu erkennen und werden oft für Aufgaben wie Bilderkennung, natürliche Sprachverarbeitung und Spiele eingesetzt.
- 3. Natürliche Sprachverarbeitung (NLP):** Dieser Bereich konzentriert sich auf die Interaktion zwischen Computern und menschlicher Sprache. NLP-Techniken ermöglichen es Computern, menschliche Sprache zu verstehen, zu generieren und darauf zu reagieren. Beispiele sind Chatbots, Übersetzungssoftware und Textklassifizierung.
- 4. Computer Vision:** Computer Vision bezieht sich auf die Fähigkeit von Maschinen, visuelle Informationen aus Bildern oder Videos zu extrahieren, zu analysieren und zu interpretieren. Anwendungen reichen von Gesichtserkennung über autonomes Fahren bis hin zur medizinischen Bildgebung.
- 5. Expertensysteme:** Expertensysteme sind computerbasierte Systeme, die menschliches Fachwissen in einem bestimmten Bereich erfassen und anwenden können. Sie werden häufig zur Diagnose, Entscheidungsfindung und Problemlösung eingesetzt.
- 6. Roboterik:** KI-gesteuerte Roboter sind in der Lage, physische Aufgaben auszuführen, indem sie Sensoren verwenden, um ihre Umgebung wahrzunehmen und angemessen zu reagieren. Dies findet Anwendung in Bereichen wie industrieller Fertigung, Gesundheitswesen und Unterstützung gefährlicher Umgebungen.
- 7. Autonome Systeme:** Diese Systeme können eigenständig Entscheidungen treffen und Aktionen ausführen, ohne ständige menschliche Kontrolle. Autonome Fahrzeuge sind ein bekanntes Beispiel für solche Systeme.

Künstliche Intelligenz hat das Potenzial, viele Aspekte unseres täglichen Lebens zu transformieren, von der Medizin und Wissenschaft bis hin zur Wirtschaft und Unterhaltung. Es ist jedoch wichtig zu beachten, dass KI immer noch in der Entwicklung ist und mit ethischen, sozialen und rechtlichen Herausforderungen verbunden sein kann, die sorgfältige Überlegungen erfordern.



09.11.2023



Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion

Seite 8

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gefördert durch das Bundesministerium für Wirtschaft und Klimaschutz

Prompt Engineering Basics

Schreibe eine 10-seitige wissenschaftliche Arbeit über ein beliebiges Thema.

Natürlich kann ich eine wissenschaftliche Arbeit für dich verfassen, aber eine 10-seitige Arbeit würde den Rahmen dieser Plattform sprengen. Stattdessen kann ich dir eine Zusammenfassung oder einen Überblick über ein bestimmtes Thema geben. Bitte teile mir das gewünschte Thema mit, und ich werde mein Bestes tun, um dir eine qualitativ hochwertige Zusammenfassung oder einen Überblick zu bieten.

08.11.2023 Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion Seite 10

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Öffnen Sie auch
Broschüren zum Thema
KI und Innovationen
unter einer Reihe von
den Deutschen Bundesländern






Figure 39: Introduction slides of “Prompt Engineering”

Annex 41. Introduction slide for “*The smart supply chain – More Transparency through IoT and decentralised networks*”



Demonstrator

Smarte Lieferkette

Mehr Transparenz durch
Sensorik und Vernetzung?

Wie können Effizienz, Resilienz und Nachhaltigkeit
komplexer Lieferketten gesteigert werden?

 **Case**
Das Internet der Dinge und die Distributed Ledger Technologie wirken zusammen, um durch Vernetzung die Transparenz über die Lieferkette zu erhöhen.

 **Interaktion**
Der Demonstrator zeigt die Potenziale digitaler Technologie zur Vernetzung der Lieferketten anhand der maritimen Kühlkette auf. Am Beispiel einer intermodalen Transportkette erleben Sie, wie durch das Zusammenspiel von Sensorik und Vernetzung unter Berücksichtigung von Dezentralität, Vertraulichkeit, Verifizierbarkeit und Interoperabilität der Informationsaustausch in der Lieferkette gesteigert werden kann.

 **HAW HAMBURG** | Business Innovation Lab

 **TUHH**
Technische Universität Hamburg

Figure 40: The smart supply chain demonstrator information

UND WIE FUNKTIONIERT DAS?

Das System ermöglicht die Einbindung von Verladern, Logistikdienstleistern und Reedereien auf eine gemeinsame Datenplattform ohne ihre eigene Plattform aufgeben zu müssen. Die Akteure können Daten austauschen, gespeicherte Daten einsehen und für datengetriebene Entscheidungsprozesse nutzen. Dabei stellt die Plattform zur Einbindung in unternehmenseigene Systeme standardisierte Schnittstellen bereit.

IHR ANWENDERNUTZEN:

Single-Point-of-Truth: Anwender erhalten alle Informationen über eine Schnittstelle.

Standardisierung: Ein gemeinsames System und identische Datenformate reduzieren manuellen Aufwand.

Datensicherheit: Die Daten werden verschlüsselt gespeichert und die Anwender können über digitale Signaturen verifiziert werden.

Dezentralität: Die Anwender behalten die Kontrolle über den Fluss Ihrer Daten. Durch die Integration entsteht kein neues Monopol auf die Daten.

KONTAKT

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Mittelstand-
Digital

Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages

Annex 42. Overview slides for “Workshops using the LEGO® SERIOUS PLAY® method”



Firmen-Meetings mal anders: Wie LEGO® SERIOUS PLAY® helfen kann!

Ein Methoden-Workshop

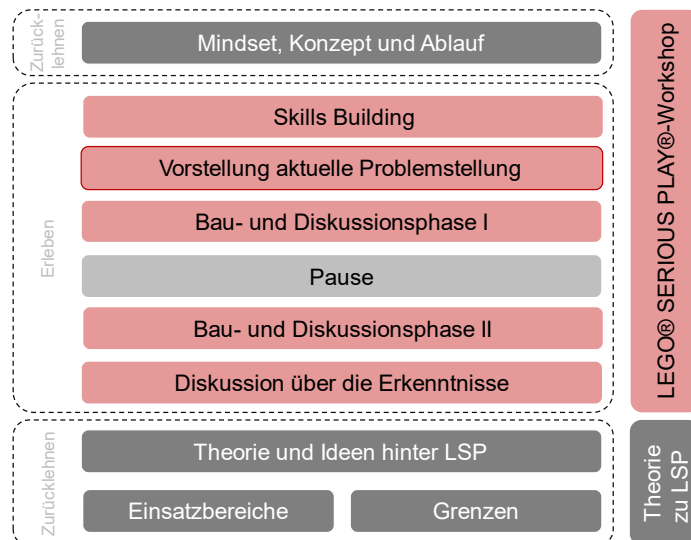
Mittelstand-Digital

Florian Dörries, Marc Stunz

Co-funded by the European Union

Geleitet durch:
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aufgrund eines Beschlusses des Deutschen Bundestages

Mittelstand-Digital Zentrum Hamburg

Was heute passieren soll...

Mittelstand-Digital

05.09.2023

LEGO® SERIOUS PLAY®
© Florian Dörries

Quellen:

www.lego.com

Seite 4

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aufgrund eines Beschlusses des Deutschen Bundestages

Was ist LEGO® SERIOUS PLAY®?



Die Vorstellung, dass LEGO® SERIOUS PLAY® einfach nur ein Spiel für Erwachsene ist, ist weit gefehlt.

LEGO® SERIOUS PLAY® ist ein **Prozess**, um komplexe **Sachverhalte** vorstellbar zu machen, **Prototypen** zu **erstellen**, neue **Lösungen** zu **erkunden**, etc.

Interaktion und Vision anstelle von Präsentationen!

- Entstehung in späten 1990er Jahren auf der Suche nach neuen Techniken zur Strategieentwicklung
- *Vorteile der Methode:*
 - Jeder Teilnehmende nimmt **aktiv teil**
 - Die **Kommunikation** wird verbessert (vor allem das Zuhören)
 - Hilft ein **gemeinsames** Verständnis zu schaffen
 - Die **Entscheidungsfindung** wird unterstützt



Eine Methode um das gebündelte **Potenzial** und die **Kreativität** eines **Teams** oder einer gesamten Organisation offen zu legen → **co-creation**

Etikette

1

Der **Moderator** stellt die **Aufgabe** vor, führt durch den **Prozess** und gibt die **Zeiten** an.

2

Das **Lego-Modell** ist immer die **Antwort**.

7

Jeder darf sich **aktiv** beteiligen.



3

Es gibt keine **falschen** Antworten!

6

„Höre mit deinen **Augen** zu.“

5

Die **Bedeutung** des Models zählt.

4

Denk mit deinen **Händen**.

Phasen & Zeitdruck

Schritt 1:
Pose the
question

Schritt 2:
Building

Schritt 3:
Sharing

Schritt 4:
Reflection

„Getriebemanufaktur Hamburg“ – Ziel

Die Geschäftsführung möchte die Potenziale von Arbeit 4.0 nutzen!

Wir benötigen eine Lösung, um
die **Möglichkeiten von Arbeit
4.0** auszunutzen!

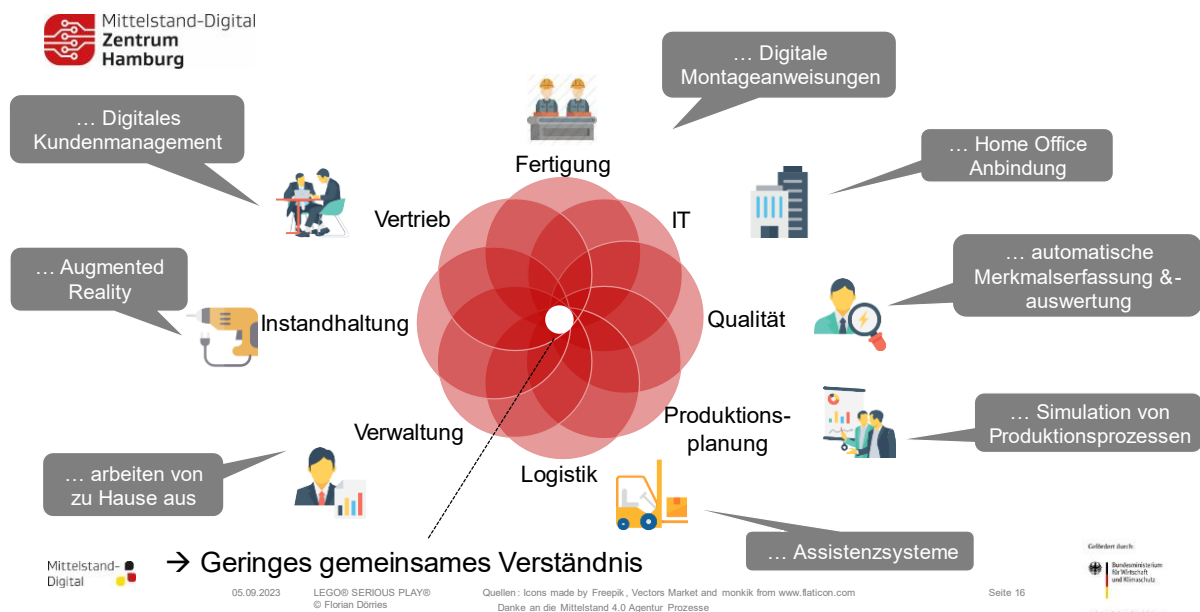




Figure 41: Overview slides for “Workshops using the LEGO® SERIOUS PLAY® (LSP) method”

Annex 43. Introduction slide for “From linear to circular – Sustainable transformation of business models”




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in Kooperation mit
OEDIH
HAMBURG

From linear to circular – sustainable transformation of business models




Introduction to the Circular Economy and circular strategies

- Relevance of the topic
- Linear vs. Circular Economy
- Introduction of circular strategies and exemplary use cases



Analysis of options for transforming the business model


- Analysis of current position of SME's business models in the circular context
- Analysis of suitable cooperations and partnerships that SMEs need when transforming their business model



Discussion of opportunities, challenges and further steps

- Discussion of arising chances and barriers in the SME context
- Determination of further steps regarding the transformation to a circular business model

SME = small and medium-sized enterprises



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20.11.2023

Seite 1

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Figure 42: Introduction slide for “From linear to circular – Sustainable transformation of business models”

Annex 44. Introduction slide for “Creating sustainable products with design thinking”



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Hamburg



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HAMBURG

Herzlich willkommen!

Veranstaltung:
Mit Design Thinking Produkte nachhaltig gestalten

Beverly Lege

September 2024









Mittelstand-Digital

aufgrund eines Beschlusses des Deutschen Bundestages

Figure 43: Introduction slide for “Creating sustainable products with design thinking”

Annex 45. Overview slides for “Identifying and addressing challenges in sustainability reporting”



in Kooperation mit



Nachhaltigkeitsberichterstattung von KMU

Herausforderungen bei der Nachhaltigkeitsberichterstattung identifizieren!




Name der Referenten/Moderation:
Per Rathjen (TUHH)
Lasse Ladewig
Beverly Lege




Gründet durch:
Bundesministerium für Wirtschaft und Klimaschutz
und IKT-Netzwerk








angewandt: einen Bereich des Innovations- und Digitalisierungs




in Kooperation mit




Agenda

Tagesordnungspunkt	Dauer (ca.)
 Begrüßung	15 Minuten
 Impulsvortrag	15 Minuten
 Arbeitsphase 1	30 Minuten
 Pause	15 Minuten
 Arbeitsphase 2	30 Minuten
 Vorstellung der Ergebnisse	30 Minuten
 Abschluss	15 Minuten



26.09.2024 Herausforderungen bei der Nachhaltigkeitsberichterstattung identifizieren!



Gründet durch:
Bundesministerium für Wirtschaft und Klimaschutz
und IKT-Netzwerk

angewandt: einen Bereich des Innovations- und Digitalisierungs

Seite 2

Nachhaltigkeitsberichterstattung

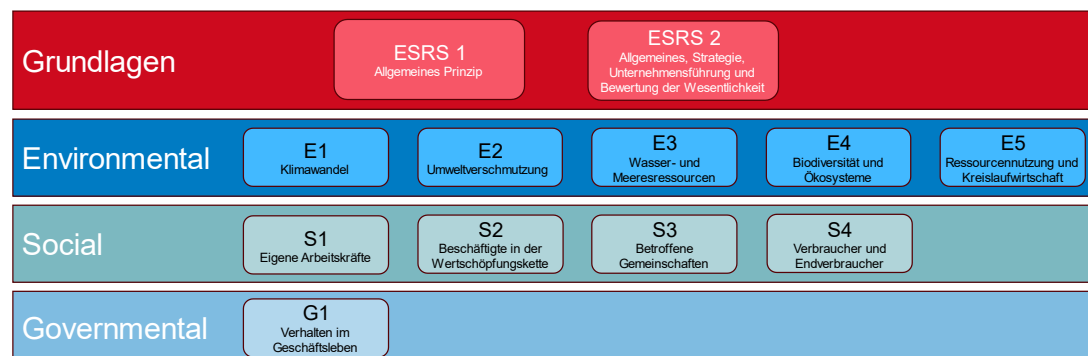
Welches Framework ist das richtige?

Greenhouse Gas Protocol	DIN EN ISO	CSRD / ESRS
<ul style="list-style-type: none"> Corporate Standard Mitigation Goal Standard Corporate Value Chain Standard Policy and Action Standard Product Standard Project Protocol GHG Protocol for Cities 	<ul style="list-style-type: none"> 14064 – 1 Design and develop organizational GHG inventories 14064 – 2 Design and implement GHG projects 14064 – 3 Validation and verification process (inkl. 14065 und 14066) 14067 Product Carbon Footprint 	<ul style="list-style-type: none"> ESRS 1 und ESRS 2 E1, E2, E3, E4 und E5 S1, S2, S3 und S4 G1 voluntary sustainability reporting standard for non-listed SMEs (VSME ESRS, aktuell im Entwurf)

Oder doch ein branchenspezifischer Standard?

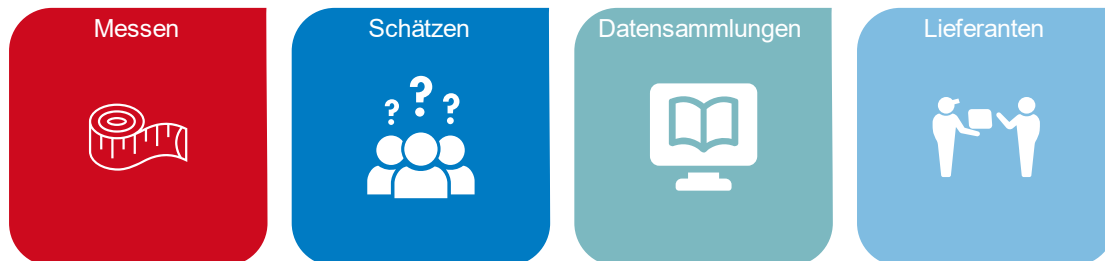
Nachhaltigkeitsberichterstattung

Aufbau ESRS



Nachhaltigkeitsberichterstattung

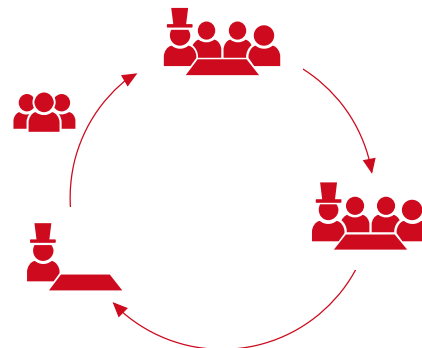
Woher kommen meine Daten?



Vorgehen

Erarbeitung von Herausforderungen im World Café

- Die Teilnehmenden werden in Gruppen aufgeteilt
- Die Gruppen werden Tischen zu gewiesen, an denen ein Host sie in ein Themengebiet einführt
- Jede Gruppe erarbeitet Herausforderungen zu ihrem Themengebiet und dokumentiert sie
- Die Gruppen wechseln die Tische und der Host des neuen Tisches führt die Gruppen in die Ergebnisse der vorangegangenen Gruppe(n) ein
- Jede Gruppe bearbeitet jedes Themengebiet







Themengebiete

An jeden Tisch wird ein spezifisches Themengebiet bearbeitet



Ressourcen

Betrachtet werden sollen alle Herausforderungen und ihre Hintergründe, die im Zusammenhang mit der Verfügbarkeit und der Beschaffung von Ressourcen stehen. Auch wenn Informationen ebenfalls eine Ressource sind, werden sie aufgrund ihrer hohen Relevanz separat betrachtet.



Informationen

Betrachtet werden sollen alle Herausforderungen und ihre Hintergründe, die im Zusammenhang mit der Verfügbarkeit, der Beschaffung sowie der Validierung von Informationen stehen.



Rechtliches und Change

Betrachtet werden sollen alle Herausforderungen und Hintergründe, die im Zusammenhang mit den rechtlichen Rahmenbedingungen und internen Barrieren im Unternehmen (Changemanagement) stehen. Hier können ebenfalls weitere Herausforderungen genannt werden, die nicht zu den vorgegebenen Themengebieten passen.



28.09.2024


Herausforderungen bei der Nachhaltigkeitsberichterstattung identifizieren!

Seite 7

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Figure 44: Overview slides for “Identifying and addressing challenges in sustainability reporting”

Annex 46. Overview slide for “*Developing a future oriented business model – but how?*” (in English)





Developing a future oriented business model – but how?




Understand your own business model and the future needs of your business

- Relevance of the topic
- Use the the Business Model Canvas
- understand market and society changes
- Sketching the future (bring technology into your business)
- Examples



Exploring technology management and innovative value propositions

- Introduction of digital technologies in SMEs (Technology Evaluation Canvas)
- Understand value propositions
- Use the Value Proposition Canvas
- Examples



Find and design your new business model

- Understand Exploitation portfolio and exploration portfolio (use the Portfolio Map)
- Understand business model innovations and use the Business Model Navigator
- Examples

SME = small and medium-sized enterprises



11/20/2023

Seite 1

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Figure 45: Overview slide for “Developing a future oriented business model – but how?” (in English)

Annex 47. Overview slide for “*Developing a future oriented business model – but how?*” (in German)

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Entwicklung eines zukunftsorientierten Geschäftsmodells - aber wie?

Verstehen des eigenen Geschäftsmodells und der zukünftigen Bedürfnisse Ihres Unternehmens

- Relevanz des Themas
- Verwendung des Business Model Canvas
- Markt- und Gesellschaftsveränderungen verstehen
- Die Zukunft skizzieren (Technologie in Ihr Unternehmen bringen)
- Beispiele

Erforschung von Technologie-management und innovativen Wertvorschlägen

- Einführung digitaler Technologien in KMU (Technology Evaluation Canvas)
- Verstehen von Wertvorschlägen
- Nutzen Sie den Value Proposition Canvas
- Beispiele

Finden und gestalten Sie Ihr neues Geschäftsmodell

- Verstehen des Verwertungsportfolios und des Explorationsportfolios (verwenden Sie die Portfoliokarte)
- Geschäftsmodellinnovationen verstehen und den Business Model Navigator nutzen
- Beispiele

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Mittelstand-Digital 11/22/2023

Figure 46: Overview slide for “Developing a future oriented business model – but how?” (in German)

Annex 48. Overview slide for “*Digital technologies to enhance scope 3 carbon accounting*” (in English)

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Digital technologies to enhance scope 3 carbon accounting (S3CA)

Introduction to the carbon footprint

- Importance of the carbon footprint for SMEs
- Calculation options for the carbon footprint

Presentation and discussion of supporting technologies for S3CA

- Advantages and disadvantages of technologies
- Application areas of technologies in the context of S3CA

Demonstration of the developed S3CA decision support tool

- Purpose of the S3CA decision support tool
- Application of the tool (how does it work? Which solutions can be generated and how can it support decision making?)

SME = small and medium-sized enterprises

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Mittelstand-Digital 20.11.2023 Seite 2

Figure 47: Introduction slide in “Digital technologies to enhance scope 3 carbon accounting” (in English)

Annex 49. Overview slide for “*Digital technologies to enhance scope 3 carbon accounting*” (in German)

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Digitale Technologien zur Verbesserung des Scope 3 Carbon Accounting (S3CA)

Einführung in den Kohlenstoff-Fußabdruck

- Die Bedeutung des Carbon Footprint für KMU
- Berechnungsmöglichkeiten für den Carbon Footprint

Präsentation und Diskussion von unterstützenden Technologien für S3CA

- Vor- und Nachteile der Technologien
- Anwendungsbereiche von Technologien im Kontext von S3CA

Demonstration des entwickelten S3CA-Entscheidungshilfe-Tools

- Zweck des S3CA-Entscheidungshilfe-Tools
- Anwendung des Tools (wie funktioniert es? Welche Lösungen können generiert werden und wie kann es die Entscheidungsfindung unterstützen?)

KMU= Klein- und Mittelständischen Unternehmen

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Mittelstand-Digital 22.11.2023

Figure 48: Introduction slide in “Digital technologies to enhance scope 3 carbon accounting” (in German)

Annex 50. Overview slide for “*Machine Learning basics: how to create value with ML*” (in English)

Machine Learning basics: how to create value with ML

Groundwork

- Explaining the difference between traditional static AI and Machine Learning

Leading by example (literally)

- Providing examples for ML applications
- Having each participant pick one or come up with one on their own
- Using these examples as starting points, then working through the hermeneutic circle

Results

- A low-resolution road map how to accomplish the self-chosen ML example
- Understanding the three main types of Machine Learning
- Understanding key statistical concepts

Mittelstand-Digital 20.11.2023 Seite 1

Figure 49: Introduction slide of “Machine Learning basics” (in English)

Annex 51. Overview slide for “*Machine Learning basics: how to create value with ML*” (in German)

Grundlagen des maschinellen Lernens: Wie man mit ML Werte schafft

Grundlagen

- Erläuterung des Unterschieds zwischen traditioneller statischer KI und maschinellem Lernen

Leitbeispiel

- Bereitstellung von Beispielen für ML-Anwendungen
- Jeder Teilnehmer wählt eines aus oder denkt sich selbst eines aus
- Diese Beispiele als Ausgangspunkt verwenden und dann den hermeneutischen Kreis durcharbeiten

Ergebnisse

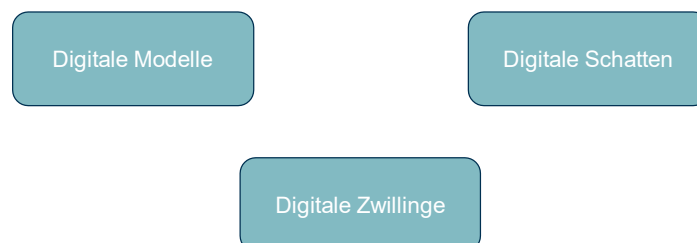
- Eine niedrig aufgelöste Roadmap, wie man das selbst gewählte ML-Beispiel durchführt
- Verstehen der drei Haupttypen des maschinellen Lernens
- Verstehen der wichtigsten statistischen Konzepte

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Figure 50: Introduction slide of “Machine Learning basics” (in German)

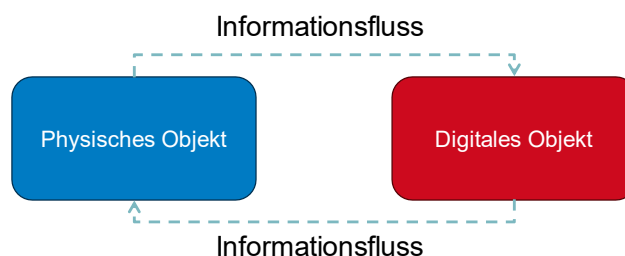
Annex 52. Overview slides for “Digital Twins: The self-optimizing company”**Begriffserklärung**

Was ist was?



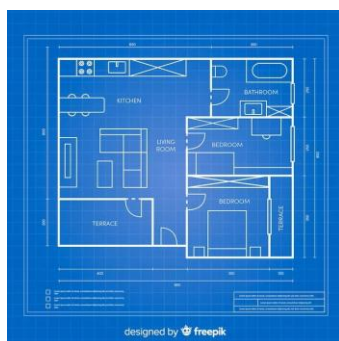
Begriffserklärung

Digitaler Zwilling



Begriffserklärung

Digitales Modell



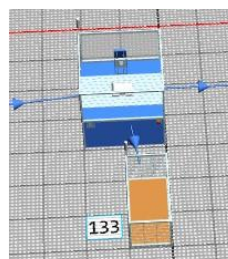
Quelle: unity.com

Begriffserklärung

Digitaler Schatten



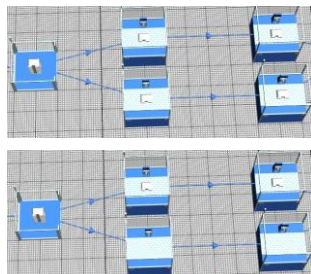
Quelle: www.wenglor.com



Quelle: PlantSim, eigen Darstellung

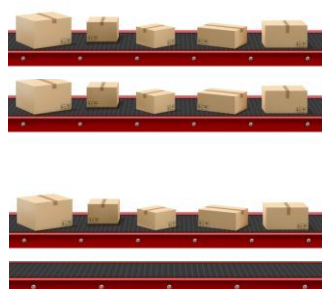
Begriffserklärung

Digitaler Zwilling



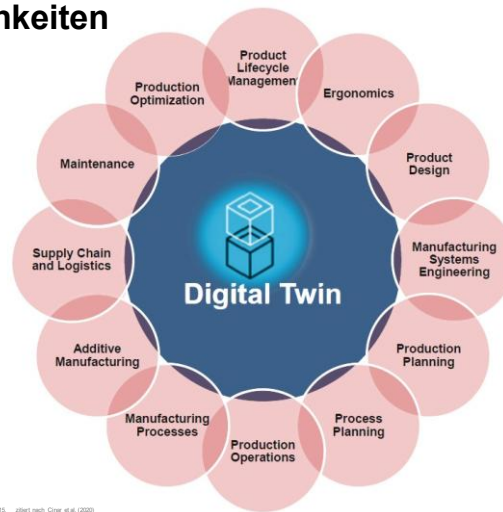
☐ Gestört ☒ Eingang gesperrt

Quelle: PlantSim, eigen Darstellung



Quelle: www.freepik.com, Autor: upkyak

Anwendungsmöglichkeiten



Zusammenfassung

Was braucht eine KI zum Lernen?

- Daten
 - Bestehende sammeln
 - Simulieren
 - Neue erzeugen
- Dateneigenschaften
 - Erkennbare Muster
 - Alle relevanten Variablen
 - Nur die relevanten Variablen

Figure 51: Overview slides for “Digital Twins: The self-optimizing company”

Annex 53. Overview slides for “Navigate Uncertain Times Agile and Purposefully with OKR”


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in Kooperation mit EDIH HAMBURG


Mit OKR agil und zielsicher durch unsichere Zeiten navigieren

Mittelstand-Digital

Lyn Luisa Zenner, M.Sc.

Co-funded by the European Union


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aufgrund eines Beschlusses des Deutschen Bundestages



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AGENDA



1,5 – 2 h

- Warm Welcome & Workshop-Goals (10 Minuten)
- OKRs verstehen: Was und warum? (10 Minuten)
- OKRs erstellen: Wie geht das? (20 Minuten)
- OKRs in der Praxis umsetzen (15 Minuten)
- Teamarbeit: Case Study (20 Minuten)
- Ergebnisse präsentieren und diskutieren (10 Minuten)
- Wrap-Up & Feedback (5 Minuten)



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aufgrund eines Beschlusses des Deutschen Bundestages

WAS IST OKR?

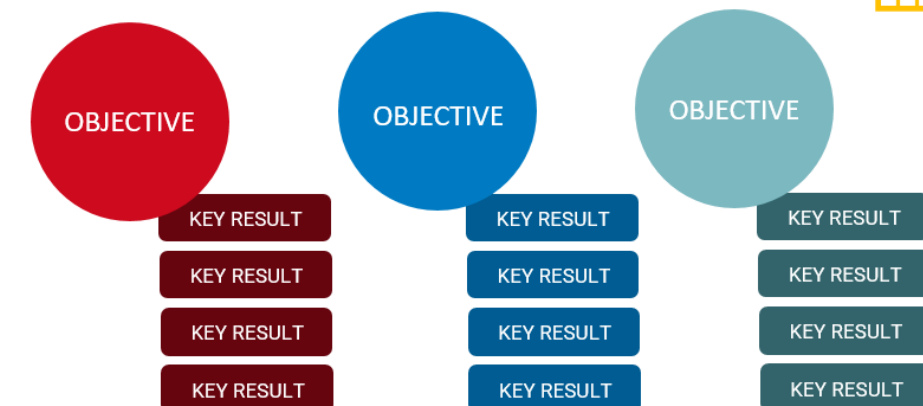


OKR ist eine Methode, die Unternehmen dabei hilft, klare Ziele zu setzen und deren Fortschritt zu messen, um sicherzustellen, dass alle auf die wichtigsten Aufgaben fokussiert bleiben und motiviert sind.

OKR-SETS



Planungszeitraum:
3-6 Monate



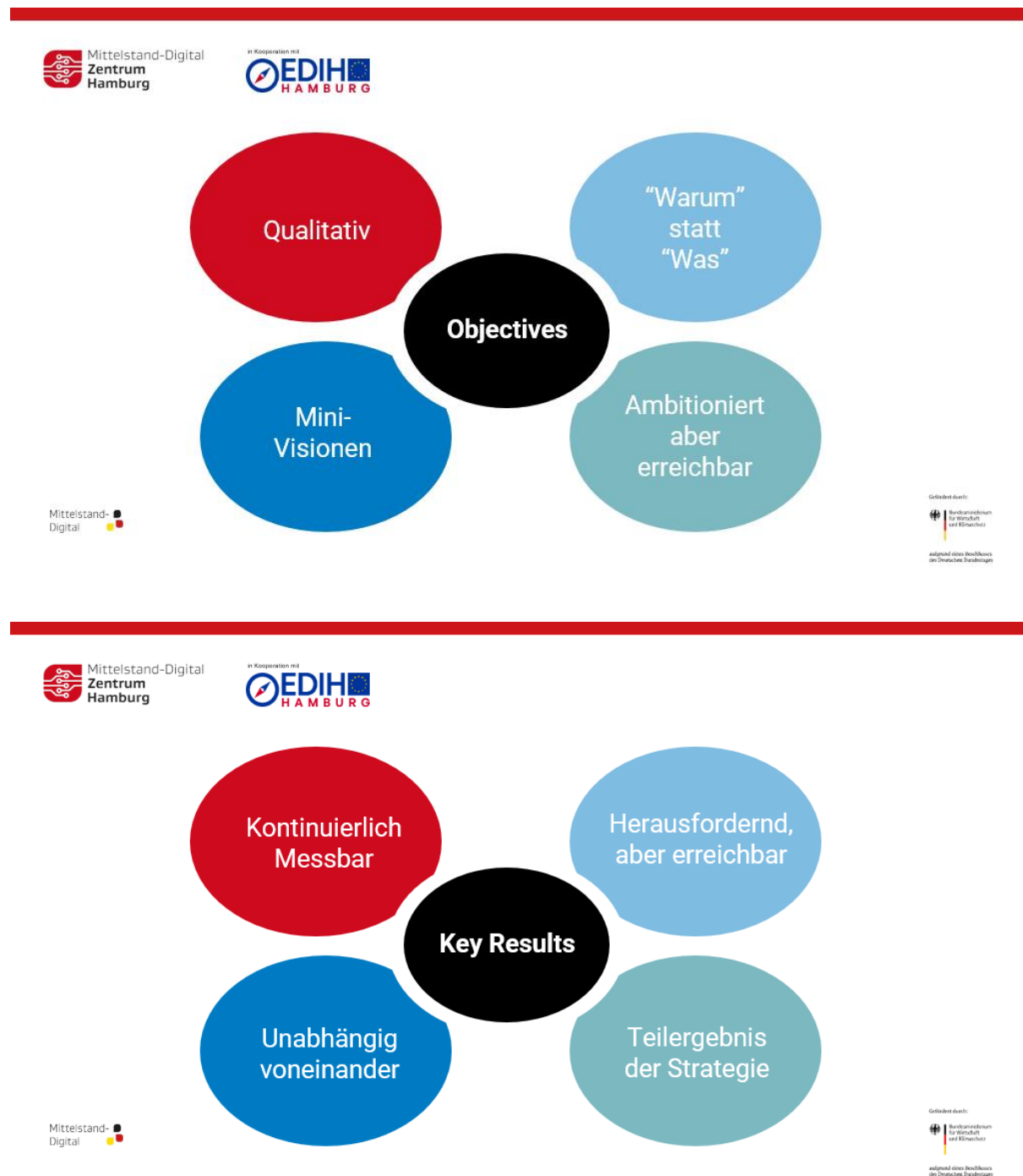


Figure 52: Overview slides for “Navigate Uncertain Times Agile and Purposefully with OKR”

Annex 54. Overview slides for “Ready to Thrive Through Crisis - Equipped with Expertise for the Future!”


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Krisensicher durchstarten

Mit Know-how für die Zukunft gerüstet sein!



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Resilienz

Definition

- **Resilienz = Die Fähigkeit eines Systems,**
 - Störungen zu widerstehen
 - sich von Störungen zu erholen
 - sich an verändernde Gegebenheiten anpassen zu können
- Im Fokus stehen vor allem **große Störungen,**
 - die eher selten auftreten, aber
 - große negative Auswirkungen haben

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Quelle: Ivanov 2023 – Einführung in die Widerstandsfähigkeit
28.09.2024 NORTEC 2024

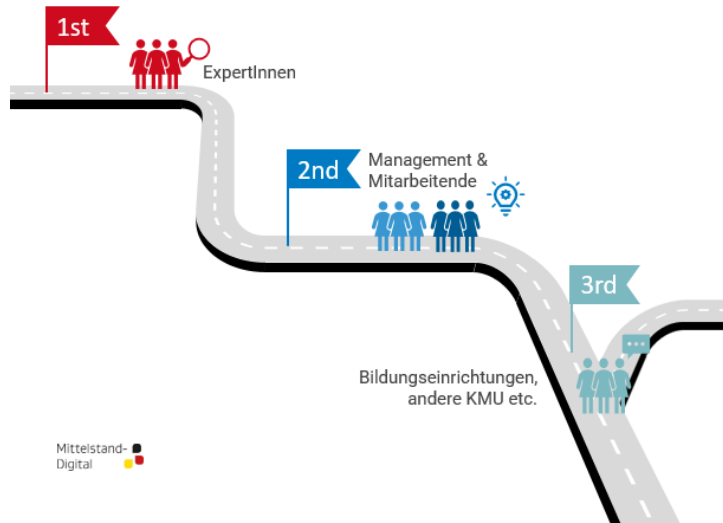
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Seite 4

Die 3 Phasen der Resilienz



Resilienz in der Praxis



Technologie- und Risikovorrausschau

Wie sehen mögliche Zukünfte aus?

Mitarbeitende in Strategieprozess einbinden

Welche Strategien für diese Zukünfte?

Kommunikation nach außen

Strategische Partnerschaften knüpfen

Figure 53: Overview slides for “Ready to Thrive Through Crisis - Equipped with Expertise for the Future!”

Annex 55. Overview slides for “Artificial Intelligence in production”



Künstliche Intelligenz in der Produktion

Demonstratorpräsentation

Mittelstand-Digital 

Christian Bruss

Gründet durch:

aufgrund eines Beschlusses
des Deutschen Bundestages



Übersicht



- Künstliche Intelligenz
- Maschinelles Lernen
- Meta-Heuristiken
- Wahl der Mittel

Mittelstand-Digital 

28.09.2024 Vernetzungstreffen

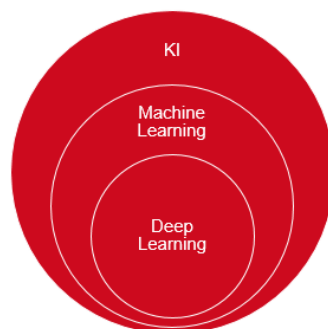
Gründet durch:

aufgrund eines Beschlusses
des Deutschen Bundestages

Seite 6

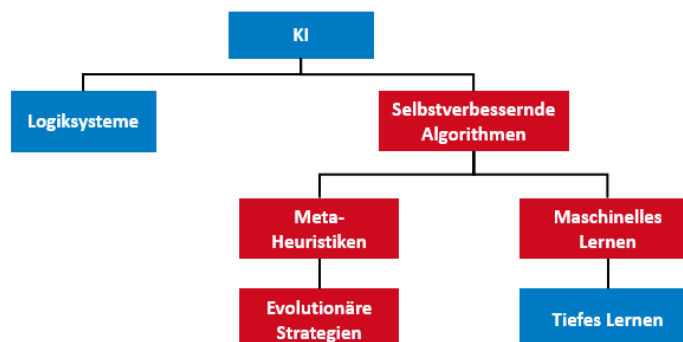
Künstliche Intelligenz

Klassifikation



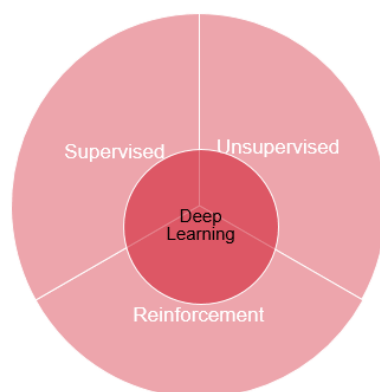
Künstliche Intelligenz

Klassifikation



Maschinelles Lernen

Klassifikation



Meta-Heuristiken

Genetischer Algorithmus

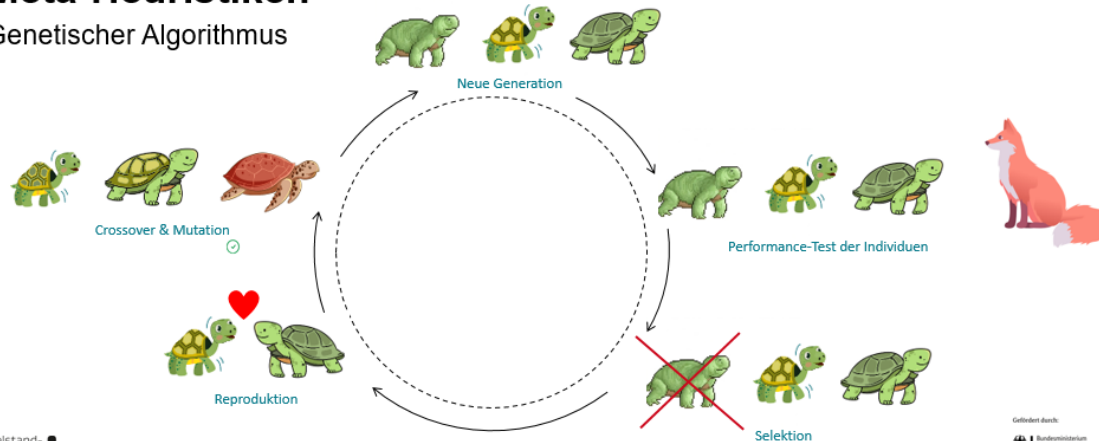


Figure 54: Overview slides for “Artificial Intelligence in production”

Annex 56. Overview slides for “Current topics in digital transformation (Info event)”

Was ist eine E-Rechnung



```
<?xml version="1.0" encoding="UTF-8"?>
<ubl:Invoice xmlns:ubl="urn:oasis:names:specification:ubl:schema:xsd:Invoice-2"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
  xmlns:cac="urn:oasis:names:specification:ubl:schema:xsd:CommonAggregateComponents-2"
  xmlns:cbc="urn:oasis:names:specification:ubl:schema:xsd:BasicComponents-2">
  <ubl:Header>
    <ubl:InvoiceID>123456789</ubl:InvoiceID>
    <ubl:IssueDate>2023-11-28</ubl:IssueDate>
    <ubl:InvoiceTypeCode>380</ubl:InvoiceTypeCode>
    <ubl:SupplierReference>
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        </ubl:PartyIdentification>
      </ubl:PartyReference>
    </ubl:SupplierReference>
    <ubl:CustomerReference>
      <ubl:PartyReference>
        <ubl:PartyIdentification>
          <ubl:PartyIdentificationCode>987654321</ubl:PartyIdentificationCode>
        </ubl:PartyIdentification>
      </ubl:PartyReference>
    </ubl:CustomerReference>
  </ubl:Header>
  <ubl:Body>
    <ubl:Item>
      <ubl:Quantity>1</ubl:Quantity>
      <ubl:UnitCode>C62</ubl:UnitCode>
      <ubl:LineItemDescription>
        <ubl:Text>Beschreibung eines IT-Lösungs- und Digitalisierungsprojekts</ubl:Text>
      </ubl:LineItemDescription>
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  </ubl:Signature>
</ubl:Invoice>
```

■ Rechnung Papier / PDF

(Quelle: www.streit-software.de)

■ E-Rechnung (XML)

(Quelle: www.e-rechnung-bund.de)

05.11.2024	Selber.Machen – Solo Erfolgreich im Handwerk	1
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Figure 55: Overview slides for “Current topics in digital transformation (Info event)”

Annex 56. Example Service Experience Exchange with the topic time recording software, “Current topics in digital transformation (Experience exchange)”

The image shows a web page for a workshop titled "Minuten, Mitarbeiter, Management: Zeiterfassung im Handwerk". The page is from the Mittelstand Digital Zentrum Hamburg website. It includes a header with navigation links, a main title, and a registration button "ZUR ANMELDUNG". Below the button, there is a description of the workshop, a list of topics, a moderation section, a contact information section, and a registration form. The registration form includes fields for name, email, phone, address, and company, as well as checkboxes for consent and a "SENDEN" button. At the bottom, there is a footer with the website's name and a red bar with the text "© 2023 Mittelstand Digital Zentrum Hamburg".

Minuten, Mitarbeiter, Management: Zeiterfassung im Handwerk

Präsenz-Workshop | 27. November 2023 17:00
HafenCity, Adresse wird nach bestätigter Anmeldung mit geteilt. | 25 Teilnehmer

ZUR ANMELDUNG

Zwischen Unternehmenserfolg und Mitarbeiterzufriedenheit: Interaktiver Erfahrungsaustausch zu den Herausforderungen der mobilen Zeiterfassung im Handwerk. Wir beleuchten das Spannungsfeld zwischen gesetzlichen Vorgaben, unternehmerischen Interessen und Mitarbeiterzufriedenheit.

Folgende spannende Themen stehen auf dem Programm:

- Erfahrungsbereitschaft aus dem Handwerk
- Zeiterfassungsprogramme vorgestellt - ein praktischer Einblick
- Mitarbeiter mehrnehmen und Veränderungsprozesse gemeinsam gestalten
- Austausch und Vernetzung zu aktuellen Fragestellungen rund um Digitale Zeiterfassung
- Themenspezifische Diskussionen in kleinen Gruppen

Moderation:

- Christian Harburg, Raumausstattungsmeister Etwild Hamburg GmbH
- Friedemann Meier, Digitalisierungsberater der Handwerkskammer Hamburg, EDIH
- Christine Mohr, Mittelstand Digital Zentrum Hamburg - Handwerkskammer Hamburg

Zeitgruppe:

Geschäftsführer*innen, Personalverantwortliche, Betriebsräte und alle aus dem Handwerk oder handwerknahen Betrieben. Es sind ausschließlich Betriebe zugelassen, keine Multiplikatoren oder Berater.

Veranstaltungsort:

HafenCity, Adresse wird nach bestätigter Anmeldung mit geteilt.

Wir starten pünktlich um 17:00 Uhr. Für Ihr leibliches Wohl wird mit einem Imbiss und Getränken gesorgt sein.

Anmeldung:

Bitte melden Sie sich bis zum 23.11.2023 bis 12:00 Uhr an. Eine Teilnahme ist nur nach bestätigter Anmeldung möglich. Nach Bestätigung Ihrer Anmeldung erhalten Sie spätestens einen Tag vor dem Veranstaltungstermin weitere Hinweise per Mail. Achten Sie bitte auf die korrekte Schreibweise Ihrer E-Mail-Adresse, je nach Anmeldedatum kann es sein, dass wir je Unternehmen nur eine Anmeldung zulassen, damit möglichst viele verschiedene Betriebe an diesem Angebot teilnehmen können. Wir bitten um rechtzeitige Abgabe, falls Sie doch nicht teilnehmen können.

Die Förderung durch das BMWK ermöglicht uns, Ihnen diese Veranstaltung kostenfrei anzubieten.

Mit freundlichen Grüßen

Ihr Mittelstand Digital Zentrum Hamburg Team

ZUR ANMELDUNG

Termininformationen

Beginn	27. November 2023 17:00
Ende	27. November 2023 19:30
Stichtag, Anmeldungsende	23. November 2023 12:00
Ort	HafenCity, Adresse wird nach bestätigter Anmeldung mit geteilt.

Anmeldeformular

Vorname * | Nachname *

Branche * | Unternehmen *

Telefon * | E-Mail * | Bundesland *

Postleitzahl | Adresse

Positionsbezeichnung * | Unternehmensgröße *

☐ Bestätigung von Film- und Fotoaufnahmen

☐ Ich stimme zu, dass das Mittelstand Digital Zentrum Hamburg meine Daten zur Durchführung der Veranstaltung und zu Zwecken der Evaluation für die Projektdauer speichert.

☐ Ich stimme einer späteren Kontaktaufnahme - zwecks Durchführung der Evaluation der besuchten Formate zu.

☐ Ich möchte bitte zukünftig von der Handwerkskammer Hamburg über weitere Veranstaltungen und Neuigkeiten per Newsletter informiert werden.

SENDEN

Newsletter Anmeldung

Vorname | Nachname

E-Mail

☐ Ich akzeptiere die Allgemeinen Geschäftsbedingungen und die Datenschutzerklärung

SENDEN

Mittelstand Digital

© 2023 Mittelstand Digital Zentrum Hamburg

Figure 57: Example Service Experience Exchange with the topic time recording software

Annex 57. Example Slide showing the consultation process, “*Digitalization Consultation*”

HWK Workshop "Betriebssoftware" - WS 1


 SOLVIE
UND PARTNER
UND PARTNER
Prozessinventur

Betrieb: _____

Datum: _____

		relevant für Betrieb	heute in Software?		
Bereich	Fragestellung	j/n	j/n	wenn ja: welche?	wie zufrieden (Schulnoten 1-6)
Akquise	Wie werden die Leistungen / Produkte beworben?				
	Wie werden neue Kunden gewonnen?				
	Wie werden Interessenten betreut?				
Angebot	Wie werden konkrete Anfragen verwaltet (egal über welchen Kanal)?				
	Wie werden die relevanten Daten aufgenommen?				
	Wie werden ggfs. vor-Ort Termine organisiert? (Vereinbarung bis Durchführung)				
	Wie werden Kundendaten verwaltet?				
	Wie werden die Angebote erstellt (inkl. Kalkulation)?				
	Wie werden gewonnene Angebote zu Aufträgen?				
Auftrag	Wie wird geplant (Personal, Produktion, Material, Fahrzeuge, Unterauftragnehmer, ...)?				
	Wie wird umgeplant?				
	Wie wird ausgeführt?				
	Wie wird die Ausführung überwacht? (Rückmeldung Fortschritt, Zeiten, Kosten, ...)				
	Wie wird intern zum Auftrag kommuniziert? Wie wird extern kommuniziert?				
Service	Wie wird der Kunde nach dem Auftragsende betreut?				
	Kundenportal? Emails, ...?				
	Wie wird Kundendienst geplant und abgerechnet?				
	Wie wird Notdienst abgewickelt?				
	Wie läuft die Tourenplanung und Bestückung der Servicewagen?				
Bestellung und Eingangsrechnung	Wie laufen Bestellungen ab?				
	Wer darf was und mit welchem Wert bestellen?				
	Wie werden Eingangsrechnungen verarbeitet (Eingang, Prüfung, Korrektur, Zahlung, Ablage,...)				
Ausgangsrechnungen	Wie wird mit den Kunden abgerechnet? Abschlag, Zwischen-/Endrechnung, ...				
	Wie wird die Rechnung erstellt und abgelegt?				
	Wie wird die Rechnung versendet?				
	Wie wird der Zahlungseingang überwacht?				
	Wie läuft das Mahnwesen ab?				

Annex 58. Overview slides of “Digitalization Consultation”



Figure 56: Infographic ERP Software selection “Digitalization Consultation”

Handwerkskammer Hamburg

Software-Anbietersauswahl*

TR Schmidt GmbH

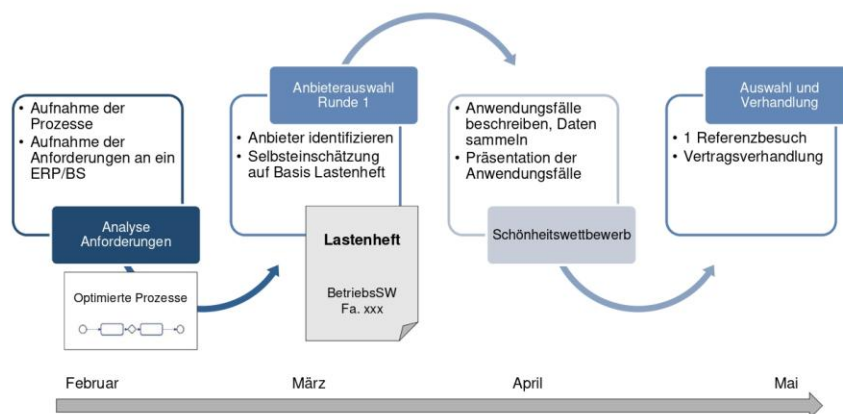
	Erfassung von Ort, Uhrzeit & Auftrag	Ergänzung von Bemerkungen	Excel-Export der Arbeitsstunden
Crewmeister Preis: ca. 250€ / Jahr	Ja	Ja	Ja
Timicx Zeiterfassung Preis: ca. 500€ / Jahr	Ja	Ja	Ja
timr Preis: ca. 500€ / Jahr	Ja	Ja	Ja
123erfasst Preis: ca. 600€ / Jahr	Ja	Ja	Ja
Clockodo Preis: ca. 600€ / Jahr	Ja	Ja	Ja

*Haftungsausschluss: Eine vermögensrechtliche Haftung gegenüber dem Beratenden ist ausgeschlossen. Die Handwerkskammer Hamburg gibt diese Übersicht ausschließlich zur unverbindlichen Information ihrer Mitglieder heraus und übernimmt in keinem Falle irgendeine Gewähr für den Inhalt, insbesondere hinsichtlich dessen Richtigkeit und/oder Vollständigkeit. Diese Übersicht ersetzt keinesfalls das Einholen eigener Informationen beim Hersteller durch den Betrieb.

05.11.2024 Fußzeile

Figure 57: Software provider selection, “Digitization Consultation”

Systematischer Auswahlprozess sichert Entscheidung ab



SOLVIE UND KOLLEGEN
UNTERNEHMENSBERÄTER GMBH

Figure 58: List process inventory for initial interview with SME, “Digitalization Consultation”

Annex 60. Overview slides for “LLMs in logistics – opportunities and risks of Bard, ChatGPT & Co”

The image shows a series of four slides from a presentation. The top slide is a title slide with a dark blue background and a photo of a modern building by the water. The second slide is an agenda slide with a light blue background and a vertical list of topics. The third slide is a conceptual slide with a light blue background and a Venn diagram. The bottom slide is a legend slide with a light blue background and a small ARIC logo.

Slide 1: Title Slide

aric

LLMs in der Logistik

Chancen & Risiken von Bard, ChatGPT & Co

KI-Masterclass Hub Day @ Digital Hublogistics
09.11.2023

Artificial Intelligence Center Hamburg (ARIC) e.V.
Anselm Fehnker & Lars Hofferbert

HUB DAY 23
DIGITAL HUB LOGISTICS HAMBURG

EDIH HAMBURG

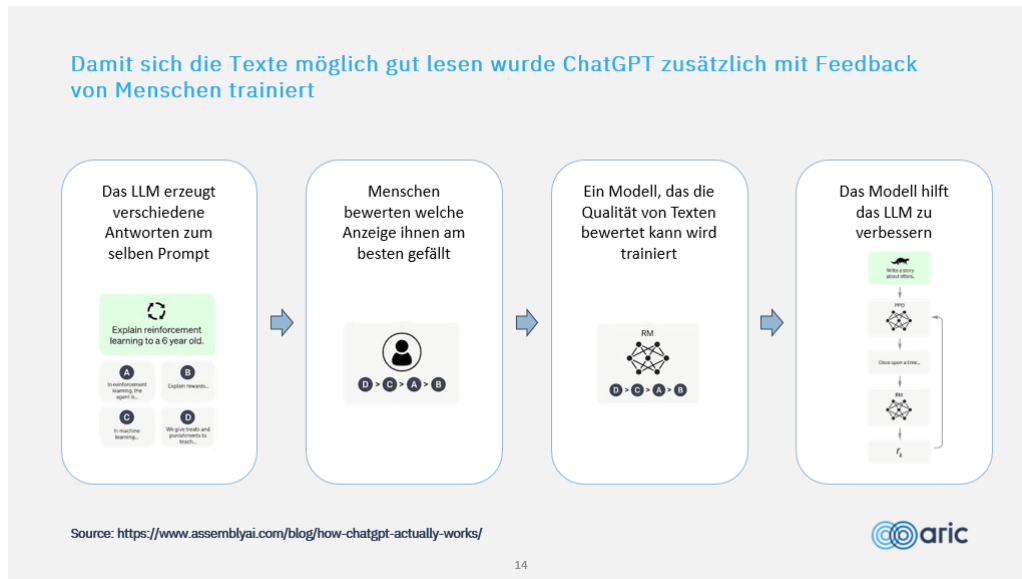
Slide 2: Agenda

- KI & LLMs – wie funktioniert das eigentlich?
- Anwendungsfälle – wo macht KI Sinn?
- Risiken & Empfehlungen – wo muss man aufpassen?
- Diskussion

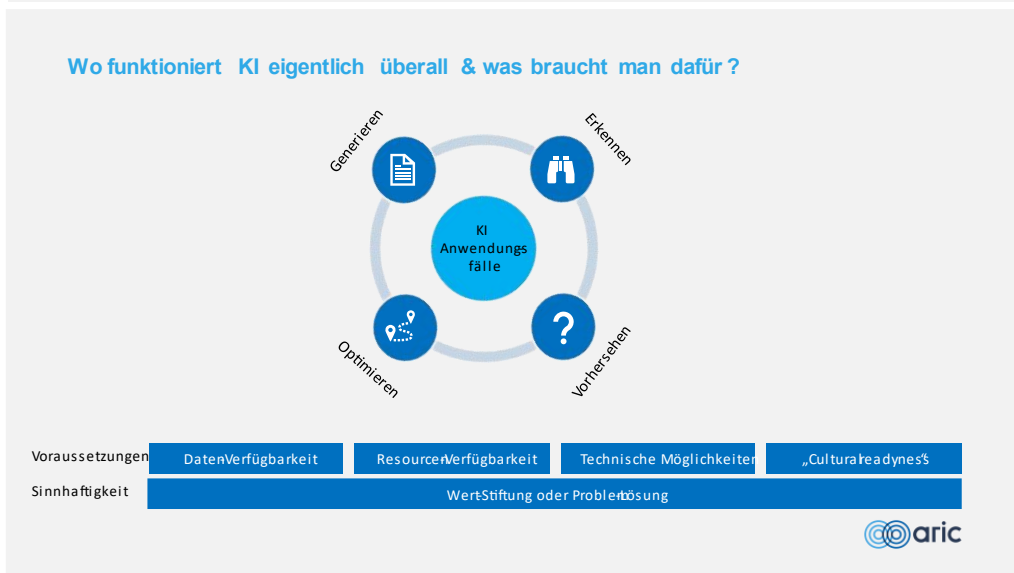
Slide 3: Künstliche Intelligenz beruht auf Methoden aus der Informatik und Statistik

Slide 4: Legend

KI = Künstliche Intelligenz
ML = Machine Learning
DL = Deep Learning



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Anwendungsbereich 4: „Optimieren“

Weitere Beispiele

- Routen & Ankunftszeiten optimieren
- Ladeflächen analysieren & optimieren
- Energieverbrauch z.B. durch Geschwindigkeitsanpassungen optimieren
- Prozesse optimieren oder automatisieren (IT, Order Fulfilment, Beladungen, ...)

Optimieren der verwendeten Bereifung

Es werden vorhandene Daten (LKW, Reifen, Routen, etc.) verwendet, um die optimale Bereifung für einzelne LKWs zu errechnen (CO2OPT)

aric

Figure 59: Overview slides of “LLMs in Logistics”

Annex 61. Overview slides for “Workshop for Startup Support Programs: How to identify AI in Startups?”



How to KI-Startup?

Artificial Intelligence Center
Hamburg e.V. (ARIC)

Supported as part of the European Digital Innovation Hub (EDIH)



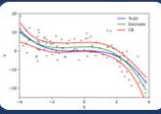

Co-funded by
the European Union



Hamburgische
Investitions- und
Finanzbank



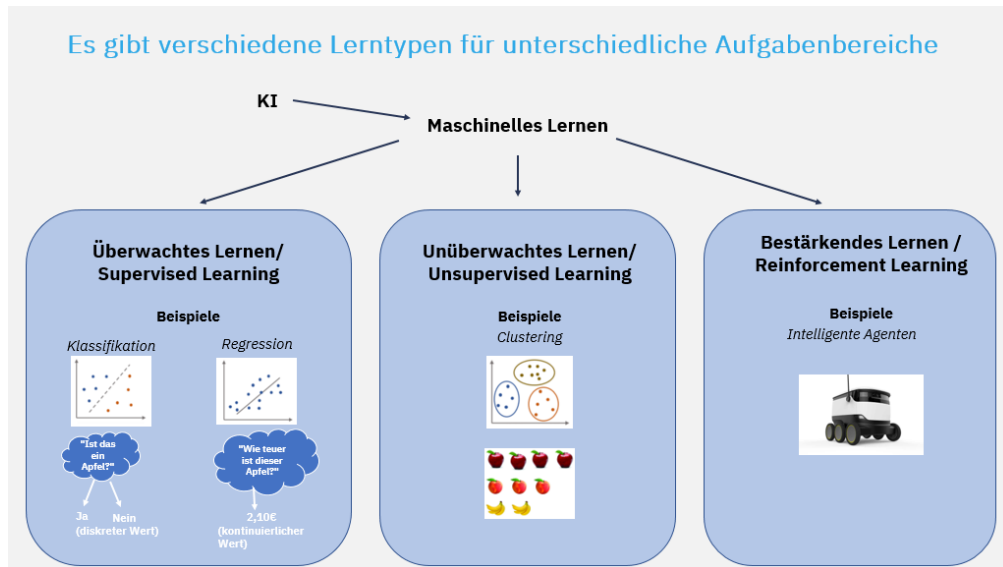
Künstliche Intelligenz kann für verschiedene Aufgaben genutzt werden

 <p>Wahrnehmende Fähigkeiten</p> <p>Computer Vision Computer Audition Klassifikation</p>	 <p>Analytische Fähigkeiten</p> <p>Mustererkennung Prognosen Planung und Optimierung</p>	 <p>Motorische Fähigkeiten</p> <p>Steuerung von Regelsystemen Robotik</p>	 <p>Generierende Fähigkeiten</p> <p>Generierung von Audio-, Text-, Sprach-, Bild- und Videosequenzen</p>
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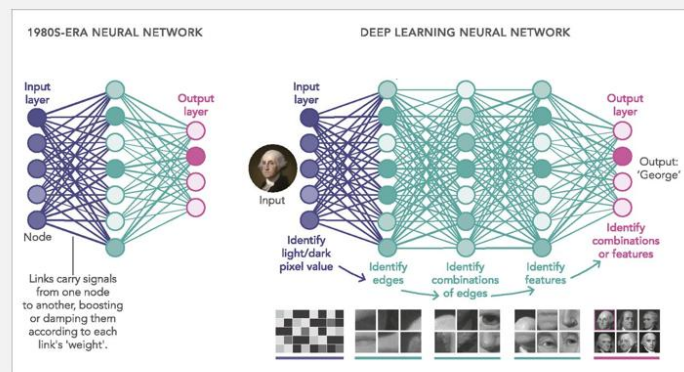


Weak AI / Narrow AI	Strong AI / Artificial General Intelligence (AGI)
<ul style="list-style-type: none"> Erfüllt klar definierte Aufgaben und bleibt auch bei diesen „Weak“ sagt nichts über die Qualität der Aufgabenerfüllung aus Bei diesen konkreten Aufgaben sind auch bessere Ergebnisse als bei der Ausführung vom Menschen möglich 	<ul style="list-style-type: none"> Ist in der Lage bei allen Aufgaben die menschliche Intelligenz zu übertreffen Kann sich selber neue Fähigkeiten beibringen Expert:innen sind sich uneins, ob AGI je erreicht werden kann





Eine solche Klassifikation kann mit einem neuronalen Netzwerk durchgeführt werden:



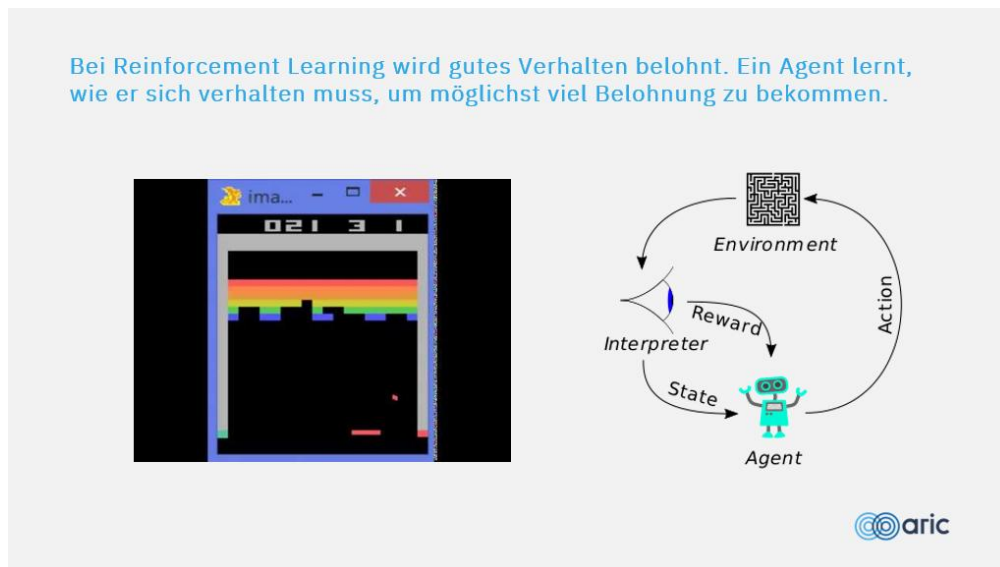


Figure 60: Overview slides of “How to identify AI in Startups?”

Annex 62. Overview slides for “*Introduction to generative AI*”

The image displays two slides from a presentation. The top slide is a dark blue title slide with the ARIC logo in the top left. It features the text 'Hamburger Horizonte 2024' in light blue, followed by the main title 'Einführung in die Generative KI' in large white font. Below this, it says 'Artificial Intelligence Center Hamburg (ARIC) e.V.' and 'Hamburg, 16.10.2024'. The right side of the slide shows a photograph of a modern, angular glass building situated on a waterfront. The bottom slide is light gray with the title 'Agenda' in blue. It lists five topics, each preceded by a white circle connected by a line: 'Was ist Generative KI?', 'Wie funktioniert Generative KI?', 'Wie werden gute Prompts geschrieben?', 'Welche Generativen KI-Tools gibt es?', and 'Fragen & Diskussion'. The ARIC logo is in the bottom right corner, and a decorative graphic of overlapping gray circles is on the right side.

Slide 1: Title Slide

aric

Hamburger Horizonte 2024

Einführung in die Generative KI

Artificial Intelligence Center Hamburg (ARIC) e.V.






Hamburg, 16.10.2024


Slide 2: Agenda

- Was ist Generative KI?
- Wie funktioniert Generative KI?
- Wie werden gute Prompts geschrieben?
- Welche Generativen KI-Tools gibt es?
- Fragen & Diskussion

aric

Elemente eines Prompts – Woraus besteht ein Prompt ?

	Frage	„Wie wurde das Römische Reich gegründet?“
	Anweisung	„Beschreibe die fünf wichtigsten Eckpunkte im Niveau für eine 8. Klasse!“
	Kontext	„Nutze zur Beantwortung folgenden Text: “[Text]““
	Ausgabeformat	„Erstelle eine kurze Liste mit den wichtigsten Ereignissen. Nutze das Format: Jahreszahl - Ereignis“
	Beispiel	„Das erste Ereignis wäre z.B.: 753 v. Chr. – [Ereignis 1].“



Noch präziser ausgedrückt sagt ein Sprachmodell die Wahrscheinlichkeit, dass ein Wort das nächste ist – und zwar für alle(!) Wörter im Vokabular des Modells

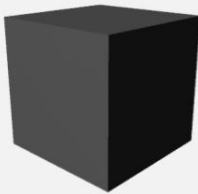
Die

Würde

des

Menschen

→




language model

→

Aal	0.00%
...	...
ist	90.00%
isst	0.23%
Island	0.00%
...	...
Zebra	0.00%
,	0.00%
.	0.00%

Hinweis: Natürlich sind es auch hier ganz genau genommen wieder Tokens (und nicht Wörter)



17

Figure 61: Overview slides of “Introduction to generative AI”

Annex 63. Overview slides for “Responsible AI”**Responsible AI**



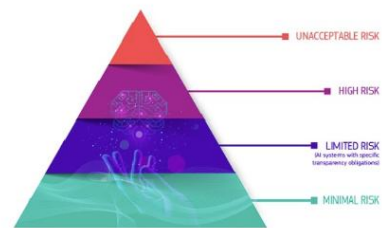
Artificial Intelligence Act (AIA)

- April 2021: Entwurf der Europäischen Kommission
- Dezember 2023: Kompromisstext aus dem Trilog
- 1. August 2024: Inkrafttreten
- Geltung der Regeln zwei Jahre nach Inkrafttreten (einige Regeln gestaffelt)
- Risikobasierter Ansatz
- Anforderungen aus Titel III Kapitel 2 & 3 sind verbindlich für Hochrisiko-KI, sollen aber möglichst auch freiwillig erfüllt werden

→ Individuelle Betroffenheit ist jeweils zu klären & hängt ab von

- Art der KI-Anwendung (Risikostufe, GPAI)
- Rolle bezüglich der KI-Anwendung

The Regulatory Framework defines 4 levels of risk for AI systems:



source: [European Commission](#)

Künstliche Intelligenz hat einen Einfluss auf Menschen und Umwelt



Figure 62: Overview slides of “Responsible AI”

Annex 65. Illustrations to “*Elements of AI for Business*”

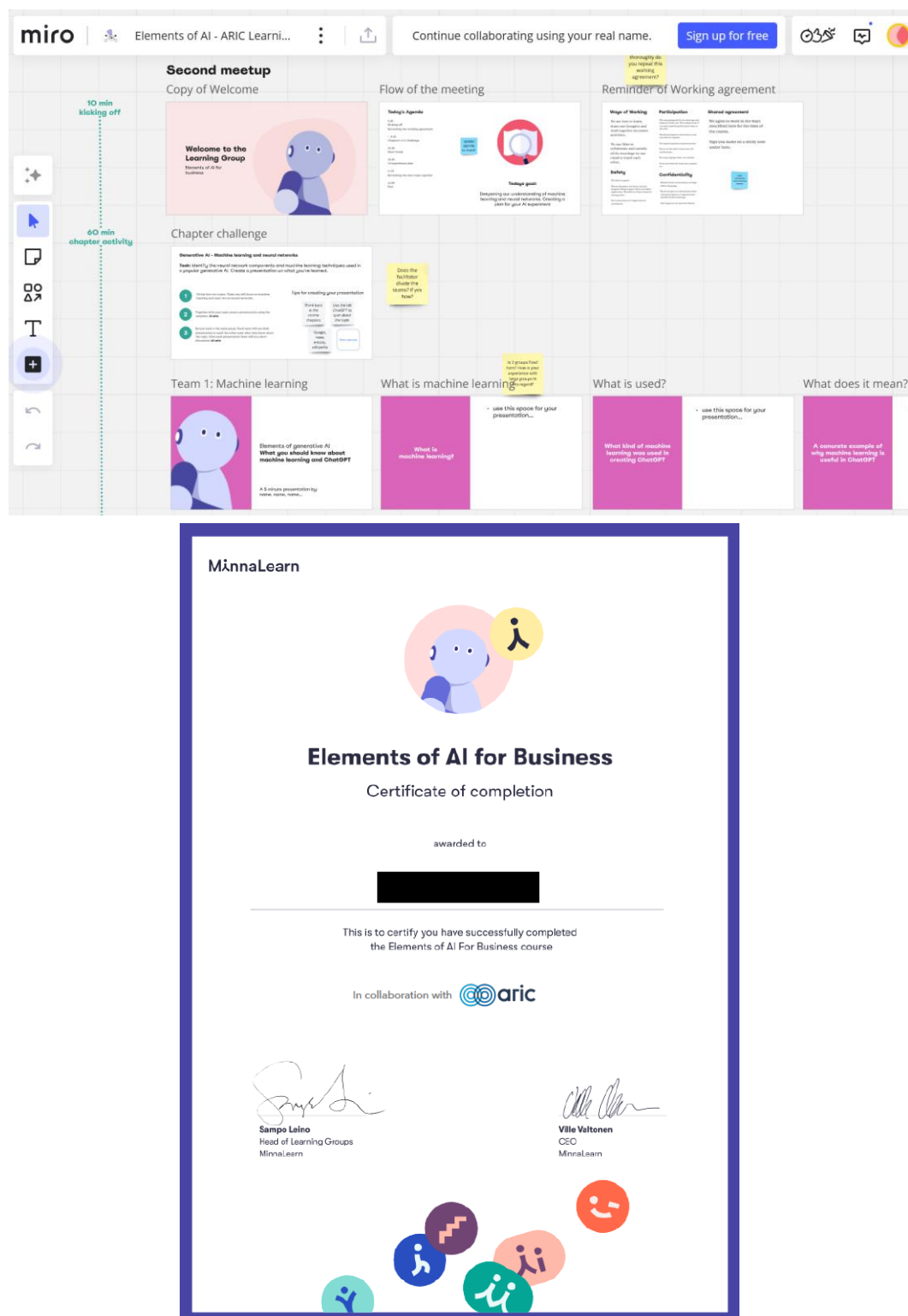


Figure 63: Illustrations to “*Elements of AI for Business*”

Annex 66. Questionnaire for the customer feedback on ST-formats (in German)

Draft ID: 6aa4f4a4-aa20-4590-bc1b-46b42bf7dcfb

Date: 21/11/2023 15:50:36

Befragung zu *Skills und Training*-Formaten im Rahmen von EDIH-Hamburg.

Mit * markierte Felder sind Pflichtfelder.



Befragung zu Skills und Training-Formaten von EDIH4UrbanSAVE

Mit Ihrer Teilnahme ermöglichen Sie uns unsere Angebote auf Ihre Bedürfnisse anzupassen. Vielen Dank!

- * An welchem Kurs der EDIH-Academy haben sie teilgenommen?

Kursbewertung

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	stimme zu	stimme teilweise zu	unentschieden	stimme teilweise nicht zu	stimme nicht zu	keine Angabe
* Der Kurs trifft meinen (Weiterbildungs-) Bedarf.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* Der Kurs bietet Ansatzpunkte für mein Unternehmen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* Der Inhalt des Kurses (Kursaufbau, Material, etc.) hat insgesamt meine Erwartungen erfüllt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* Der organisatorische Rahmen (Anmeldung, Einladung, Ablauf, etc.) hat meine Erwartungen erfüllt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* Es ausreichend Gelegenheit, Fragen zu stellen und sich mit anderen Teilnehmern auszutauschen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- * Wo können wir besser werden?

- * Was hat Ihnen besonders gut gefallen?

- * Würden Sie diesen Kurs weiterempfehlen?

- ☐ Ja
☐ Nein

Allgemeines

- * Wären Sie an einem Zertifikatskurs im Rahmen von EDIH interessiert?

- ☐ Ja
☐ Nein

- * Zu welchen Themen wünschen Sie sich mehr Angebote von EDIH Hamburg:

- ☐ Digitalisierung
☐ Nachhaltigkeit
☐ Künstliche Intelligenz
☐ HPC
☐ Arbeit 4.0
☐ Vernetzung
☐ Wirtschaftlichkeit & Resilienz

Über Sie

- * Zu welcher Branche gehört Ihr Unternehmen?

- ☐ Handwerk
☐ Produzierendes Gewerbe
☐ Verkehr
☐ Dienstleistungen
☐ Gastgewerbe
☐ Handel
☐ Öffentliche Verwaltung
☐ Logistik

- * Wieviele Mitarbeiter hat Ihr Unternehmen?

- ☐ 1-9
☐ 10-49

- ☐ 50-249
- ☐ 250-499

Vielen Dank für die Teilnahme an der Befragung!
Durch Ihr Feedback geben Sie uns die Möglichkeit unsere Angebote besser auf Ihre Bedürfnisse anzupassen.

Contact

stephanie.vonriegen@hitec-hamburg.de

Annex 67. Questionnaire for the customer feedback on ST-formats (in English)

Draft ID: 839eed0b-adce-44fb-b708-4045f9065691

Date: 21/11/2023 16:34:40

Survey on skills and training formats as part of EDIH-Hamburg.

Fields marked with * are mandatory.



Survey on skills and training formats as part of EDIH-Hamburg.

With your participation you enable us to adapt our offers to your needs. Thank you very much!

* Which EDIH Academy course did you attend?

Course evaluation

Please select the appropriate answer for each item:

	fully agree	partially agree	undecided	partly disagree	disagree	not specified
* The course meets my (training) needs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* The course offers starting points for my company.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
* The content of the course (course structure, material, etc.) met my expectations overall.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<ul style="list-style-type: none"> The organizational framework (registration, invitation, agenda, etc.) fulfilled my expectations. 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<ul style="list-style-type: none"> There was plenty of opportunity to ask questions and exchange ideas with other participants. 	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

• Where can we do better?

• What did you particularly like?

• Würden Sie diesen Kurs weiterempfehlen?

☐ Yes

☐ No

General information

• Would you be interested in an EDIH certificate course?

☐ Yes

☐ No

On which topics would you like to see more offers from EDIH Hamburg?

- ☐ Digitisation
- ☐ Sustainability
- ☐ Artificial Intelligence
- ☐ HPC
- ☐ Work 4.0
- ☐ Networking
- ☐ Economy & resilience

About you

Which sector does your company belong to?

- ☐ Craft
- ☐ Manufacturing industry
- ☐ Transport

- ☐ Services
- ☐ Gastronomy
- ☐ Trading
- ☐ Public sector organisation
- ☐ Logistics

How many employees does your company have?

- ☐ 1-9
- ☐ 10-49
- ☐ 50-249
- ☐ 250-499

Thank you for taking part in the survey!

Your feedback gives us the opportunity to better adapt our offers to your needs.

Contact


[Contact Form](#)

Annex 68. Questionnaire for the customer feedback on AI course (in German)

Draft ID: 7fdd1910-580f-4ca4-966b-dba525953b16
Date: 13/11/2023 08:50:09

Bedarfsermittlung für Skills und Training-Formaten von EDIHHamburg

Mit * markierte Felder sind Pflichtfelder.



Vielen Dank für die Teilnahme zur Befragung zur Ermittlung von Kursbedarfen im Rahmen von EDIHHamburg.

Zielgruppe

* Haben Sie bereits Erfahrung im Umgang mit künstlicher Intelligenz?

☐ Ja
☐ Nein

Wie würden Sie Ihr derzeitiges Wissensniveau im Bereich künstlicher Intelligenz einschätzen, auf einer Skala von 1 bis 5, wobei 1 Anfängerniveau und 5 ein sehr fortgeschrittenes Niveau repräsentiert?

Themen

* Welche spezifischen Fähigkeiten oder Kenntnisse möchten Sie erwerben?

* Welche Themen oder Aspekte im Zusammenhang mit künstlicher Intelligenz interessieren Sie am meisten?

1

Formate

• Haben Sie bestimmte Präferenzen bezüglich der Lernzeit?

- ☐ Kurzer, intensiver Kurs: 1 bis 3 Wochen, mit intensiven Einheiten jeden Tag oder mehrmals pro Woche.
- ☐ Mittelfristiger Kurs: 4 bis 8 Wochen, Unterrichtseinheiten finden einmal oder zweimal pro Woche statt.
- ☐ Längerer Kurs mit geringerem Arbeitsaufwand: 3 bis 6 Monate, Unterrichtseinheiten finden einmal oder mehrmals im Monat statt.
- ☐ Flexibler Zeitplan: Das Lernen ist in Module unterteilt, was es den Teilnehmern ermöglicht, in ihrem eigenen Tempo voranzukommen, bis sie Aufgaben abschließen und ein Zertifikat erhalten.

• Welche Kursdurchführung präferieren Sie?

- ☐ Online
- ☐ in Präsenz
- ☐ Hybrid

• Bitte sortieren Sie die folgenden Kurzselemente nach Relevanz.

Use drag&drop or the up/down buttons to change the order or [accept the initial order](#).

⋮ Anwendungsbeispiele

⋮ Demonstratoren

⋮ Praktische Übungen

⋮ Theoretische Grundlagen

Vielen Dank für die Teilnahme an dieser Umfrage! Durch Ihre Rückmeldung werden wir das Angebot von EDIHHamburg besser an Ihren Bedarf anpassen können.

Contact

[Contact Form](#)

Annex 69. Questionnaire for the customer feedback on AI course (in English).

Draft ID: e88f2ced-8f98-431d-b60d-2851ab9fb421

Date: 17/11/2023 10:18:03

Survey on skills and training formats as part of EDIH-Hamburg

Fields marked with * are mandatory.



Thank you for participating in the survey to determine course requirements as part of EDIHHamburg.

Target group

Do you already have experience in dealing with artificial intelligence?

- ☐ Yes
☐ No

- * How would you rate your current level of knowledge in the field of artificial intelligence, on a scale of scale from 1 to 5, where 1 represents a beginner level and 5 a very advanced level?

Only values between 1 and 5 are allowed

Topics

- * What specific skills or knowledge would you like to acquire?

- * Which topics or aspects relating to artificial intelligence interest you the most?

Formats

Single Choice Question

- ☐ Short, intensive course: 1 to 3 weeks, with intensive sessions every day or several times a week.
- ☐ Medium-term course: 4 to 8 weeks, lessons take place once or twice a week.
- ☐ Longer course with less workload: 3 to 6 months, lessons take place once or several times a month several times a month.
- ☐ Flexible schedule: Learning is divided into modules, which allows participants to progress at their own progress at their own pace until they complete tasks and receive a certificate.

Which type of course do you prefer?

- ☐ online
- ☐ in presence
- ☐ hybrid

Ranking Question

Use drag&drop or the up/down buttons to change the order or [accept the initial order](#).

⋮ Application examples

⋮ Demonstrators

⋮ Practical exercises

⋮ Theoretical basics

Thank you for participating in this survey! Your feedback will enable us to better adapt the EDIHamburg to better meet your needs.

EDIH4UrbanSAVE is funded by the European Union's Digital 2021 programme under grant agreement No 101083713, the IFB and the MDZ.

Contact

[Contact Form](#)

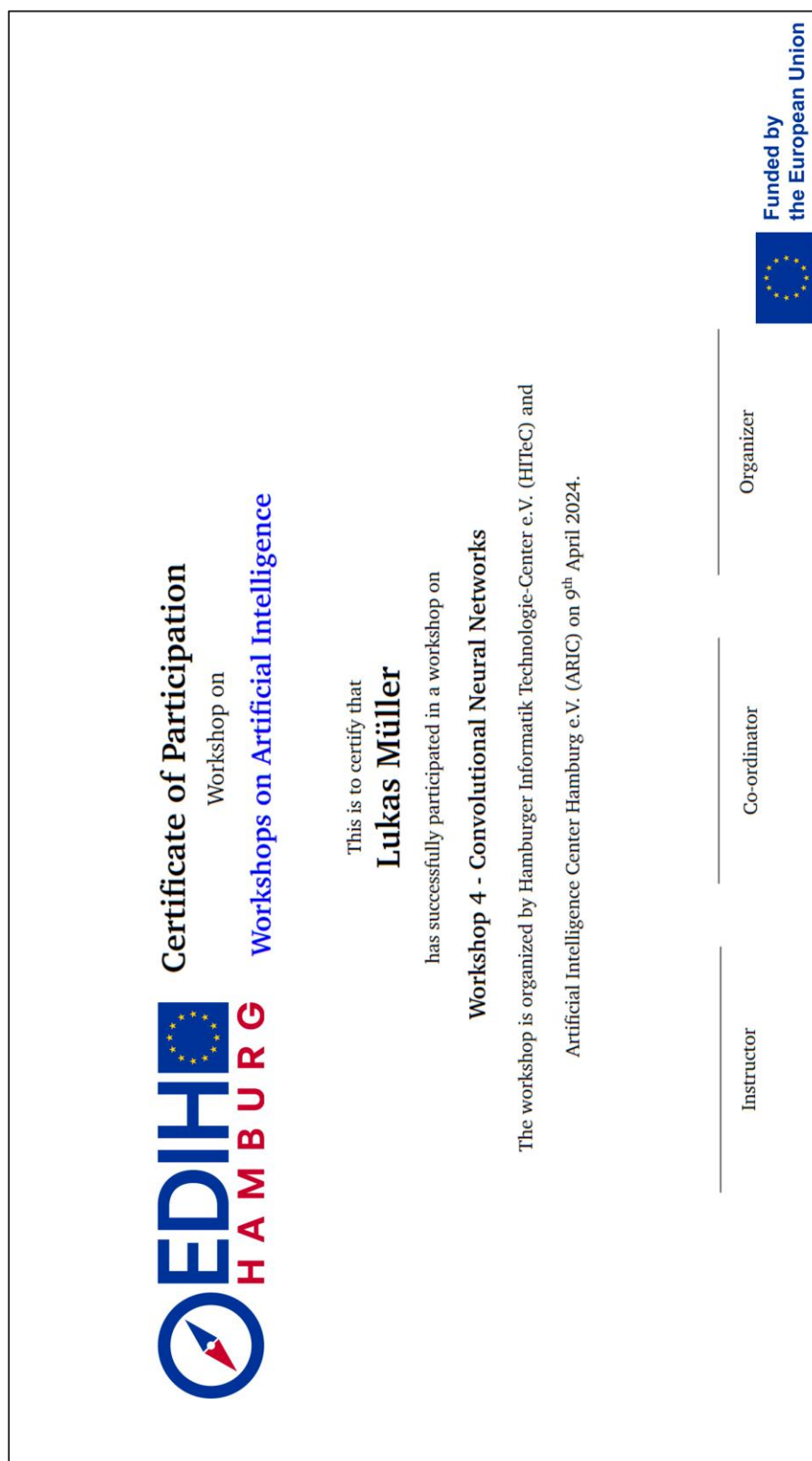
Annex 70. Example of a certificate of attendance issued by *EDIH Academy*

Figure 64: Example certificate for EDIH4UrbanSAVE