



EDIH4UrbanSAVE

Course Content & Methodology – Final Version
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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.

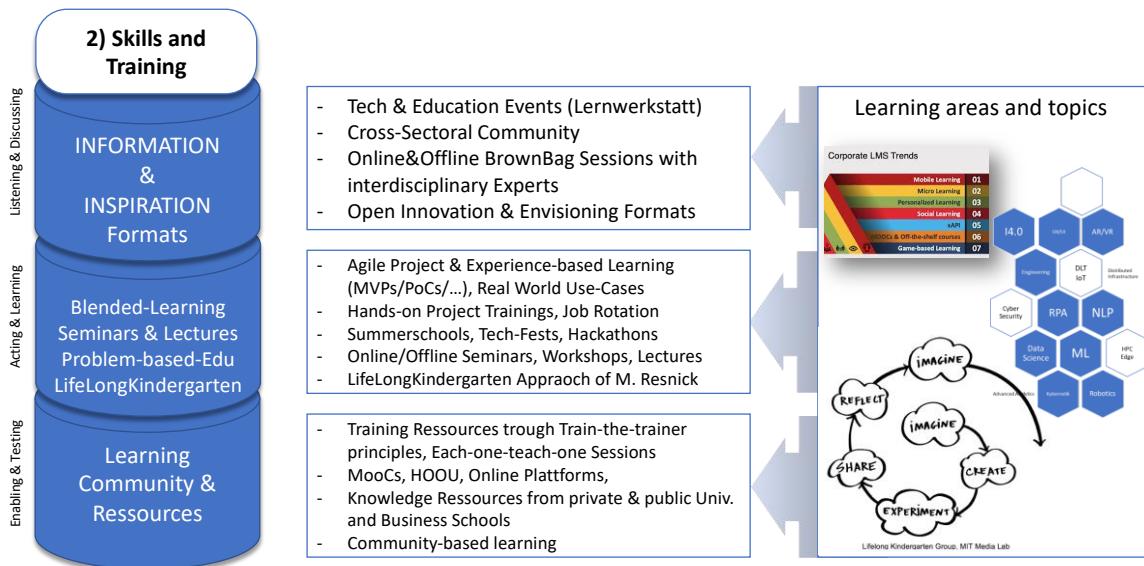


Figure 1: EDIH Hamburg service portfolio for Skills & Training

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
79.	HITeC	An Introduction to web security: authentication and data integrity
80.	HITeC	An Introduction to web security: denial of service and hosting
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
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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
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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
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)	Focused on key technologies: AI	
Format: Webinar			
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 to 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:	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
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
- 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 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. Lichtenhäler, 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 Toolkit: 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-Baqiae, 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.; Schögl, 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 Zwilling. 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 Agiley 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: (planned /in preparation)
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 and 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
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 and 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) Voenky 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 Mehmel, *European AI law explained*.³²
- 6) Alois Krtík, *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=nudNBQLABOQ>, 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/kompleteinsteig-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=2L7R7K1QxyPUa3TYZ22JS2OUkFQdvWlg28bWM0&utm_source=affiliate&utm_medium=Edukatico&utm_campaign=Online%20Tracking%20Link_&utm_content=ONLINE_TRACKING_LINK&irg_wc=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”

	<h3>Overview</h3> <ul style="list-style-type: none">▶ 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
	<h3>Introduction</h3> <h4>What is HPC?</h4> <ul style="list-style-type: none">▶ tautological definition<ul style="list-style-type: none">▶ “You are doing HPC when you are using HPC hardware.”▶ traditional definition<ul style="list-style-type: none">▶ run <i>computer simulations in natural sciences and engineering</i> as fast as possible▶ performance metric: FLOPS or Flop/s (double-precision floating-point operations per second)▶ other performance metrics<ul style="list-style-type: none">▶ time-to-solution▶ time to get a task done▶ search operations per second▶ ...▶ common denominator<ul style="list-style-type: none">▶ powerful hardware

Introduction

HPC software environment

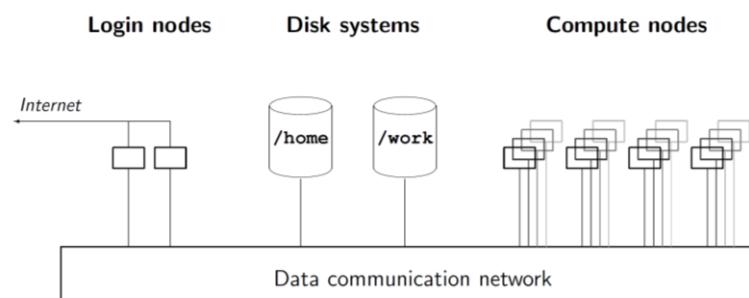
- ▶ the operating system is GNU/Linux
- ▶ interactive access is limited
 - ▶ graphical user interfaces are unusual
 - ▶ the command line has to be used
- ▶ a *batch system* has to be used
 - ▶ batch jobs are being prepared and managed from the command line
 - ▶ batch jobs have to be formulated as shell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

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!

Providers	Authorised Providers	Importers	Deployers (users: e.g. employer, agency, company)	Distributors (those in supply chain who are not providers or importers)
Apple, Microsoft, Google	Google Ireland Limited	aws marketplace	Hugging Face	

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

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

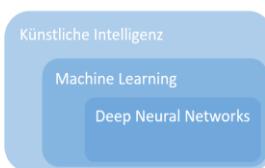
EDIH HAMBURG | IFB HAMBURG | Hamburgische Investitions- und Förderbank | **Funded by the European Union**

Fragen die wir beantworten wollen

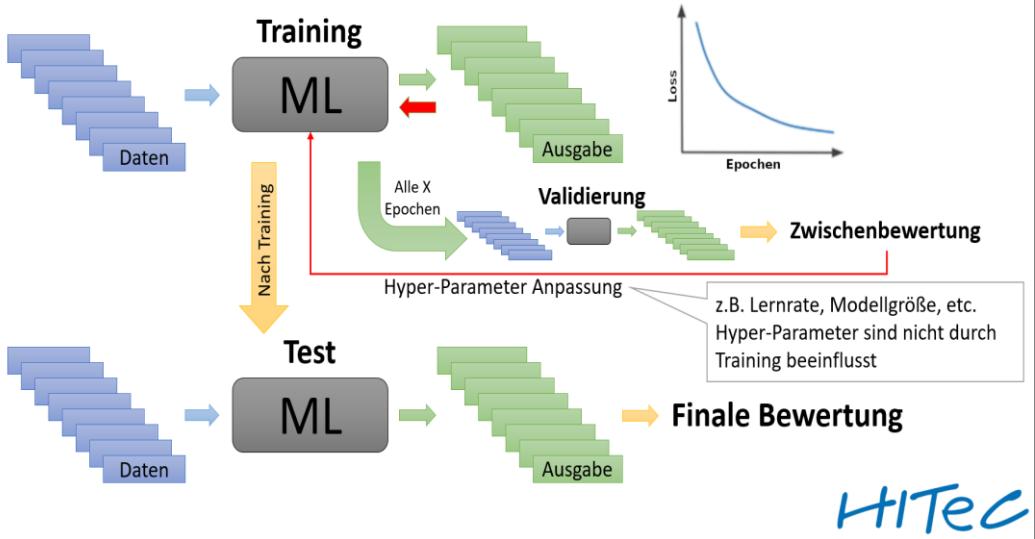
- Begriffe und **Konzepte der KI** verständlich machen
- Was ist datengetriebene KI (a.k.a **Machine Learning**)?
- Wie lernt so eine KI?
- Welche **Probleme** kann sie lösen?
- Welche **Anforderungen** müssen Daten erfüllen?
- Wie kann ein erfolgreiches **KI-Projekt** aussehen?

**HTec****KI ↔ Machine Learning**Machine Learning ist **ein** Gebiet der KI

Machine Learning (ML)= „Datengetriebenes Lernen“

**HTec**

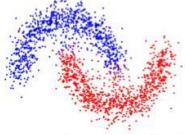
Wie kann ich das Ergebnis evaluieren?



Verschiedene Trainingsmöglichkeiten

Unüberwacht / Unsupervised

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



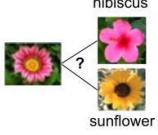
Semi-supervised / Reinforcement Learning

- 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

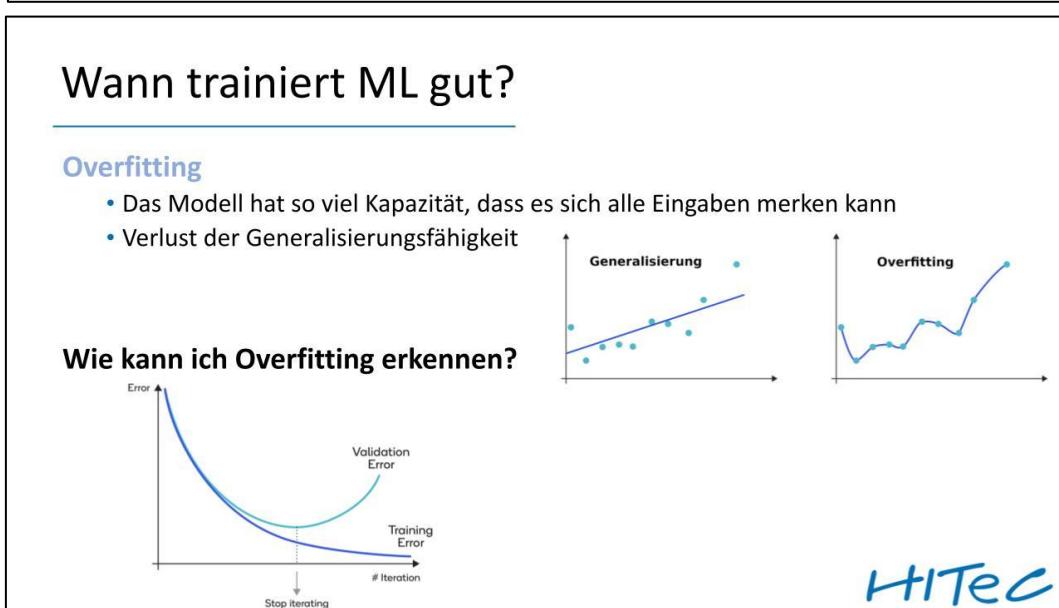
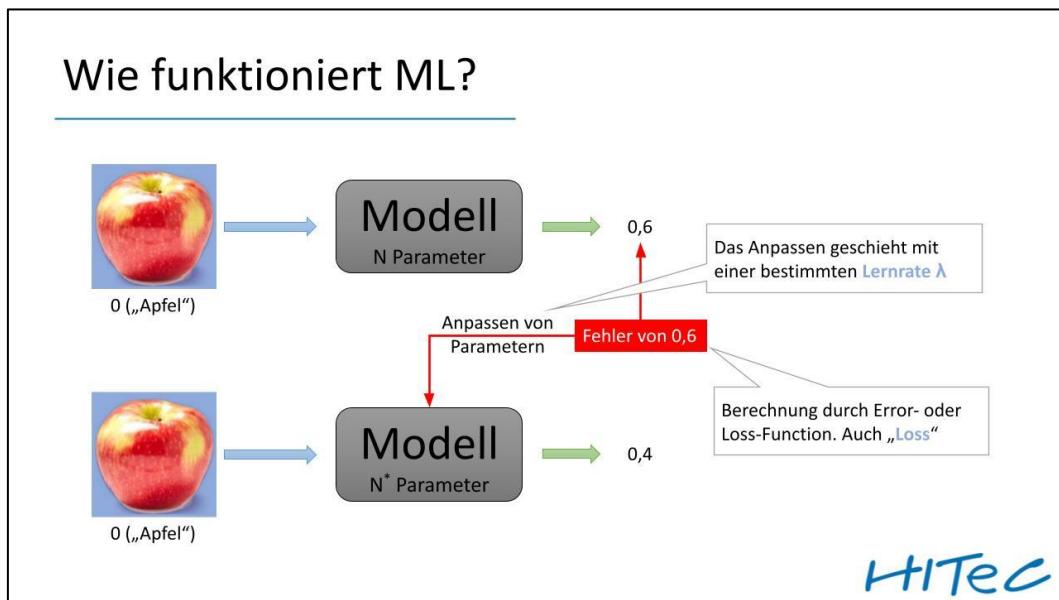
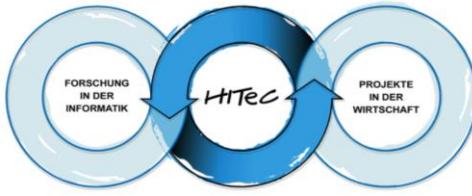


Figure 4: Slide insight into “AI for Deciders”

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



Einführung in Machine Learning

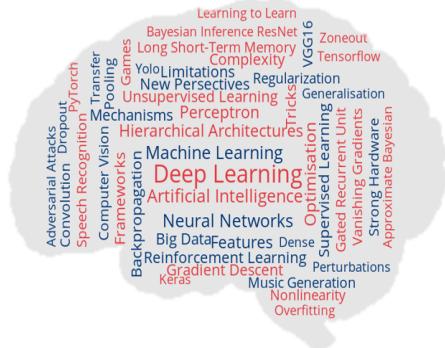
Dr. Sven Magg & Mohammad Zamani





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....

Cell body
Nucleus
Endoplasmic reticulum
Mitochondrion
Dendrite
Dendritic branches
Axon hillock
Axon
Telodendria
Synaptic terminals

SYNAPSE
Axon
Synaptic cleft
Dendrite
Neurotransmitters
Receptor molecules

ca.
10¹⁰- 10¹¹ Nervenzellen
5,8 Millionen km
Nervenbahnen
10¹⁴ Synapsen

HITec

...zum künstlichen Neuron

Das Perzeptron:

Aktivierungsfunktion, z.B.

sigmoid tanh ReLU

$y = f(X \cdot W) = \tanh \left(\sum_{k=1}^n x_k w_k + b_k \right)$

Eingabematrix Gewichtsmatrix Bias

HITec

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 Implementationen für GPUs und Parallelisierung
4. Daten! Viele, viele Daten....

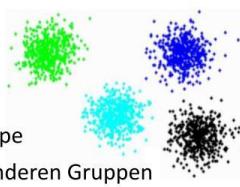
Input: 32x32
S2 E maps: 32x14x14
C3-layer: 120
Fc-layer: 16
Output: Gaussian o

HITec

Was ist Clustering?

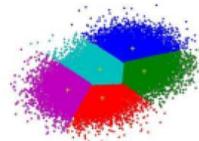
- **Cluster:** Eine Gruppe von Datenobjekten

- 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

HITec

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 ,

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

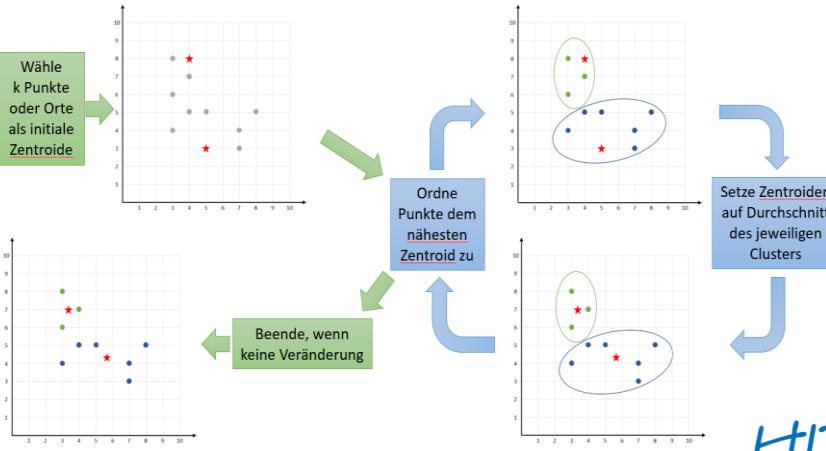
Diagramm zur Formulierung des Gesamtfehlers E aus den quadrierten Distanzen zu den Clusterdurchschnitten m_i :

- Gesamtfehler
- Summe über alle Cluster
- Zahl der Punkte in Cluster i
- Quadrierte Distanz zu Clusterdurchschnitt
- Summe über alle Punkte in Cluster i

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

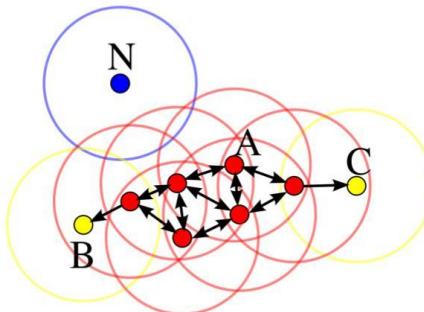
HITec

k-Means Clustering



HITec

DBSCAN - Definitionen



Core Point: Ein Punkt p ist ein Core Point wenn min_samples Punkte innerhalb einer Distanz eps liegen

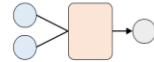
Ein Punkt q ist **erreichbar** von p wenn er innerhalb einer Distanz eps von p liegt, oder ein **erreichbarer Pfad** p_1, \dots, p_n, q existiert (=alle roten & gelben Punkte)

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

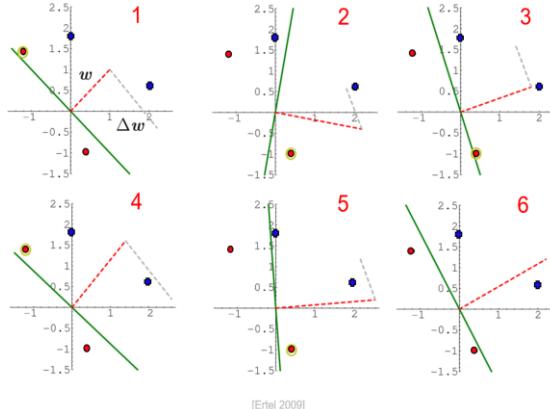
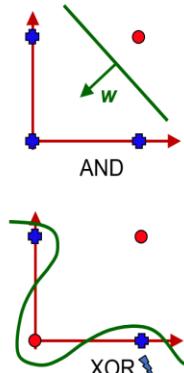
Zwei Punkte p and q sind **Dichte-verbunden** wenn beide von einem dritten Punkt o erreichbar sind.

HiTec

Was kann ein Perzeptron?

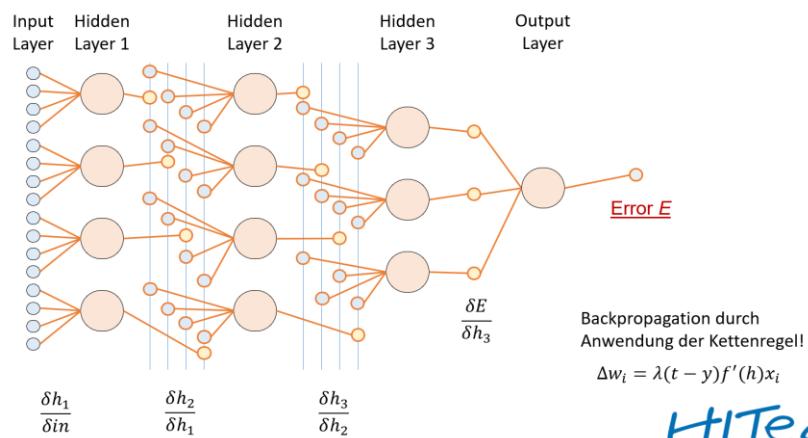


Lineare Klassifikation!



HiTec

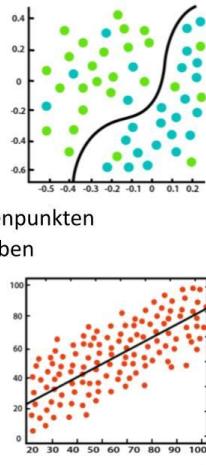
Tiefe Netzwerke - Backpropagation



HiTec

Supervised Learning

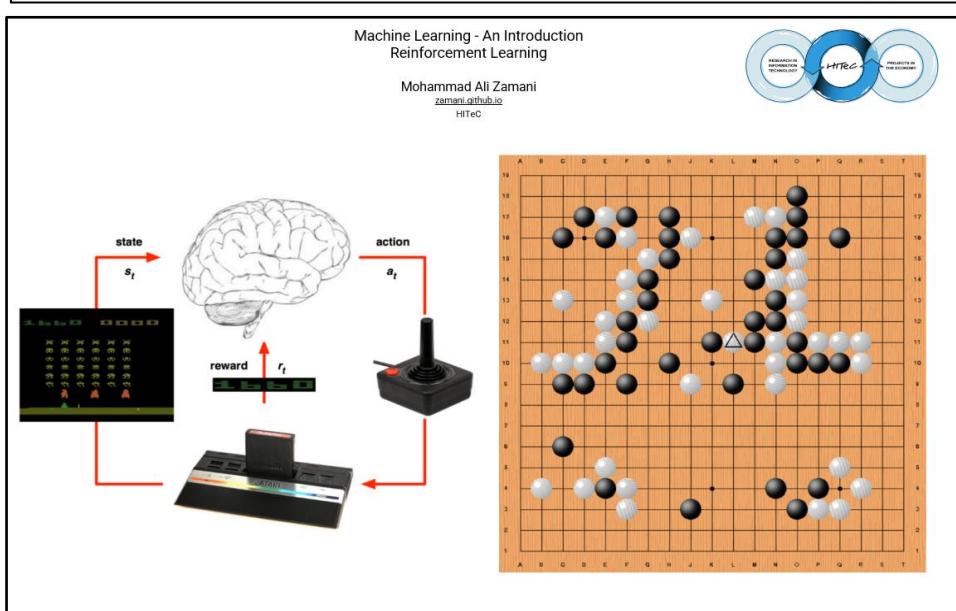
- Datenpunkte sind Paare aus Eingabe und Ausgabe
- Welche Probleme kann ich damit lösen?
 - Klassifikation: Zuordnen von „Labels“ zu ungewissen Datenpunkten
 - Regression: Vorhersage von Ausgabewerten für neue Eingaben
 - Transkription: Unstrukturiert -> Text (Spracherkennung)
 - Übersetzen: Sequenzen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



HiTec

Machine Learning - An Introduction
Reinforcement Learning

Mohammed Ali Zamani
zamani.github.io
HiTec



Supervised Learning	Unsupervised Learning	Reinforcement Learning
<p>Given</p> <p>(x, y) input ↗ label</p> <p>① help → $\begin{array}{cc} x_1 & x_2 \\ 38 & 90 \\ 35 & 95 \\ 365 & 93 \end{array}$ ② Passive</p> <p>Approach $\hat{y} = f_w(x)$ e.g. $\hat{y} = w_1x_1 + x_2x_2 + w$</p> <p>Goal: $\min_w \text{LOSS}$ w given $(x, y)_i$</p> $L = \frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2$	<p>x input ↗</p> <p>① independent ② Passive</p> <p>$x \rightarrow \hat{c}$</p>	<p>(S, A, R)</p> <p>① reward instead of S</p> <p>② Active</p> <p>$S \xrightarrow{t_1} (0, 0) \uparrow$ $t_2 \xrightarrow{S} (0, 1) \uparrow$</p> <p>- notion of time</p> <p>$S \xrightarrow{R} A \xrightarrow{\text{env}} \text{Agent}$</p> <p>max Expected reward in the future</p>

Online oder Batch Learning?

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

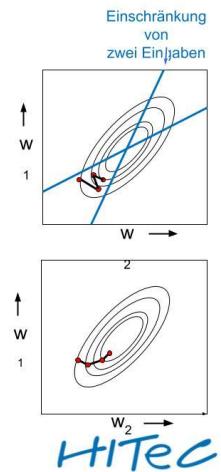


Figure 5: Slide insight into “*An introduction to Machine Learning*”

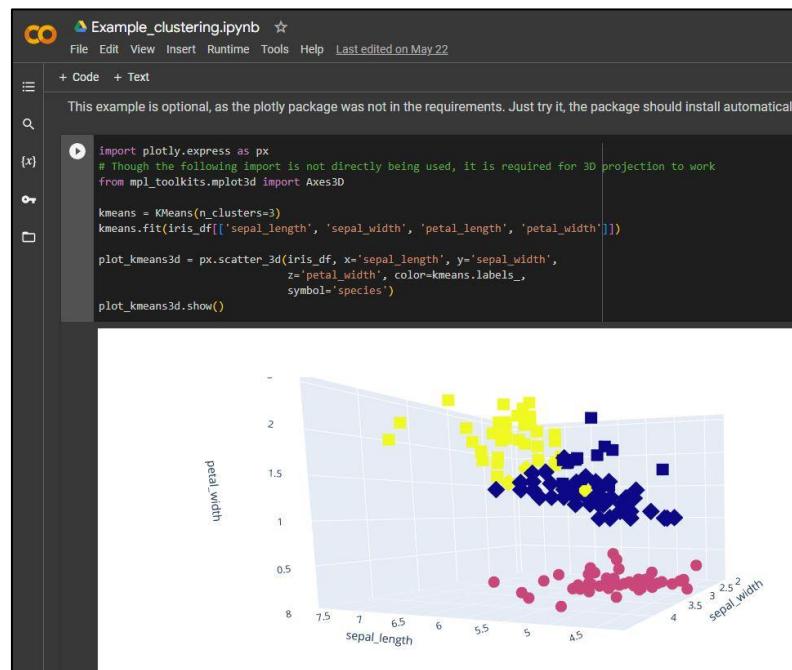
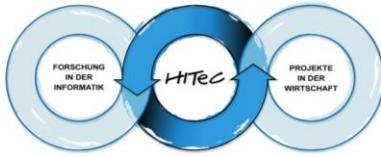


Figure 6: Insights in practical session of workshop

Annex 5. Overview slides for “Convolutional Neural Networks”



Convolutional Neural Networks

Mohammad Zamani

EDIH HAMBURG IFB HAMBURG | Hamburgische Investitions- und Förderbank  Funded by the European Union

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:

- featur 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:

Image \rightarrow NN \rightarrow cat, dog, horse \rightarrow Softmax \rightarrow $S(x_i) = \frac{e^{x_i}}{\sum_j e^{x_j}}$

Graph of the softmax function $S(x)$ showing a decreasing curve from 1 to 0 as x increases from 0 to 1.

Image	cat	dog	horse	Softmax Output	Loss
	0.71	0.26	0.04	$L(0.71) = -\ln(0.71) = 0.34$	
	0.02	0.00	0.98	$L(0.98) = -\ln(0.98) = 0.02$	
	0.49	0.49	0.02	$L(0.49) = 0.71$ lower confidence unhappy	

Pooling

reducing features

max-pooling , avg-pooling

maxpooling (2)

Regression

```
loss = ... torch.nn. ...
loss(outputs, labels)
```

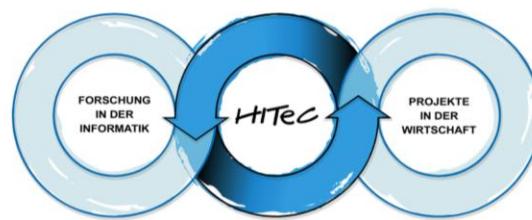
- Mean Absolute error
`torch.nn.L1Loss()`
- Mean Squared Error
`torch.nn.MSELoss()`
- Huber Loss
`torch.nn.SmoothL1Loss()`

<https://www.evergreeninnovations.co/blog-machine-learning-loss-functions/>



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

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



AutoML and Hyperparameter Optimisation

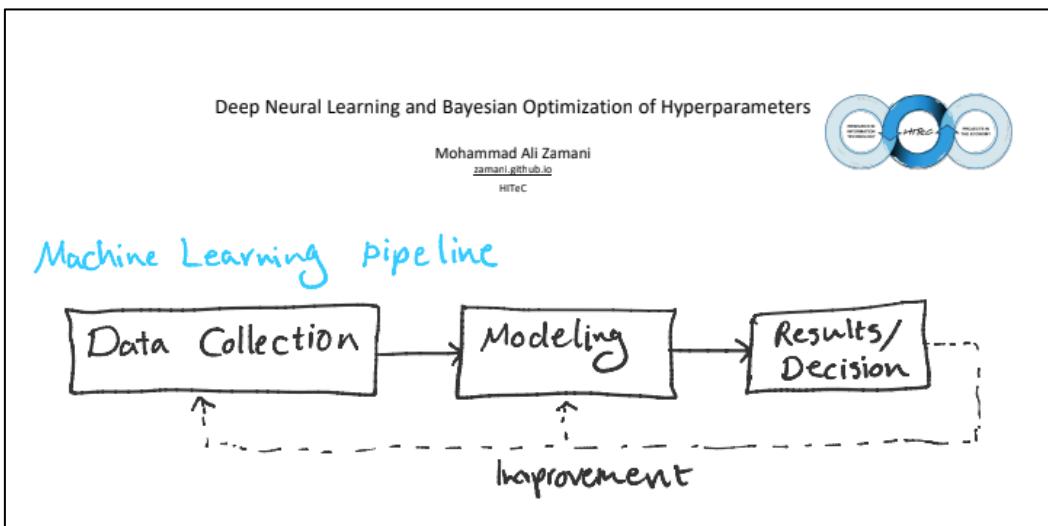
Mohammad Zamani



Hamburgische
Investitions- und
Förderbank



Funded by
the European Union



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

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

$\left\{ \begin{array}{l} f \text{ unknown} \rightarrow \text{only evaluation} \\ \text{expensive evaluation} \\ \text{noisy} \end{array} \right.$

In our case \rightarrow loss function

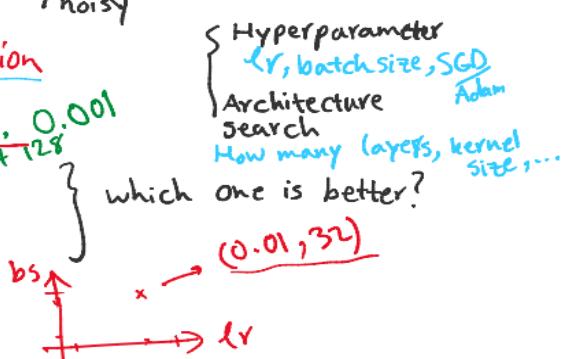
How?
1- Grid Search

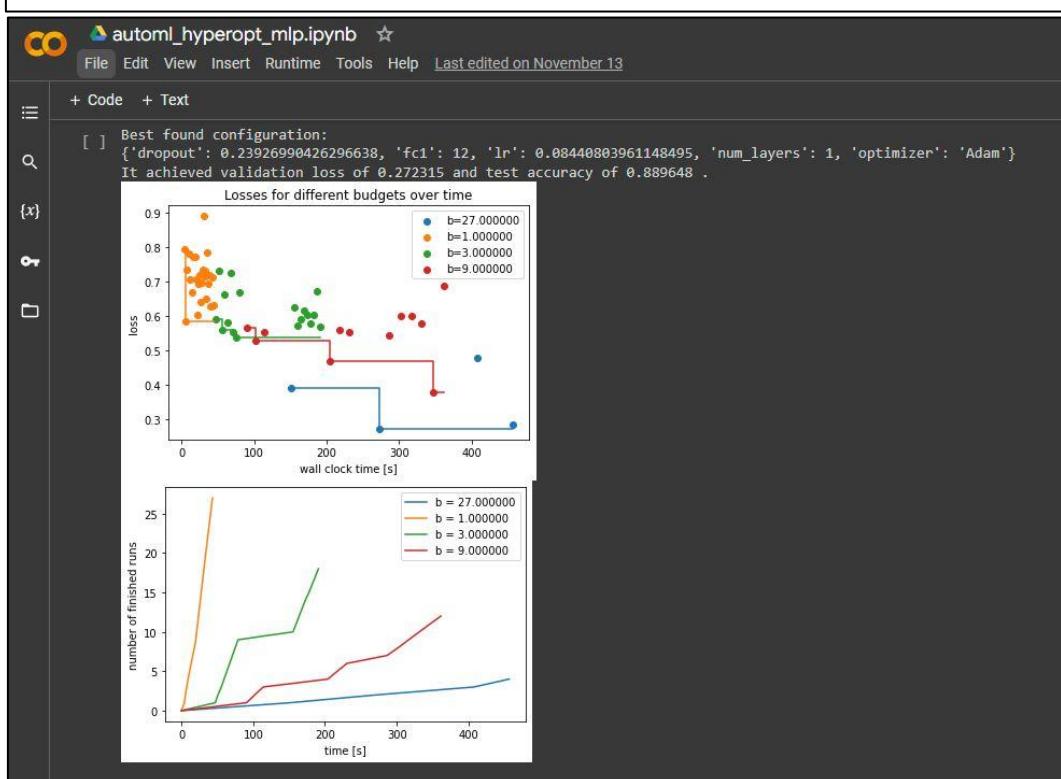
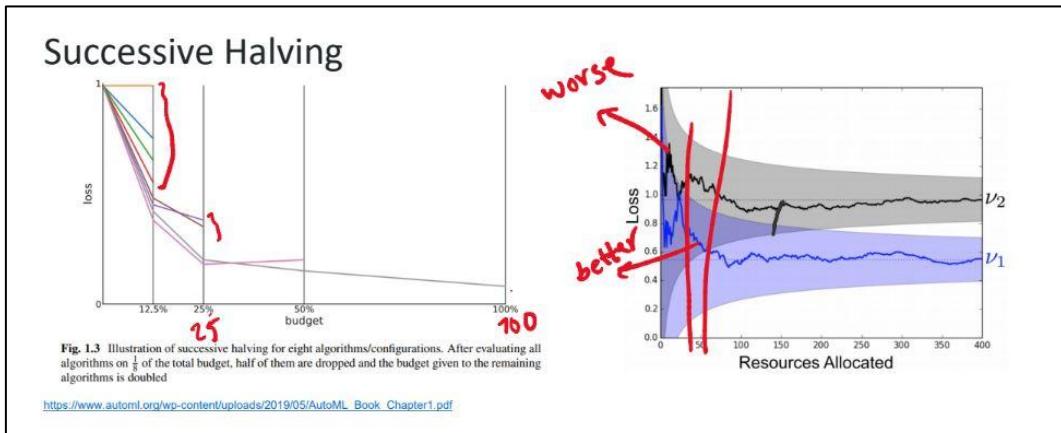
~~vs~~ ~~1, 16, 32, 64, 128~~
0.1, 0.05, 0.001

A lot of evaluations

2- Random Search

Good benchmark





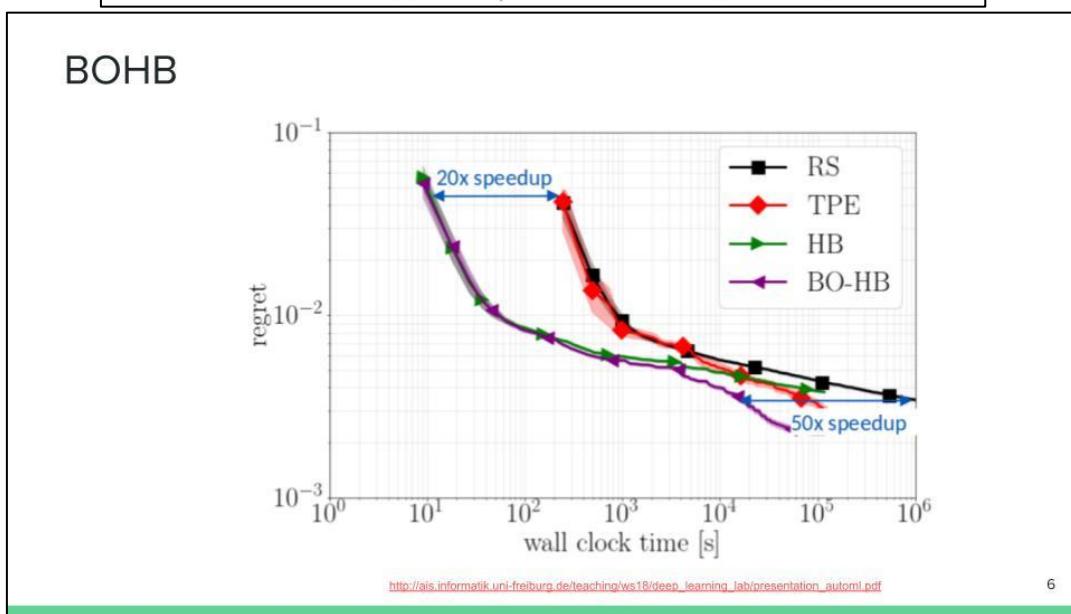
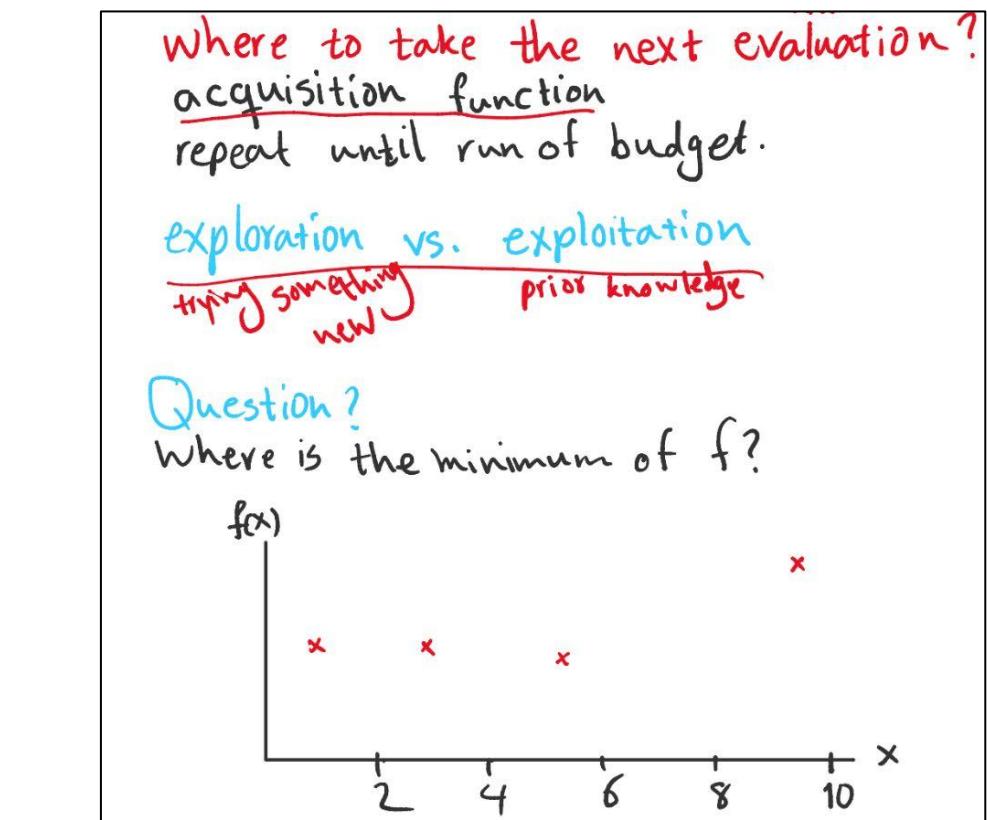
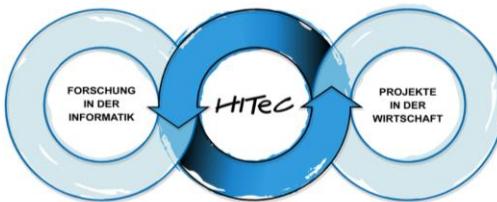


Figure 8: Glimpse into “AutoML and Hyperparameter Optimisation”,
workshop with accompanying live development

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

Embedded AI

Mohammad Al Zamani

EDIH HAMBURG

IFB HAMBURG | Hamburgische Investitions- und Förderbank

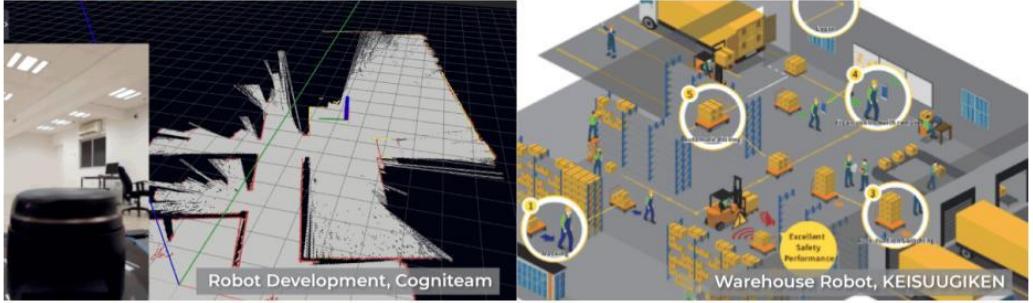
 Funded by the European Union

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>

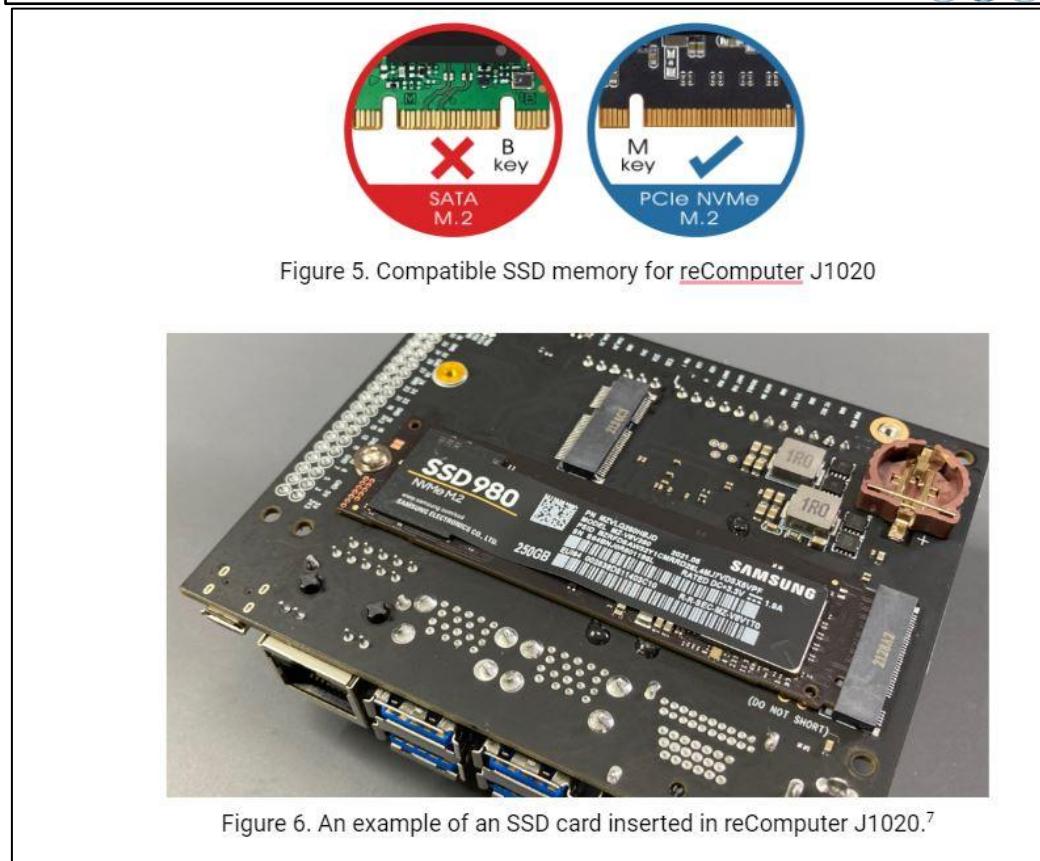
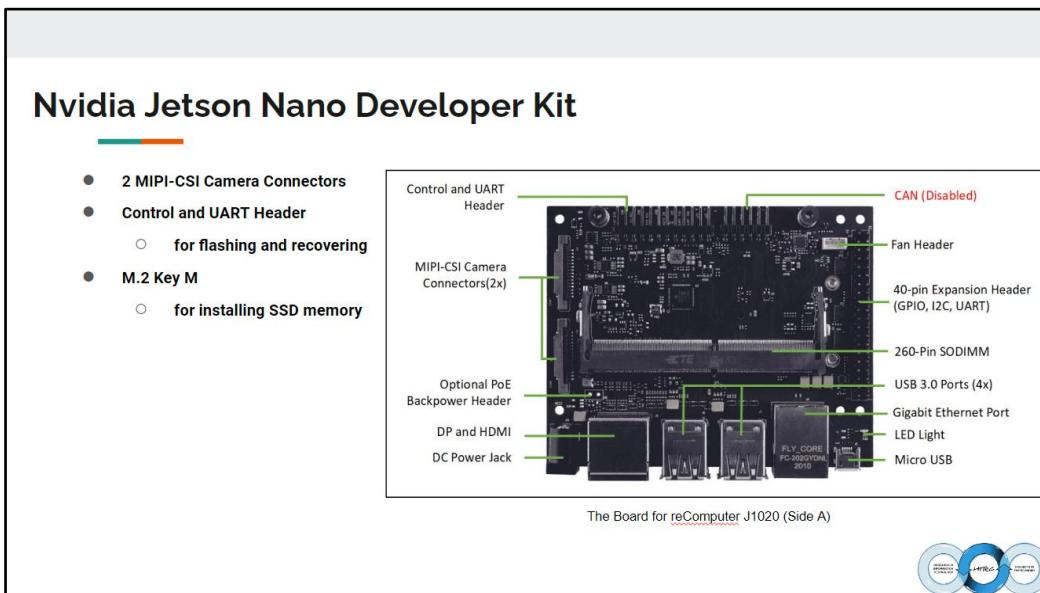


Applications



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





Nvidia Jetson Nano Developer Kit

- 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.

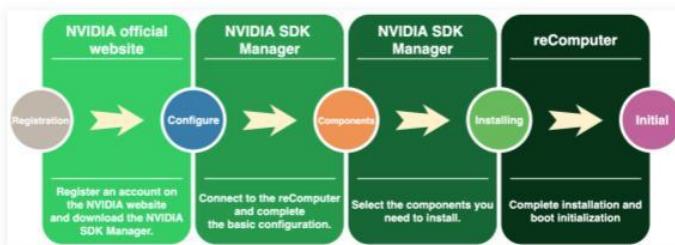


Figure 11. Overall Steps for flashing Nvidia Jetson



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

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



Praktische Perspektive

- Was ist möglich?
- Wie geht das?
- Wie funktioniert das?*

* Technische Details werden verkürzt dargestellt. Es geht um die Anwendung und Möglichkeiten der Technologie, nicht um die Theorie dahinter.

HiTec



Generative AI
Bildgenerierung mit Stable Diffusion

Matthias Kerzel
matthias.kerzel@hitec-hamburg.de

EDIH HAMBURG Funded by the European Union

HiTec

Überblick

- 1) Bildgenerierung mit Stable Diffusion
- 2) Promt-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?

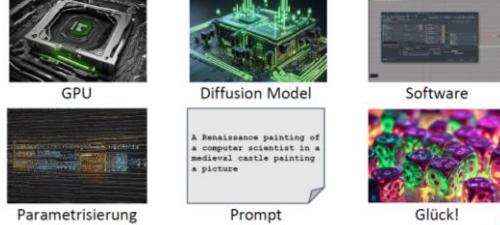
HiTec

Ein Bild Generieren - Vom Prompt zum Bild



HiTec

Ein Bild Generieren - Was brauche ich dazu



Glück! **HiTec**

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

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

 **Funded by**
the European Union

IFB  **HAMBURG** | Hamburgerische
Investitions- und
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

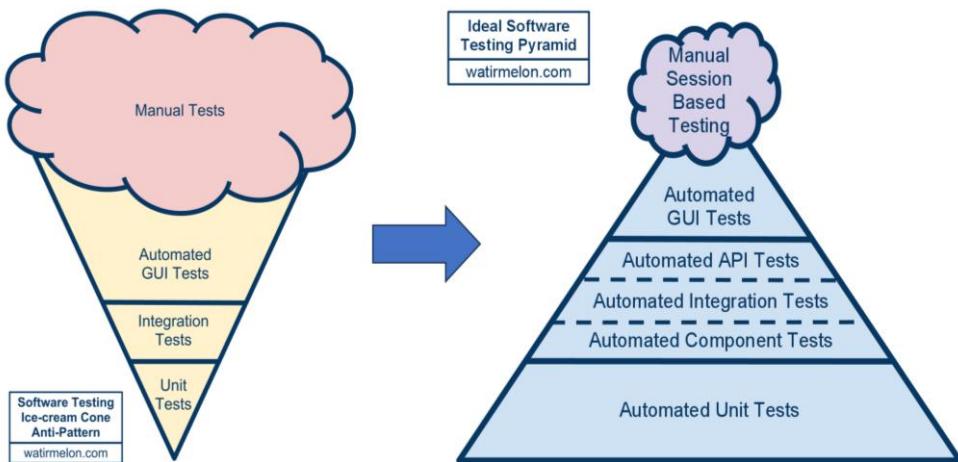
Relationship Between Quality And Costs

- 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.

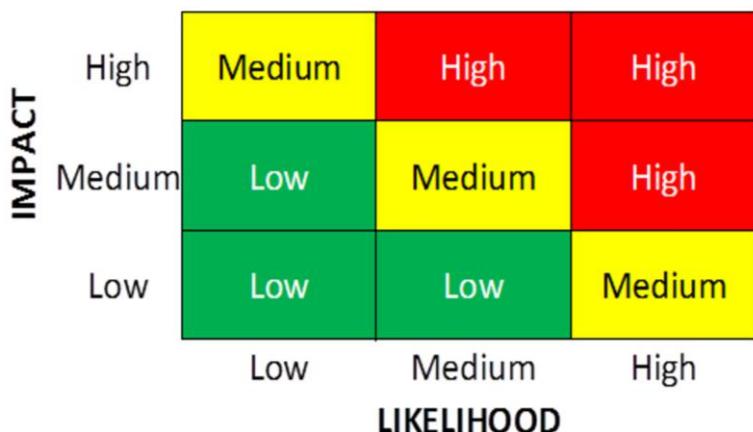


Source: N., Santhosh & REGO, ANIL & Sunil, Ganapathy & NAIK, SACHIN & Gowda, Ashwin & PATIL, SACHIN. (2018). Evaluation of defect correlations with quality, delivery and cost. International Journal of Mechanical and Materials Engineering, 6, 472-484.

Testing Model: From Ice-Cream to Pyramid



Risk-based Testing



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

Continuous Testing

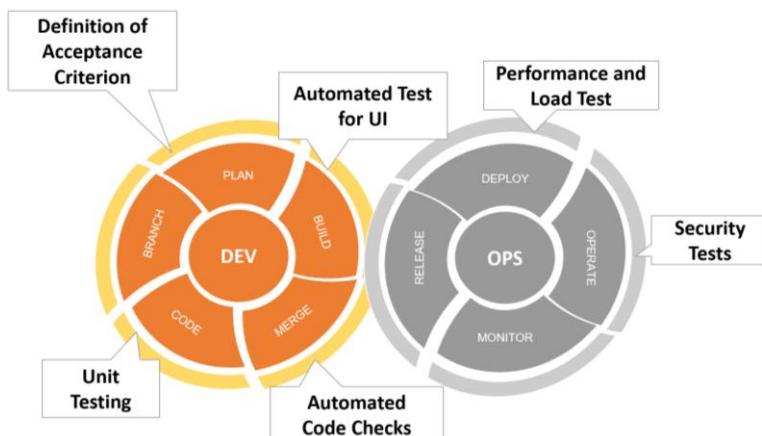


Figure 11: Overview slides of “Test management” lecture

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

The image shows three vertically stacked presentation slides. Each slide has a white background with a dark blue horizontal bar near the top. The top slide is titled 'Enabling the realization of own innovations' and 'Use case definition and development'. The middle slide is titled 'Overview' and lists various topics with sub-points. The bottom slide is titled 'Ermöglichen der Realisierung von eigenen Innovationen' and 'Use case definition and development'. All three slides include logos for EDIH Hamburg, HITec, and IFB Hamburg, along with a 'Funded by the European Union' logo.

Enabling the realization of own innovations
Use case definition and development

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

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



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

October 30, 2024

Anum Talpur | HITEC Workshop

2

Recent Attack Reports

March 2024

June 2024

Anum Talpur | HITEC Workshop

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 | HIITC 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*”



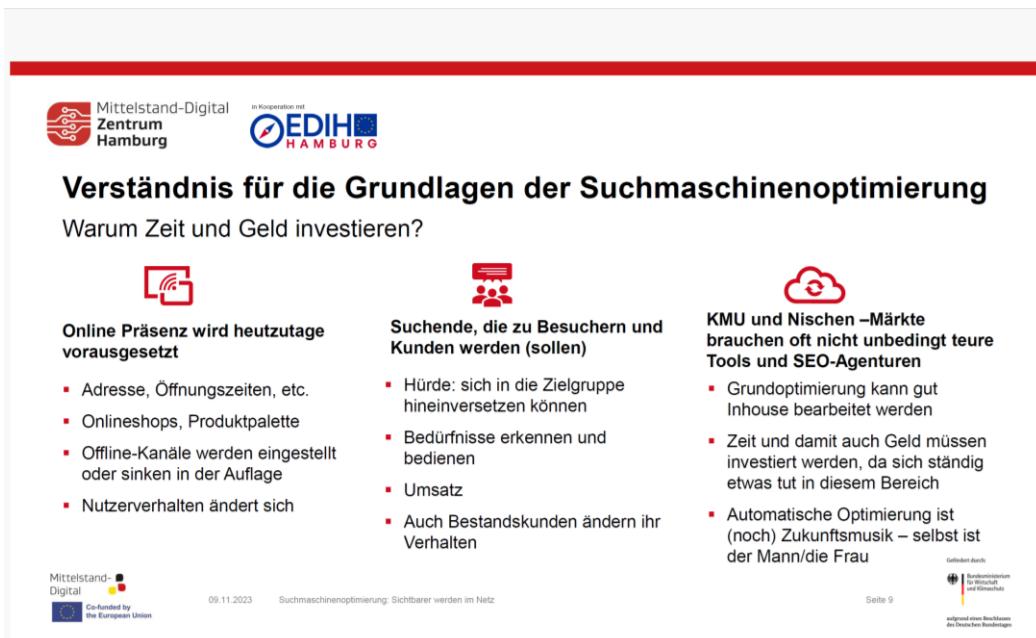


Figure 15: Insights in slides of “Search engine optimization”

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



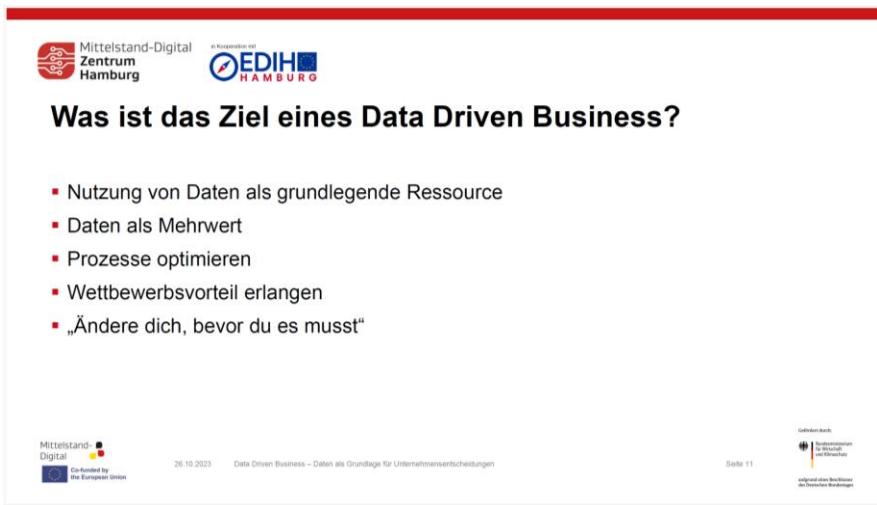


Figure 16: Slide insights in “Data Driven Business”

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





Figure 17: Introduction slides of “Digitalization of intralogistics”

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

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

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

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?

Erfolg im Digitalzeitalter: Daten erkennen, verstehen und nutzen

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)

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#>

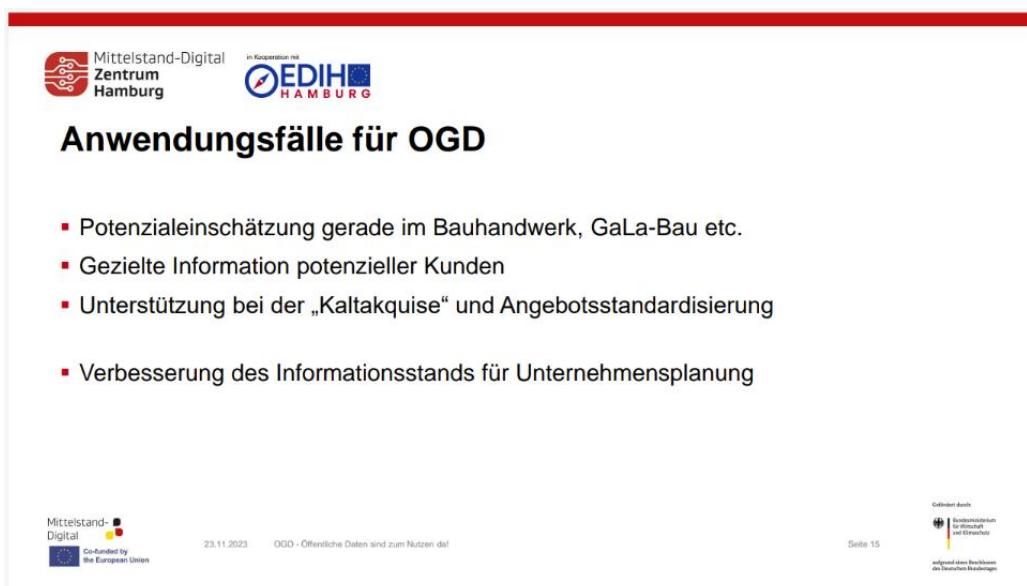


Figure 18: Introduction slides of OGD

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





Agenda

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

II. Ausgangssituation



II. Ausgangssituation

Digital Index nach Unternehmensgröße (IW Consult 2018)

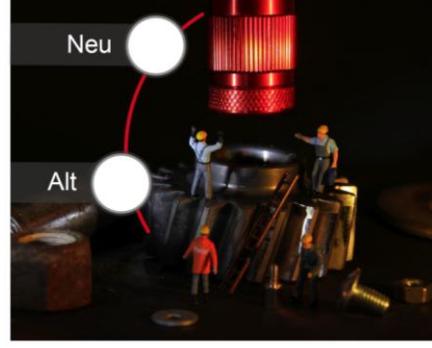




III. Retrofit

Was ist das?

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





III. Retrofit



Identifikation



Identifikation
Speicherplatz



Identifikation
Speicherplatz
Datenverarbeitung



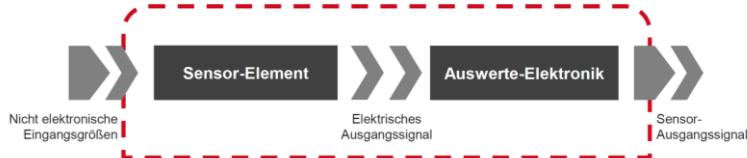
Identifikation
Speicherplatz
Datenverarbeitung
Kommunikation

Klassen intelligenter Systeme



III. Retrofit

Sensoren sind Elemente zur Erfassung der Messgrößen der Umwelt



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

Seite 11

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

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

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

The slide has a red header bar. Logos for 'Mittelstand-Digital' and 'EDIH HAMBURG' are at the top left. A yellow box in the center contains a line graph showing a Weibull distribution curve. The main title 'II. Weibull-Analyse' is in large white font. Below it is a bulleted list of advantages of Weibull analysis. The slide footer includes logos for 'Co-funded by the European Union', 'Gefördert durch: Bundesministerium für Wirtschaft und Klimaschutz', and 'aufgrund eines Beschlusses des Deutschen Bundestages'.

II. Weibull-Analyse

Interpretation Beta

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

III. Weibull-Tool

Weibull Analysen selber durchführen
mit dem Excel Tool

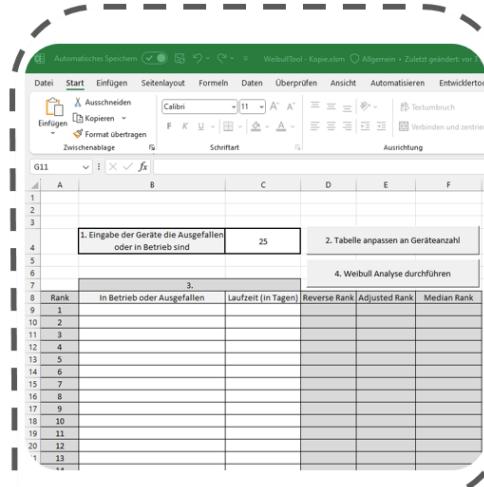


Figure 20: Overview slides of “Creating customer favourites”

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



Meta Horizon Worlds

Quelle: <https://www.facebook.com/photo.php?fbid=1011462539809351>

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

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

Gartner Hype Cycle VRAR

Quellen:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years

<https://www.gartner.com/en/pressroom/press-releases/2015-08-18-gartners-2015-hype-cycle-for-emerging-technologies-identifies-the-computing-innovations-that-organizations-should-monitor>

<https://www.gartner.com/smarterwithgartner/top-trends-in-the-gartner-hype-cycle-for-emerging-technologies-2017>

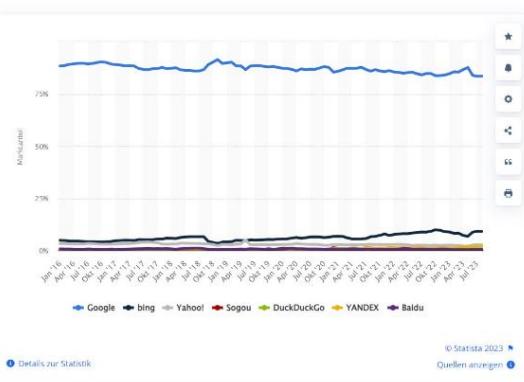
<https://www.gartner.com/en/newsroom/press-releases/2018-08-20-gartner-identifies-five-emerging-technology-trends-that-will-blur-the-lines-between-human-and-machine>

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

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



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



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 verstößen (bei angemessener Nutzung) nicht gegen die Richtlinien

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

Wer ist schlussendlich der Autor?



12.11.2024 Digitale Wege, reale Ziele



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

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

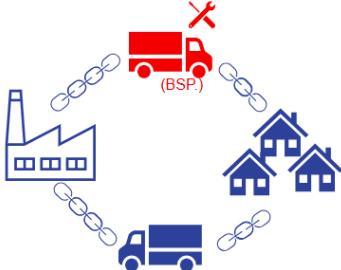


Supply Chain Risk Management

Mit Risiken in Supply Chains richtig umgehen



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

Mittelstand-Digital Zentrum Hamburg

10.11.2024

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

Seite 6

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 (LkSG 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 Mindestarbeitenehmeranzahl auf 1.000.

Mittelstand-Digital Zentrum Hamburg

10.11.2024

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

Seite 8

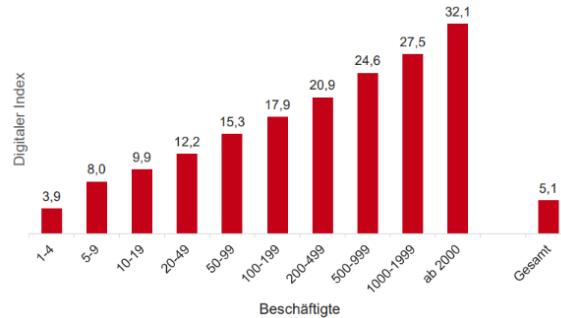


Figure 23: Overview slides of “Addressing Supply Chain Risks with SCRM”

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

II. Ausgangssituation

Digital Index nach Unternehmensgröße (IW Consult 2018)



Getönt durch:
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und Klimaschutz
aufgrund eines Beschlusses
des Deutschen Bundestags

Seite 9

III. Retrofit

Klassen intelligenter Systeme



Identifikation

Identifikation
SpeicherplatzIdentifikation
Speicherplatz
DatenverarbeitungIdentifikation
Speicherplatz
Datenverarbeitung
Kommunikation

Mittelstand-
Digital

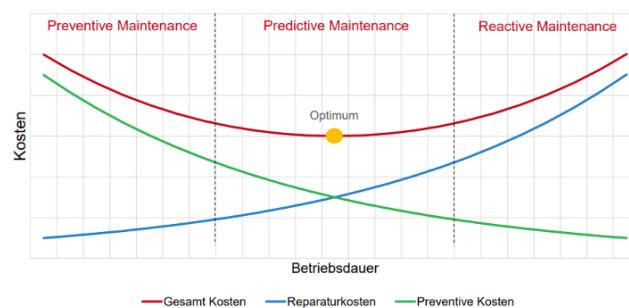
Aus alt macht neu: Wie können Maschinen günstig digitalisiert werden?

Seite 11

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und Klimaschutz
aufgrund eines Beschlusses
des Deutschen Bundestags

III. Retrofit

Predictive Maintenance



Mittelstand-
Digital

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

Seite 15

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und Klimaschutz
aufgrund eines Beschlusses
des Deutschen Bundestags

Figure 24: Overview slides "Production of the future"

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



Mittelstand-Digital

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Bundesministerium
für Wirtschaft
und Klimaschutz
aufgrund eines Beschlusses
des Deutschen Bundestages

Mittelstand-Digital
Zentrum
Hamburg

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	40716543209
3	Jane	Dorsey	MediCare	Medical Engineer	11 Crown Street	j dorsey@mc.com	40791245621
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	derrick@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	m norton@aperture.us	40731254562
10	Stacy	Shelby	TechDev	HR Manager	19 Pineapple Boulevard	s shelby@techdev.com	40741785214
11	Lara	Palmer	Timepath Inc.	Programmer	87 Orange Street	l palmer@timepath.co.uk	40731653845

First Name	Company Name	Role in Company
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
SUBMIT		

Mittelstand-Digital

08.11.2024

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



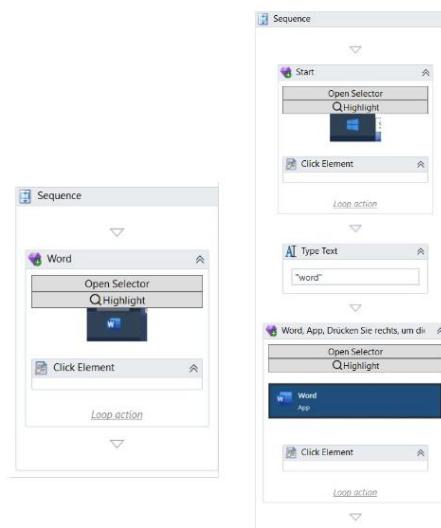
Wie funktioniert RPA?

Technische Umsetzung

- (technische) Selektoren
- Screen Scraping
- OCR
- Web Scraping
- HTML-Tags `<a>`, `<input>`, `<h2>`
- XML
- JSON
- Betriebssystem

```

        .auto-form-login--" data="grid-col-4" style="margin-bottom: 10px;">
            
            
            
            
        
```



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Seite 17

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RPA und Künstliche Intelligenz

Integration in Unternehmensprozesse

- Einsatz von KI-gesteuerten Robotern für präzise Prozessunterstützung
 - Immobilienbewertung, Kreditausfall Prognose
- Einsatz von KI-gesteuerten Robotern für hochvariable Prozesse
 - Lebenslauf-Matching
 - Kaufentscheidung
- Verarbeitung unstrukturierter Daten
 - Rechnungsextraktion
 - Sprachverarbeitung

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on/ai-and

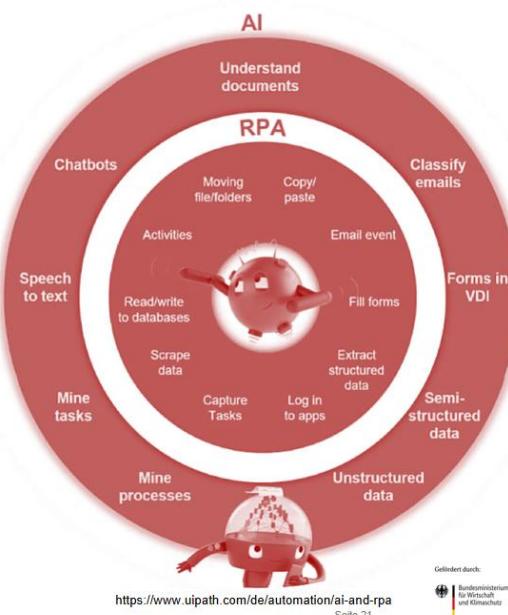


Figure 25: Overview slides of “Digital assistance”

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

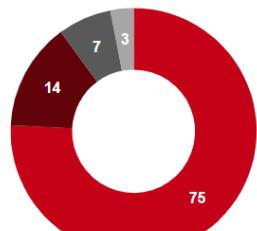
Agenda

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

Quelle: ifo Konjunkturumfrage, Oktober 2022.

II. Ausgangslage

Energieeffizienz

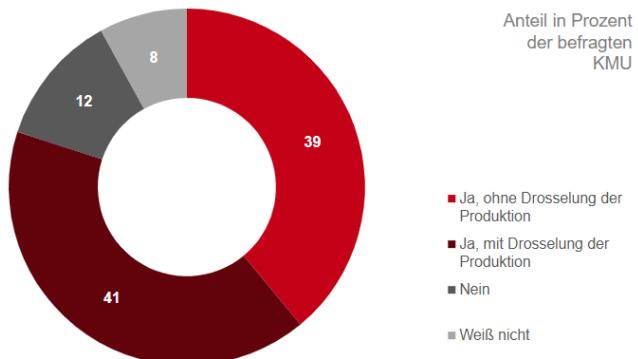


UMGESETZTE MAßNAHMEN, UM ERDGAS ZU SPAREN (MÄRZ 2022 - SEPTEMBER 2022)

Minderungen des Erdgasverbrauchs im Produktionsprozess im Verarbeitenden Gewerbe

Aus Alt mach Neu – Verbesserung der Energiebilanz

WEITERE GEPLANTE MAßNAHMEN, UM ERDGAS ZU SPAREN (OKTOBER 2022 - MÄRZ 2023)



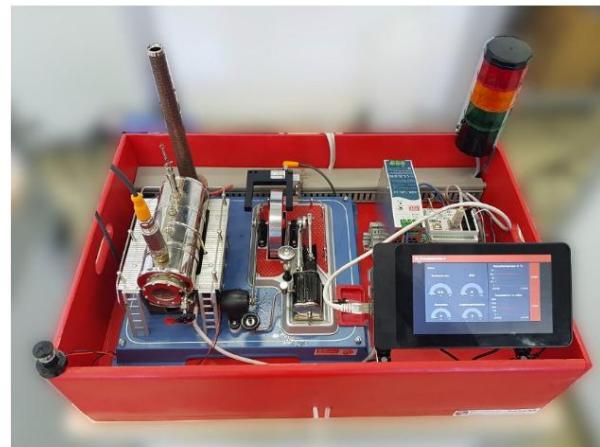
- Ja, ohne Drosselung der Produktion
- Ja, mit Drosselung der Produktion
- Nein

■ Weiß nicht

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)



Aus Alt mach Neu – Verbesserung der Energiebilanz

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

Mittelstand-Digital

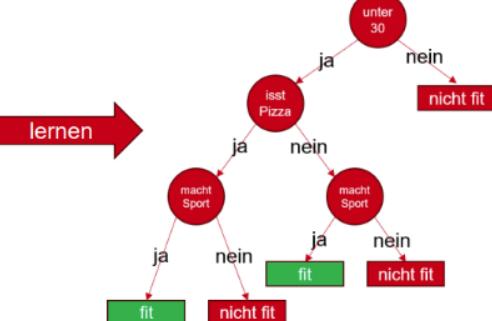
Thomas Rosin

Gefördert durch:

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



Mittelstand-Digital

08.02.2024 Thomas Rosin - Vom Datenschutz zum Datennutz

Gefördert durch:

Seite 9



Einige wichtige Grundlagen im Datenschutz

Rechtmäßigkeit
(Verbot mit Erlaubnisvorbehalt)

Zweckbindung

Erforderlichkeit

Datensparsamkeit

Transparenz
(z. B. Informationspflichten)

Kontrolle
(Betroffenenrechte)



5 best practices



- I. Transparenz bei Zielen und Daten schaffen
- II. Transparenz in der Technik schaffen
- III. Datenschutz als funktionale Anforderungen
- IV. Datenschutz-Folgenabschätzung
- V. Maßnahmen zur regelmäßigen Überprüfung

Figure 27: Overview slides of “Datenschutz zum Datennutz”

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



This slide is a continuation of the previous one, showing the 'Trainingsdatenerzeugung Pipeline'. It includes logos for 'Mittelstand-Digital Zentrum Hamburg' and 'in Kooperation mit EDIH HAMBURG'. The title 'Trainingsdatenerzeugung Pipeline' is in large bold font. A bulleted list details the data acquisition process: 'Datenbeschaffung durch existierendes Qualitätskontrollsysteem' and 'Softwaregestütztes Labeling durch Experten'. Below this, the 'Herausforderung' section lists 'Heterogenität der Daten' and 'Menschliches Verhalten / Definition „NG“ / „OK“'. To the right, there is a screenshot of a software interface titled 'PyQ3 - Annotation tool for assigning image classes', showing three image thumbnails and a detailed view of one image with a bounding box.

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

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

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

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

Leitfaden zu KI-generierten Inhalten

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

Was ist gerade schlussendlich der deutsche Autor?	Wer ist gerade schlussendlich der deutsche Autor?	KI-Inhalte verstößen (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
--	--	--	--	--

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

Seite 6

The image shows two slides from a presentation. The top slide is titled 'KI für Keyword-Recherche' (AI for Keyword Research) and features three main sections: 'PERSONA ERSTELLEN' (Personas Create) with a woman in a floral wreath, 'KI für Keyword-Recherche' (AI for Keyword Research) with a magnifying glass over a grid of icons, and 'IDEEN SAMMELN' (Ideas Collect) with a colorful bookshelf. The bottom slide is titled 'Keywords – Ideen sammeln' (Keywords – Ideas Collect) and contains a list of tips for keyword research, accompanied by a colorful illustration of a library.

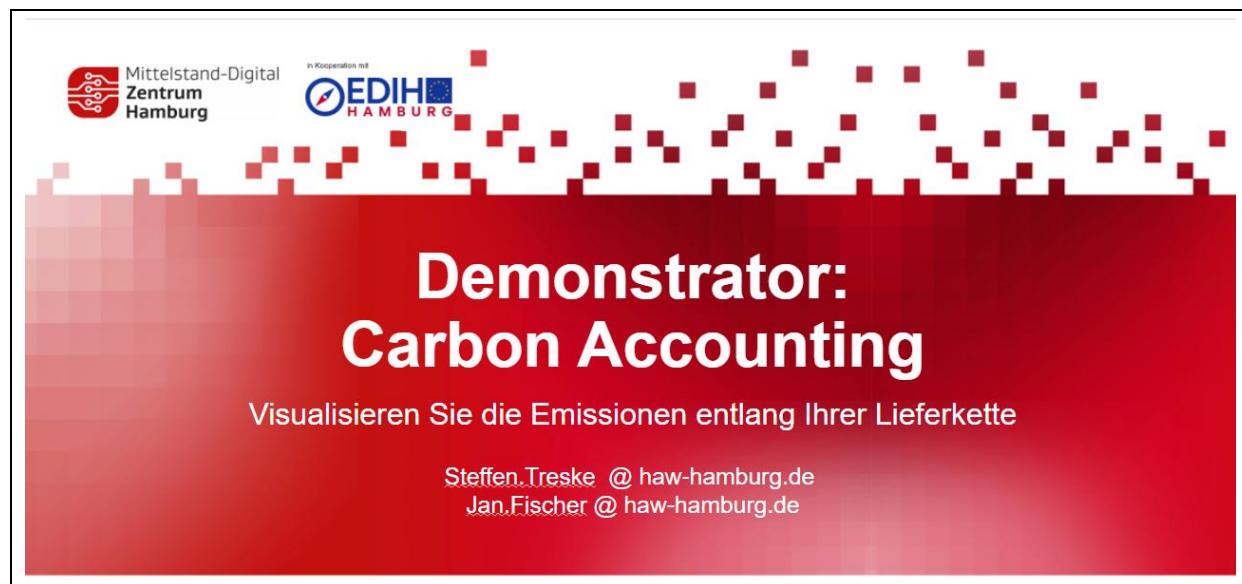
Slide 1: KI für Keyword-Recherche

- PERSONA ERSTELLEN**
- KI für Keyword-Recherche**
- IDEEN SAMMELN**

Slide 2: 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.

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

Annex 30. Overview slides for “*CARVIS*”

Demonstrator:
Carbon Accounting

Visualisieren Sie die Emissionen entlang Ihrer Lieferkette

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

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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*”


Mittelstand-Digital Zentrum Hamburg in Kooperation mit EDIH HAMBURG

Suchmaschinenoptimierung: Sichtbarer werden im Netz

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

Mittelstand-Digital Co-funded by the European Union

Getragen 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

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In Kooperation mit


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



09.11.2023 Suchmaschinenoptimierung: Sichtbarer werden im Netz.

Getragen durch:

unterstützt von:


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



09.11.2023 Suchmaschinenoptimierung: Sichtbarer werden im Netz.

Getragen durch:

unterstützt von:


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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PyQDS - Annotation tool for assigning image classes

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

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

Select a model: learner-densenet161-2...

Upload one or more images!

Drag and Drop or Select Files

Start Prediction

Filename

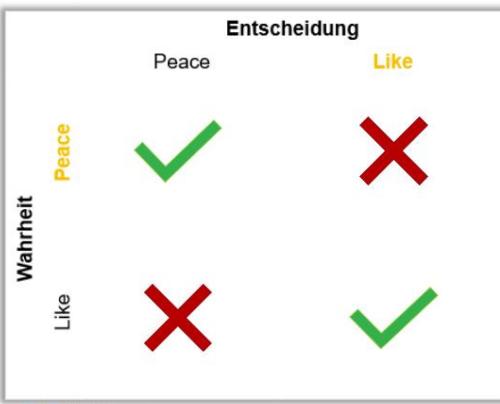
20190903_092052(040)_Nr. 94943.jpg
20190903_092052(080)_Nr. 115586.jpg
20190903_092053(101)_Nr. 120430.jpg
20210429_120112(001)_Nr. 491091.jpg
20210429_120112(002)_Nr. 491131.jpg
20210429_120112(003)_Nr. 491142.jpg

17-17-55-814340

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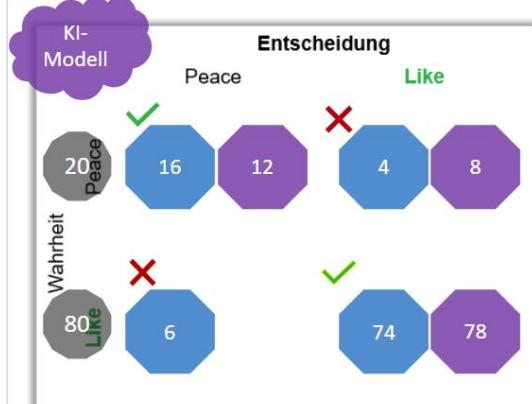



Entscheidung

	Peace	Like
Wahrheit	✓	✗
Like	✗	✓

Co-funded by the European Union





Entscheidung

	Peace	Like			
Wahrheit	20 Peace	16	12	4	8
Like	80 Like	6	74	78	

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Figure 32:Introduction slides of “AI-Hackathon”

Annex 33. Overview slides for “Customer relationship management”

Customer-Relation-Management

Es gelingt nicht, keins zu haben

Prof. Dr. Rüdiger Weißbach

Mittelstand-Digital

In Kooperation mit

EDIH HAMBURG

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Bundesministerium für Wirtschaft und Klimaschutz

und das Forschungsministerium des Deutschen Bundestages



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?

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

Seite 8

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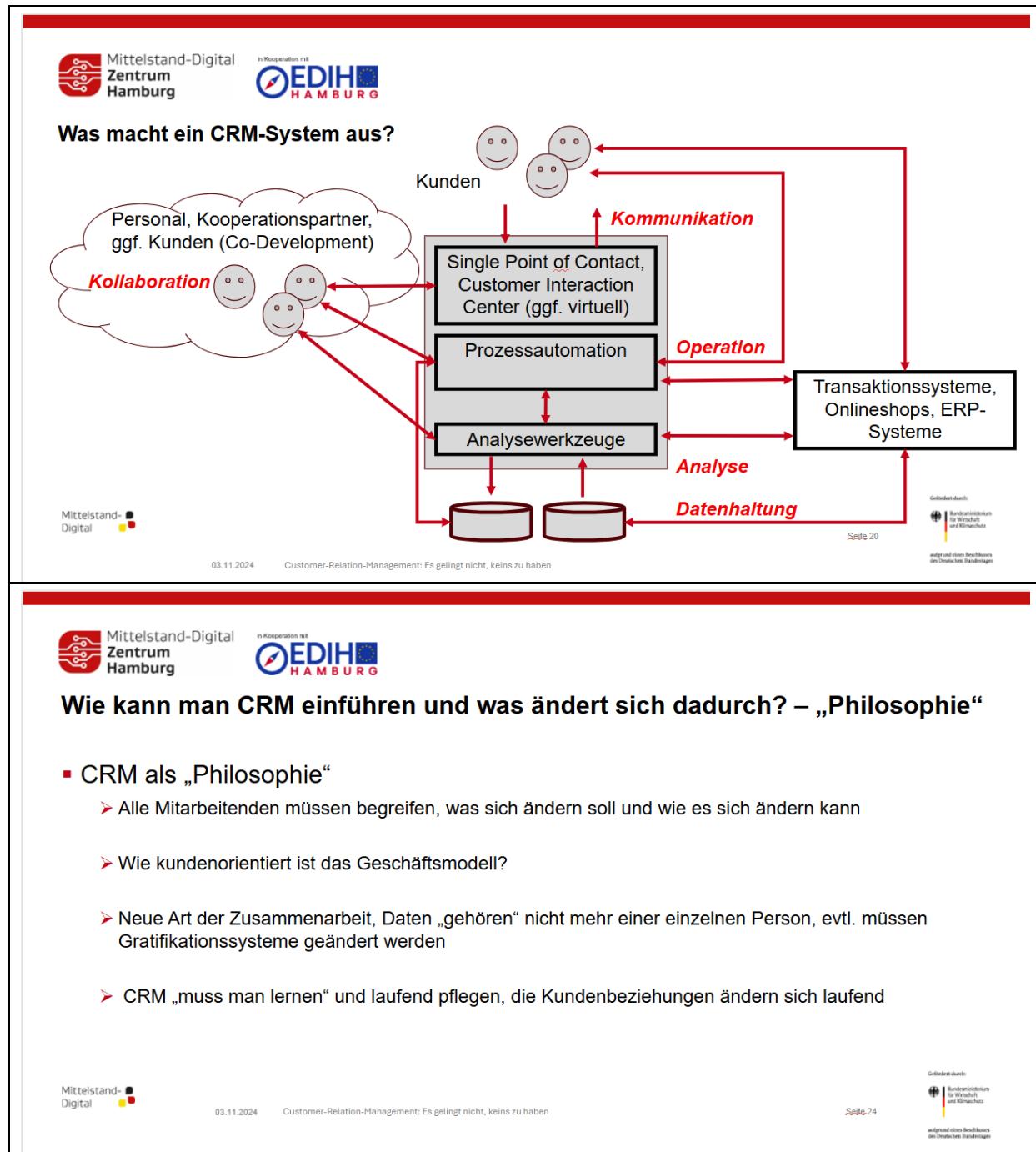


Figure 33: Overview slides of “Customer relationship management”

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

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EDIH 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



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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



Claude

Gemini

2020 Jasper AI startet eine generative Textplattform für Unternehmensanwender
2022 OpenAI veröffentlicht ChatGPT, einen kostenfreien generativen allgemeinen Chatbot.
2023 Google veröffentlicht seinen eigenen generativen AI-Chatbot namens Bard (heute Gemini) für die Öffentlichkeit.
2023 Open Source LLM Chatbots wie LAIONs „Open Assistant“ sind frei und lokal nutzbar

2024 LLMs auf dem iPhone

20

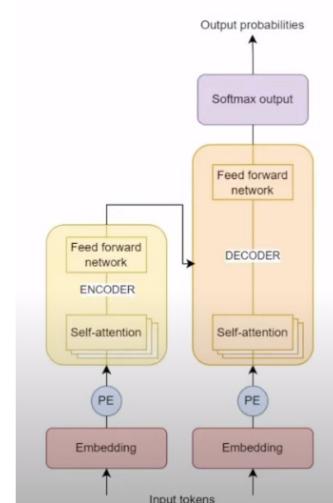


(R)Evolution der Chatbots
 Jan Fischer @ haw-hamburg.de

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”

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DIY Chatbots

Chatbot-Entwicklung leicht gemacht

Jan.Fischer @ haw-hamburg.de

Forschungs- und Transferzentrum Business Innovation Lab

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Chatbots mit eigenen Daten – RAG

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

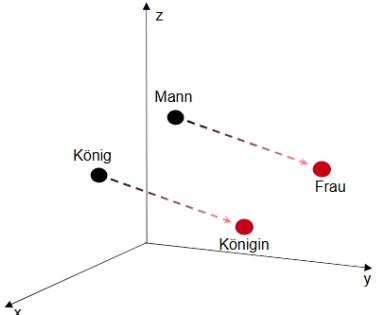
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Embeddings

- 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



A 3D coordinate system with axes x, y, and z. Four points are plotted: 'Mann' (black dot) is positioned above 'König' (black dot). 'Frau' (red dot) is positioned to the right of 'Königin' (red dot). Dashed lines connect 'Mann' to 'König' and 'Frau' to 'Königin', illustrating that words with similar meanings are close together in the vector space.

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Seite 6




Beispiele für Chatbot-Plattformen



Chatbase



Dialogflow

botpress















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Seite 9

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

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

The image shows two vertically stacked presentation slides. Both slides have a red background with a pixelated pattern at the top and bottom. The top slide features the logos of 'Mittelstand-Digital Zentrum Hamburg' and 'EDIH HAMBURG' in the top left and top right corners respectively. The title 'KI-Modelle trainieren für alle' is centered in large white font. Below it is the subtitle 'Einblicke in die Entstehung von KI-Modellen'. The authors' email 'Jan.Fischer, Steffen.Treske, Marcel.Hoop @ haw-hamburg.de' is listed, along with the research center 'Forschungs- und Transferzentrum „Business Innovation Lab“ Hochschule für Angewandte Wissenschaften Hamburg'. The bottom slide also features the 'Mittelstand-Digital Zentrum Hamburg' and 'EDIH HAMBURG' logos. It includes the European Union flag and the text 'Co-funded by the European Union'. The slide is funded by the 'Bundesministerium für Wirtschaft und Klimaschutz' and 'aufgrund eines Beschlusses des Deutschen Bundestages'. The left side of the bottom slide features a stylized brain-like network diagram. The right side lists three topics: I. Transfer Learning, II. Pseudoausschuss-Reduzierung EdgeClip, and III. Wer trainiert die beste KI?



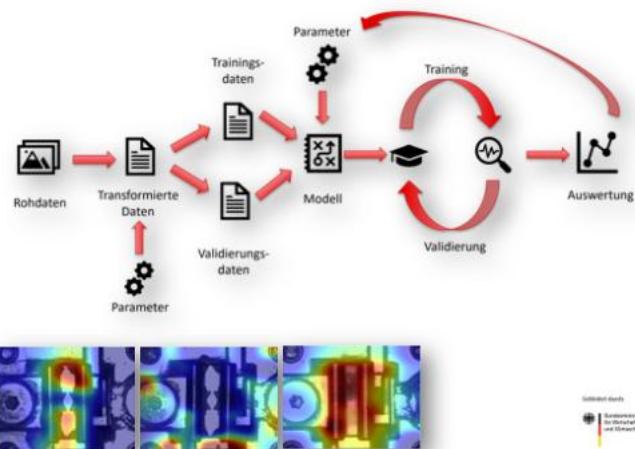

Trainingsprozess

Projektfortschritt

Verbesserung durch

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

Genauigkeit: ca. 95%

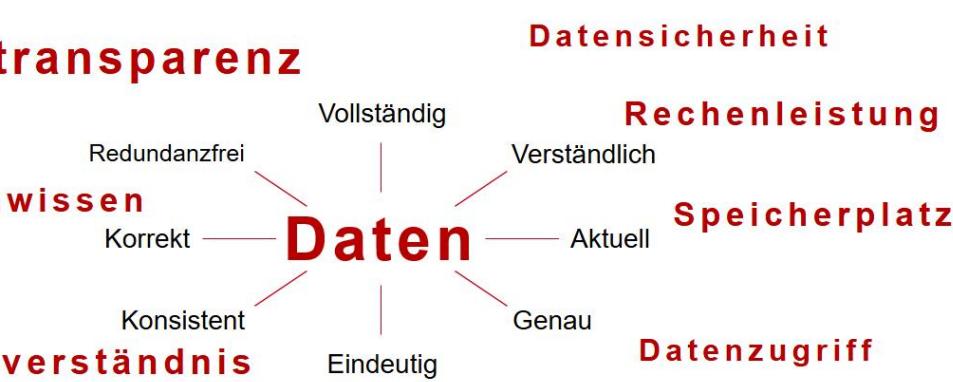


Geleitet durch: Kompetenzzentren für Wirtschaft und Klimaschutz aufgrund eines Beschlusses des Deutschen Bundestages




Nachbesprechung – Datenqualität

Prozesstransparenz



Geleitet durch: Kompetenzzentren 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?*”

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Zentrum
Hamburg

in Kooperation mit
 EDIH
HAMBURG



Chatbot-Entwicklung leicht gemacht

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

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

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Zentrum
Hamburg

 in Kooperation mit

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
GrogChat
Memory & Abzweigungen

15:00 - 16:00: Fortgeschrittene Funktionen & Deployment
RAG & Embeddings
Document Store RAG
Chatbot teilen & Deployment



 Mittelstand-Digital
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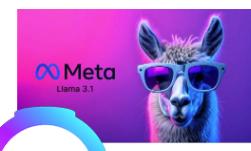
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 aufgrund eines Beschlusses
des Deutschen Bundestages

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



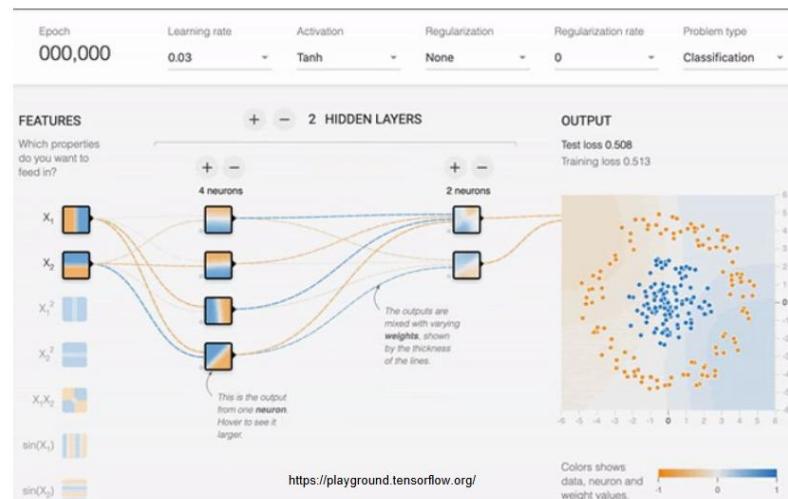
2020 Jasper AI startet eine generative Textplattform für Unternehmensanwender
2022 OpenAI veröffentlicht ChatGPT, einen kostenfreien generativen allgemeinen Chatbot.
2023 Google veröffentlicht seinen eigenen generativen AI-Chatbot namens Bard (heute Gemini) für die Öffentlichkeit.
2023 Open Source LLM 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



KÜNSTLICHE NEURONALE NETZE



22

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



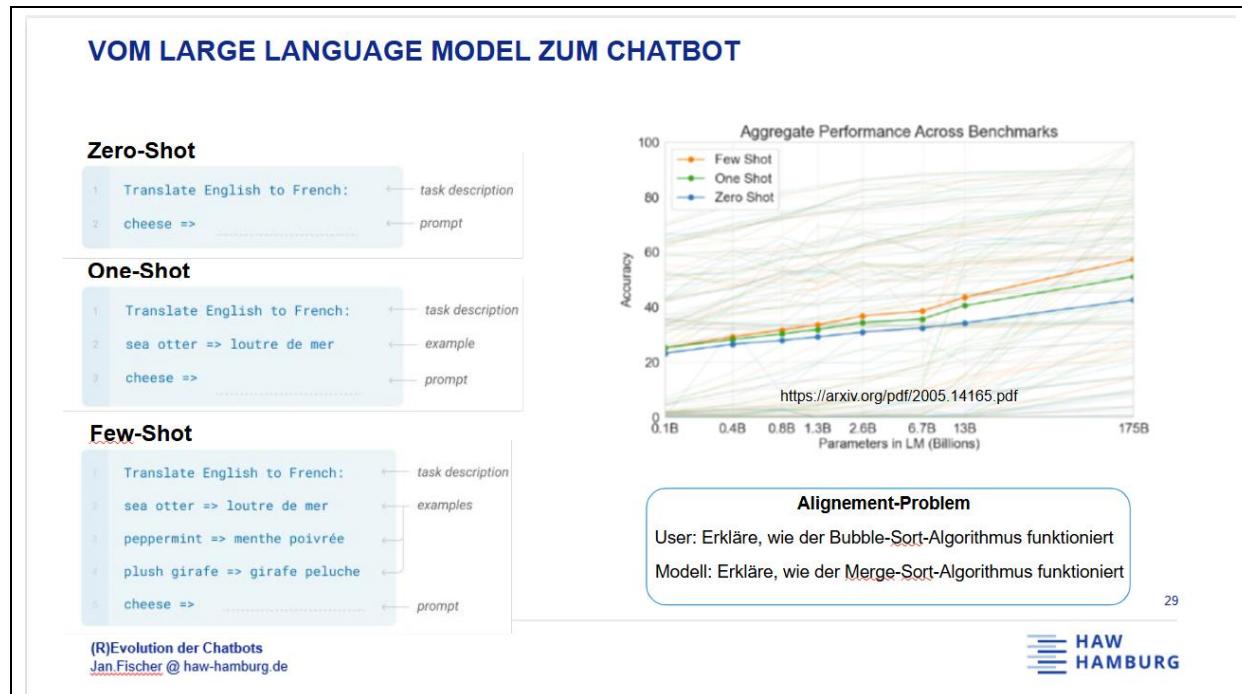


Figure 36: Overview slides of “How do I tell my Chatbot?”

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





Aufwand

100 Zeilen Code

25 Zeilen Bilderkennung

9 Zeilen Neuronales Netz

```

5. Split Data
[17]: train_size = int((1-(data)*))
val_size = int((data)*)
test_size = int((data)*)
[18]: train_size
...
[19]: train = data[:train_size]
val = data[train_size:train_size+val_size]
test = data[val_size+val_size:val_size+test_size]

6. Build Deep Learning Model
[20]: train
...
[21]: from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Dense, Flatten, Dropout
[22]: model = Sequential([
[23]:     model.add(Conv2D(32, (3,3), 1, activation='relu', input_shape=(56,56,3)))
model.add(MaxPooling2D((2,2), 1, activation='relu'))
model.add(Flatten())
model.add(Dense(128, activation='relu'))
model.add(Dense(1, activation='sigmoid'))
[24]: model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])
[25]: model.summary()
...
7. Train
[26]: log_dir = 'log'
[27]: tensorboard_callback = tf.keras.callbacks.TensorBoard(log_dir=log_dir)
[28]: hist = model.fit(train, epochs=10, validation_data=val, callbacks=[tensorboard_callback])

```



Fehler erster und zweiter Art

```

[28]: if yhat > 0.5:
    print('Predicted class is defect')
else:
    print('Predicted class is ok')
Predicted class is defect

```

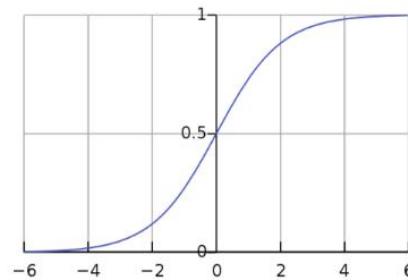


Figure 37: Overview slides of “Intelligent image recognition”

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

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

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

Gefördert durch:

Mittelstand-Digital
in Kooperation mit
EDIH HAMBURG

Co-funded by
the European Union

Personas erstellen mit KI

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

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

Seite 11

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Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages



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?"

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13.11.2024 KI-Tricks für SEO: Wie wird mein Unternehmen online sichtbar? Seite 15

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und Klimaschutz
aufgrund eines Beschlusses
des Deutschen Bundestages

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

Mittelstand-Digital
Co-financed by the European Union

Referenten: Christian Bruss & Berenice Ehrenberger

Gefördert durch:
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des Deutschen Bundestages



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

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09.11.2023 Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion Seite 2

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

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

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Prompt Engineering

Basics

- Explizite Befehle

C Erkläre mir das Konzept der künstlichen Intelligenz.

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

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Prompt Engineering

Basics

C Erkläre mir das Konzept der künstlichen Intelligenz.

1. Künstliche Intelligenz (KI) ist ein multifunktionaler Begriff um ein Bereich der Informatik, der von der Rekonstruktion von Technologien und Systemen herkommt, die menschenähnliche kognitive Fähigkeiten nachbilden 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 Technologien, 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 komplexe Muster zu erkennen. Dies kann in überwachtem, unüberwachtem und verteiltem Lernen erfolgen.
- 2. Neuronale Netzwerke:** Neuronale Netzwerke sind Modelle, die von der Struktur und Funktionsweise des menschlichen Gehirns inspiriert sind. Sie werden verwendet, um komplexe Daten zu erkennen und zu bearbeiten, um für Aufgaben wie Bilderkennung, sprachliche Sprachverarbeitung (NLP) und Spiele einzusetzen.
- 3. Natürliche Sprachverarbeitung (NLP):** Dieser Bereich konzentriert sich auf die Interaktion zwischen Computer und menschlicher Sprache. NLP-Technologien ermöglichen es Computern, menschliche Sprache zu verstehen, zu generieren und darauf zu reagieren. Beispiele sind Chats, Übersetzungstools und Textgeneratoren.

4. Computer Vision: Computer Vision beschreibt sich auf die Fähigkeit von Maschinen, visuelle Informationen aus Bildern oder Videos zu entnehmen, zu analysieren und zu interpretieren. Anwendungen reichen von Gesichtserkennung über autonomes Fahren bis hin zu medizinischen Bildgebungen.

5. Expertensysteme: Expertensysteme sind computerbasierte Systeme, die menschliches Fachwissen in einem spezifischen Bereich erheben und anwenden können. Sie werden häufig für Diagnose, Entscheidungsfindung und Problemlösung eingesetzt.

6. Roboter: KI-gestrahlte Roboter sind in der Lage, physische Aufgaben auszuführen, indem sie Sensoren verwenden, um ihre Umgebung wahrzunehmen und angemessen zu reagieren. Beispiele hierfür sind Roboter in der Industrie, Roboter für Haushalt und Pflege, Sicherheitsdiensten und Erkundung 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 unserer täglichen Lebens zu beeinflussen, von der Medizin und Bildungssektor bis hin zur Wirtschaft und Unterhaltung. Es ist jedoch wichtig zu betonen, dass KI immer noch in der Entwicklung ist und nicht allzuviel, zuviel und zuhastig von Menschen erwartet werden darf, da die erwarteten Überlebenschancen erfordern.

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Prompt Engineering

Basics

C 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.

09.11.2023 Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion Seite 10

Prompt Engineering

Basics

▪ Spezifizieren

- Als was (Rollenspiel) an wen (Publikum)

C Erkläre mir KI - insbesondere überwachtes und unüberwachtes Lernen - als ob ich 5 Jahre alt wäre.

Künstliche Intelligenz (KI) ist wie ein Computer, der lernen kann, aber nicht so wie du und ich. Er kann Aufgaben erledigen, ohne weiß zu verstehen, was er tut.

Es gibt zwei Arten, wie ein Computer lernen kann: überwachtes Lernen und unüberwachtes Lernen. Ich werde dir erläutern, ob wovon es geht.

▪ Überwachtes Lernen

Stell dir vor, du spielst ein Memory-Spiel, jemand zeigt dir zuerst alle Karten und sagt dir, welche Passe zusammenpasst. Du schaust dir die Karten an, und du versuchst, die passenden Karten zu finden, indem du dich an die Hinterseite des Bildes gedreht hast. Das ist so ähnlich wie überwachtes Lernen. Der Computer bekommt eine Beispiele und sagt ihm, was richtig ist und was falsch ist. So lernt er, die richtigen Antworten zu finden, wenn er ähnliche Aufgaben erledigen muss.

▪ Unüberwachtes Lernen

Jetzt stell dir vor, du spielst ein Memory-Spiel, bei dem du niemanden sagt, welche Karten zusammenpassen. Du schaust dir alle Karten an und versuchst, die passenden Karten zu finden und zusammenzulegen. Das ist so unüberwachtes Lernen. Der Computer bekommt keine Hinweise, was richtig ist. Er schaut sich die Daten an und versucht, Muster oder Assoziationen selbst zu finden. Er kennt also, indem er Dinge in Gruppen einstellt, die irgendwie zusammenpassen.

Das sind die beiden Arten, wie Computer lernen können, und sie helfen uns, viele nützliche Dinge zu tun, wie zum Beispiel Bilder erkennen, Texte verstehen oder Entscheidungen treffen. Aber denk daran, der Computer versteht nicht wirklich wie wir, er lernt nur, indem er Beispiele sieht oder Muster erkennt. Es ist ein bisschen wie Zaubern für Computer!

09.11.2023 Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion Seite 12

Prompt Engineering Techniken für ChatGPT

Strategien

▪ Input- Output Prompting

C Schreibe ein C#-Skript, das ein Objekt blau färbt.

```
cs
using UnityEngine;

public class ColorChanger : MonoBehaviour
{
    void Start()
    {
        // Ändere die Farbe des GameObjects zu Blau
        GetComponent<Renderer>().material.color = Color.blue;
    }
}
```

Copy code

09.11.2023 Prompt Engineering: Bessere Ergebnisse bei ChatGPT und Stable Diffusion Seite 20

Figure 39: Introduction slides of “Prompt Engineering”

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

The slide features a blue-toned background image of a port with shipping containers and cranes. Overlaid on the image is a network of white lines connecting various points, symbolizing connectivity. In the top right corner, a red box contains the word "Demonstrator". The main title "Smarte Lieferkette" is displayed in large white letters. Below it, a red box contains the text "Mehr Transparenz durch Sensorik und Vernetzung?". A sub-question "Wie können Effizienz, Resilienz und Nachhaltigkeit komplexer Lieferketten gesteigert werden?" is also present. The slide is divided into two main sections: "Case" and "Interaktion", each with its own icon and text.

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



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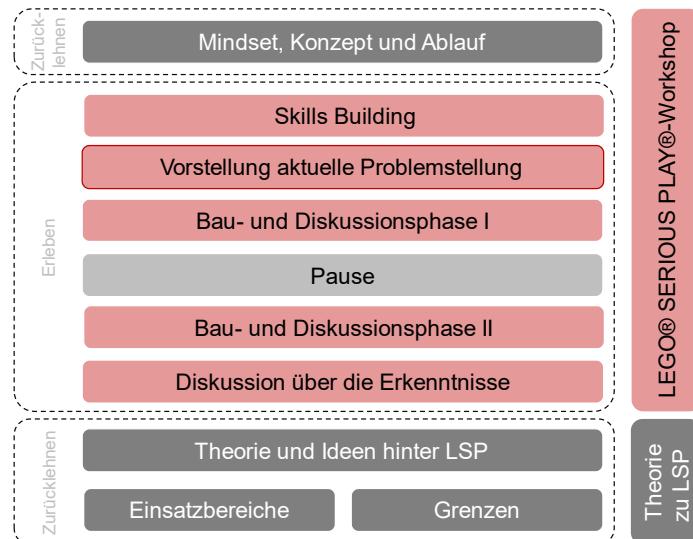
Florian Dörries, Marc Stunz

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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 Bundestags



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!

... Digitales
Kundenmanagement



Vertrieb

... Digitale
Montageanweisungen



Fertigung

... Home Office
Anbindung



... Augmented
Reality



... arbeiten von
zu Hause aus



Qualität



... automatische
Merkmalsextraktion &
auswertung

Produktions-
planung



... Simulation von
Produktionsprozessen

... Assistenzsysteme



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”

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

Geleitet durch: Deutsches Institut für Wirtschaft und Wissenschaft aufgrund eines Beschlusses des Deutschen Bundestages

Seite 1

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”

Herzlich willkommen!

Veranstaltung:
Mit Design Thinking Produkte nachhaltig gestalten

Beverly Lege

September 2024

Design Thinking vereint drei wesentliche Aspekte

Zirkuläres Produktdesign

WERT AUFBAUEN

- Design for Reliability and Durability (Langlebigkeit)
- Design for Dis- and Reassembly (Zerlegbarkeit und Montage)
- Design for Ease of Maintenance and Repair (Reparierbarkeit, Modularität)
- Design for Recycling
- Safe by Design (Verzicht auf toxische, gesundheitsgefährdende Stoffe)
- Nutzung nachhaltiger (langlebiger, trennbarer, nachwachsender) Materialien

Design für Zirkularität ist ein zentraler Enabler der Kreislaufwirtschaft.

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

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



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!

Seite 2



Nachhaltigkeitsberichterstattung

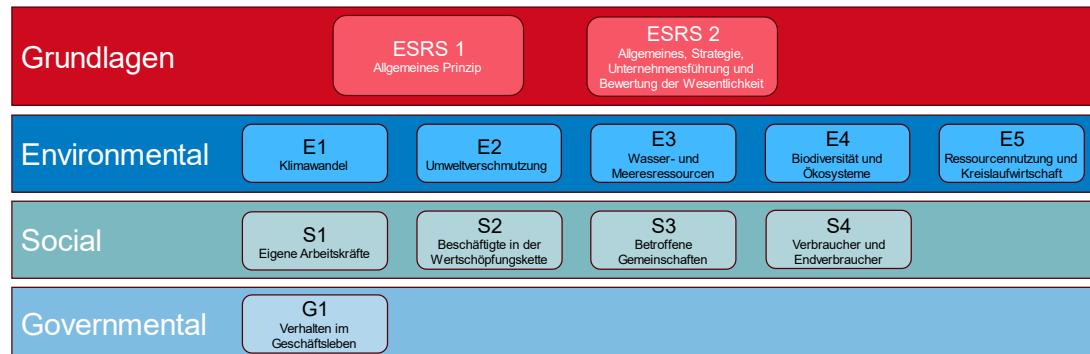
Welches Framework ist das richtige?

Greenhouse Gas Protocol	DIN EN ISO	CSR / 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

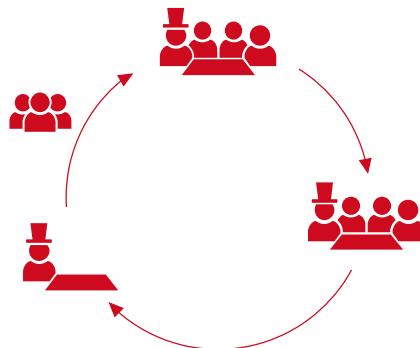
Woher kommen meine Daten?



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.

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 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

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)

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

Mittelstand-Digital Zentrum Hamburg in Kooperation mit EDIH HAMBURG

11/22/2023

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

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)

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

Mittelstand-Digital Zentrum Hamburg in Kooperation mit EDIH HAMBURG

20.11.2023

Seite 2

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

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)

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

Digitale Technologien zur Verbesserung des Scope 3 Carbon Accounting (S3CA)

 Einführung in den Kohlenstoff-Fußabdruck <ul style="list-style-type: none">▪ Die Bedeutung des Carbon Footprint für KMU▪ Berechnungsmöglichkeiten für den Carbon Footprint	 Präsentation und Diskussion von unterstützenden Technologien für S3CA <ul style="list-style-type: none">▪ Vor- und Nachteile der Technologien▪ Anwendungsbereiche von Technologien im Kontext von S3CA	 Demonstration des entwickelten S3CA-Entscheidungshilfe-Tools <ul style="list-style-type: none">▪ 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

Gedolobt durch:

Bundesministerium für Umwelt und Klimaschutz

ausgeführt eines Befehlshabers des Deutschen Bundestages

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

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

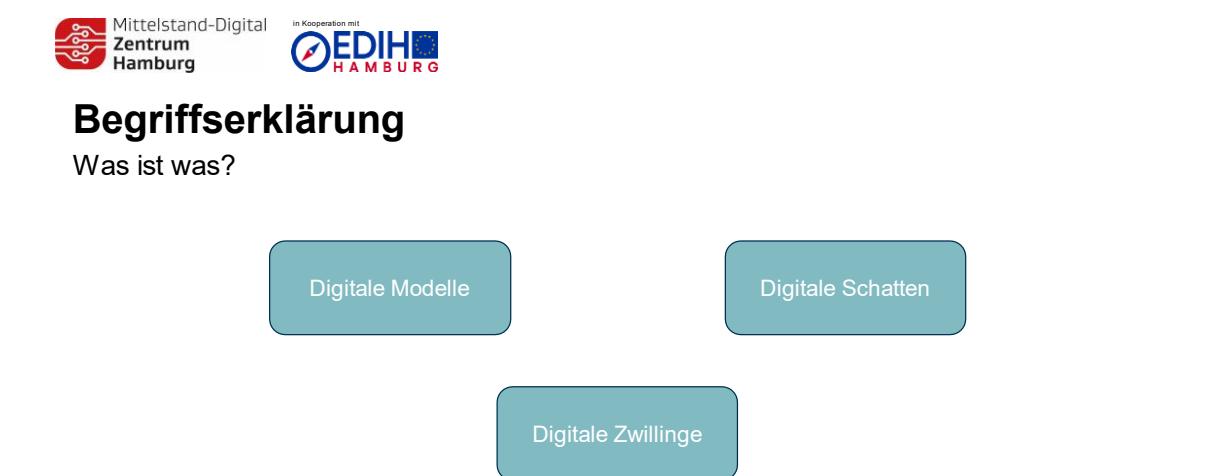
Leitbeispiel

- 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

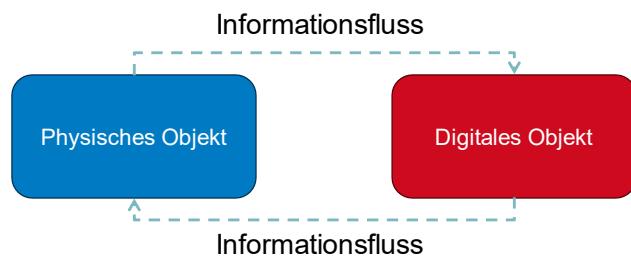
Figure 50: Introduction slide of “Machine Learning basics” (in German)

Annex 52. Overview slides for “Digital Twins: The self-optimizing company”



Begriffserklärung

Digitaler Zwilling



Begriffserklärung

Digitales Modell



Quelle: unity.com

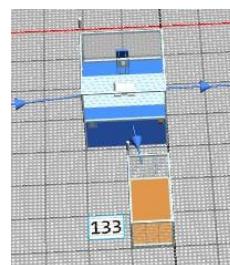


Begriffserklärung

Digitaler Schatten



Quelle: www.wenglor.com

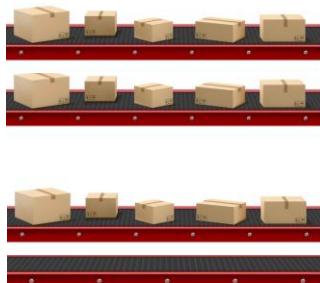


Quelle: PlantSim, eigen Darstellung

Begriffserklärung

Digitaler Zwilling

Gestört Eingang gesperrt

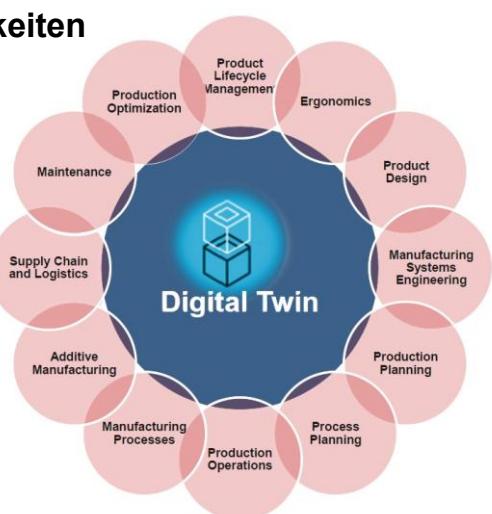


Quelle: www.freepik.com Autor: upklyak

Quelle: PlantSim, eigen Darstellung

Anwendungsmöglichkeiten

Digital Twin



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”

The slide is titled 'AGENDA' in large black text. To the left, there is a large icon of a stopwatch and the text '1,5 – 2 h'. To the right, there is a large yellow trophy icon. The agenda is listed in a vertical column of colored boxes:

- 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)

Logos for 'Mittelstand-Digital Zentrum Hamburg' and 'in Kooperation mit EDIH HAMBURG' are at the top left, and logos for 'Co-funded by the European Union' and 'gefördert durch Förderprogramm für Wirtschaft und Klimaschutz auspend eines Beschlusses des Deutschen Bundestages' are at the bottom right.

WAS IST OKR?

OKR

Objectives

Ziel



Qualitativ

Key Results

Schlüsselergebnis



Quantitativ

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


OBJECTIVE

- KEY RESULT
- KEY RESULT
- KEY RESULT
- KEY RESULT



OBJECTIVE

- KEY RESULT
- KEY RESULT
- KEY RESULT
- KEY RESULT



OBJECTIVE

- KEY RESULT
- KEY RESULT
- KEY RESULT
- KEY RESULT

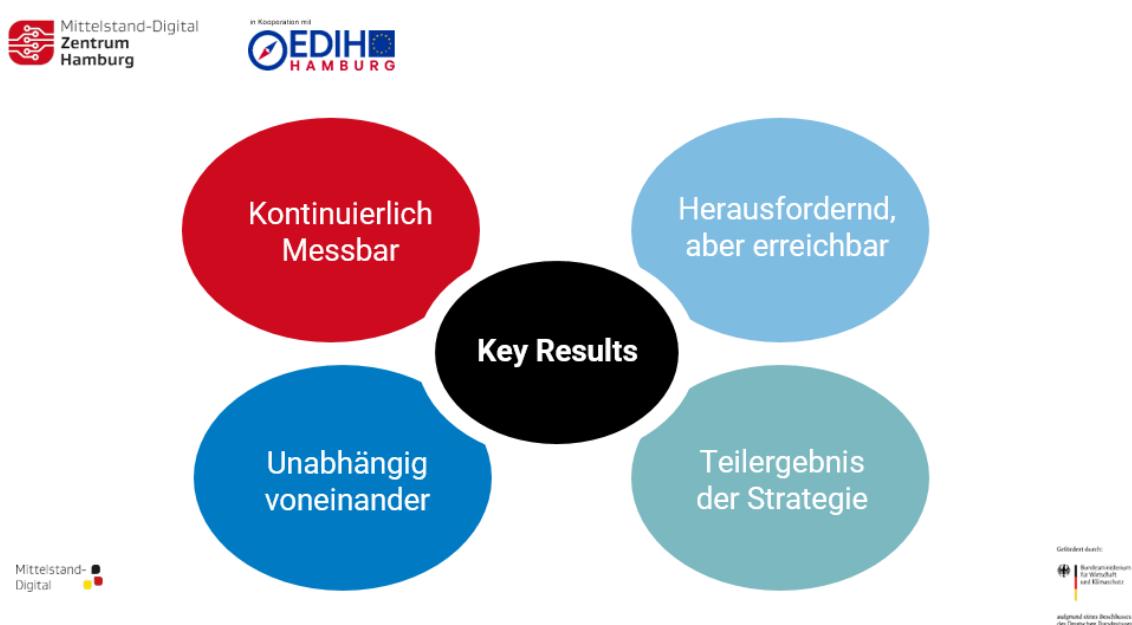
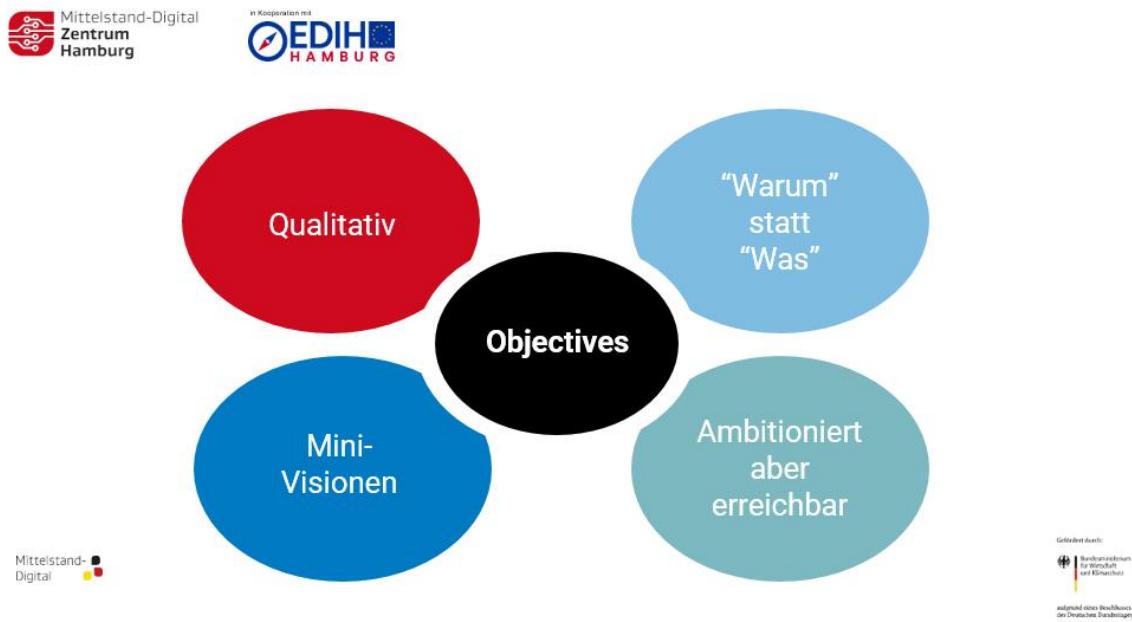


Figure 52: Overview slides for “Navigate Uncertain Times Agile and Purposefully with OKR”

Annex 54. Overview slides for “Ready to Thrive Through Crisis - Equipped with Expertise for the Future!”



Mittelstand-Digital

Lyn Luisa Zenner, M.Sc.

Co-funded by the European Union

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

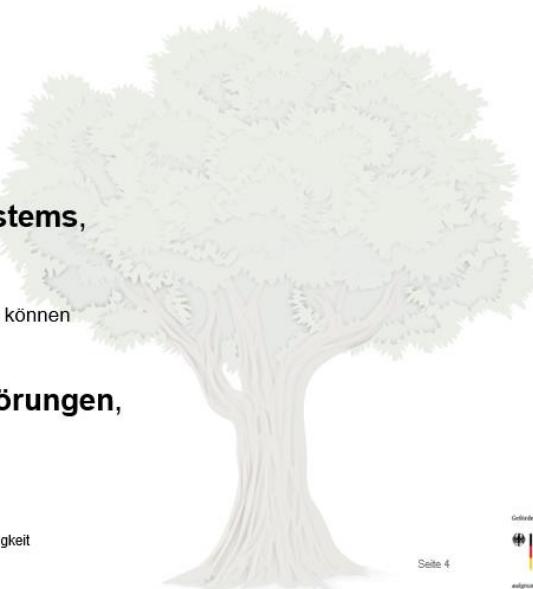
Mittelstand-Digital

in Kooperation mit EDIH HAMBURG

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



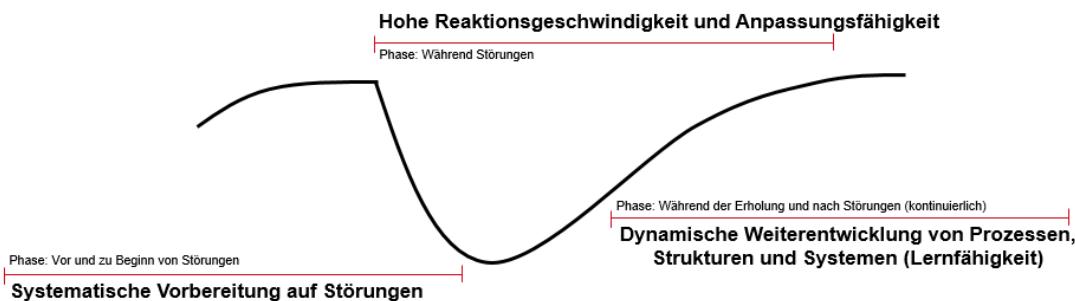
Mittelstand-Digital

Quelle: Ivanov 2023 – Einführung in die Widerstandsfähigkeit
28.09.2024 NORTEC 2024

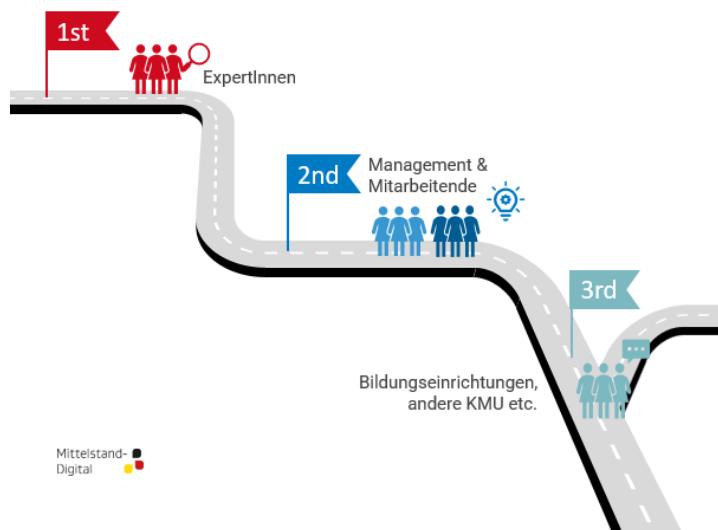
Seite 4

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Die 3 Phasen der Resilienz



Resilienz in der Paxis



Technologie- und Risikovorrausschau

Wie sehen mögliche Zukünfte aus?

Mitarbeitende in Strategieprozess einbinden

Welche Strategien für diese Zukünfte?

Kommunikation nach außen

Strategische Partnerschaften knüpfen

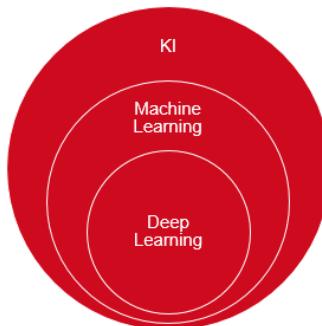
Figure 53: Overview slides for “Ready to Thrive Through Crisis - Equipped with Expertise for the Future!”

Annex 55. Overview slides for “Artificial Intelligence in production”



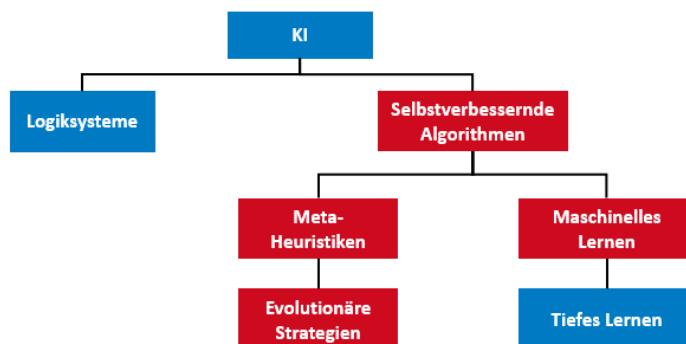
Künstliche Intelligenz

Klassifikation



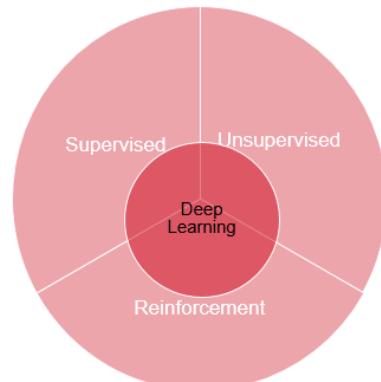
Künstliche Intelligenz

Klassifikation



Maschinelles Lernen

Klassifikation



Meta-Heuristiken

Genetischer Algorithmus

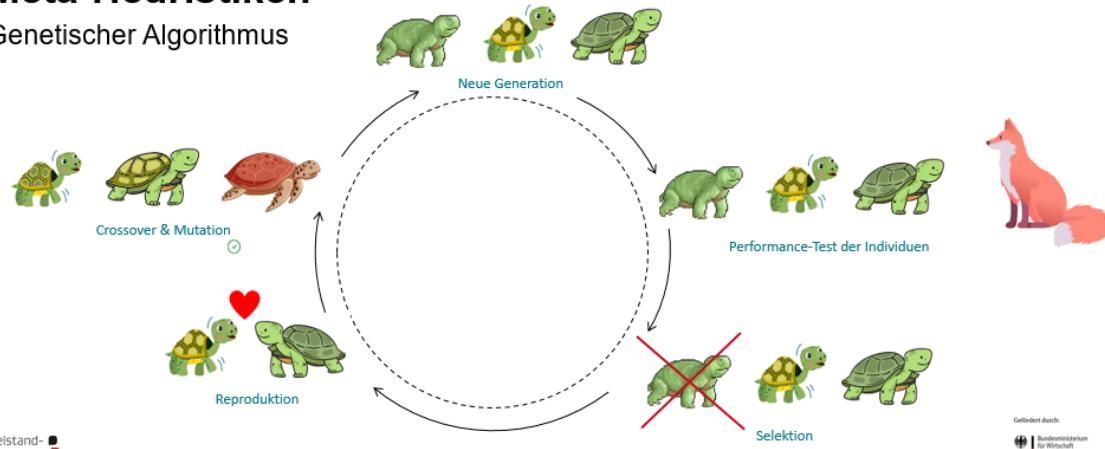


Figure 54: Overview slides for “Artificial Intelligence in production”

Annex 56. Overview slides for “*Current topics in digital transformation (Info event)*”



Was ist eine E-Rechnung



■ Rechnung Papier / PDF

(Quelle: www.streit-software.de)

■ E-Rechnung (XML)

(Quelle: www.e-rechnung-bund.de)

Selber.Machen – Solo Erfolgreich im Handwerk

1

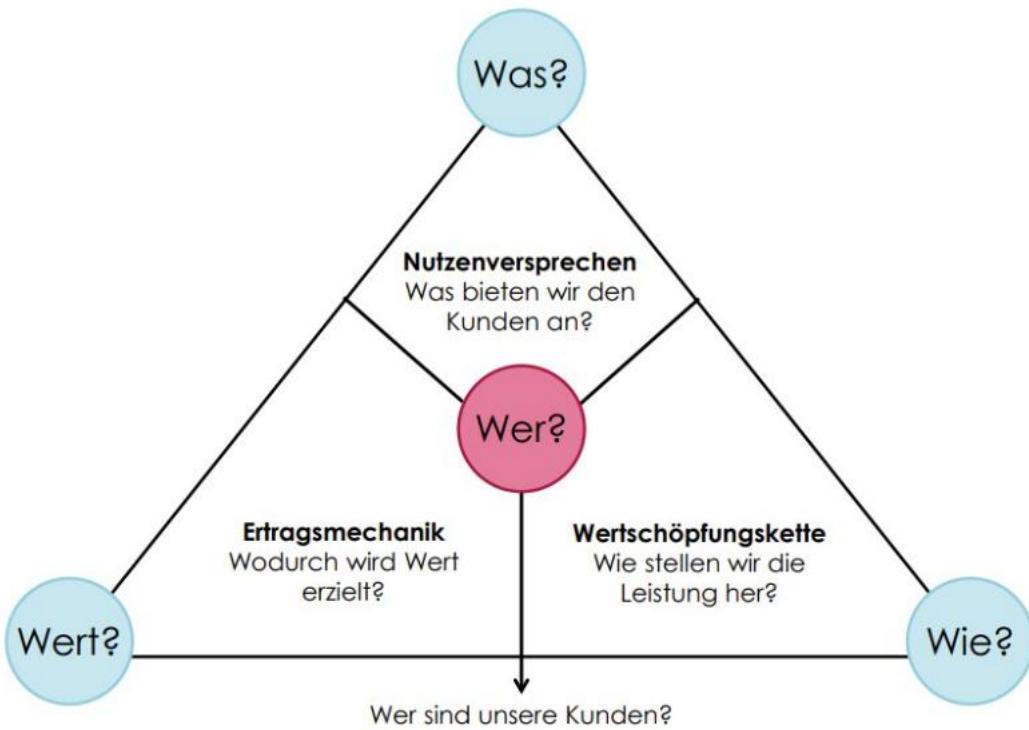


Figure 55:Overview slides for “Current topics in digital transformation (Info event)”

Annex 56. Example Service Experience Exchange with the topic time recording software, “*Current topics in digital transformation (Experience exchange)*”

Minuten, Mitarbeiter, Management: Zeiterfassung im Handwerk

ZUM ANMELDEN

Zwischen Unternehmererfolg 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:

- Erfahrungsaustausch aus dem Handwerk
- Zeiterfassungsgesetz vorgestellt – ein praktischer Blick
- Mitarbeiter interessieren und Veränderungsprozesse gemeinsam gestalten
- Austausch und Vernetzung zu aktuellen Fragestellungen rund um Digitale Zeiterfassung
- Themaspezifische Diskussionen in kleinen Gruppen

Moderation:

- Christian Hamburg, Raumausstattungsmeister Fasold Hamburg GmbH
- Friedemann Matz, Regionalverantwortlicher der Handwerkskammer Hamburg, EDIH
- Christine Mich, Mittelstand-Digital Zentrum Hamburg - Handwerkskammer Hamburg

Zielgruppe:
Geschäftsführer*innen, Personalarbeiter*innen, Betriebsräte und alle aus dem Handwerk oder handwerknahen Betrieben. Es sind ausschließlich Betriebe zugelassen, keine Mülkorporationen oder Berater.

Veranstaltungsort:
Hafencity, Adresse wird nach bestätigter Anmeldung mitgeteilt.

Wir starten punctlich um 17:00 Uhr. Für Ihr leibliches Wohl wird mit einem Imbiss und Getränken gesorgt sein.

Anmeldung:
Hier melden Sie sich bis zum 23.11.2023 bis 12:00 Uhr an. Eine Teilnahme ist nach bestätigter Anmeldung möglich. Nach Bestätigung Ihrer Anmeldung erhalten Sie einen Tag vor der Veranstaltung einen Webausweis per E-Mail. Achten Sie bitte auf die korrekte Schreibweise Ihres E-Mailadresses, in der Sie bestätigt werden. Ihre Anmeldung ist dann gültig, sobald Sie bestätigt haben. Damit möglichst viele verschiedene Betriebe an diesem Angebot teilnehmen können. Wir bitten um rechtzeitige Anmeldung, 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

Termininformationen

Beginn	27 November 2023 17:00
Ende	27 November 2023 19:30
Sichttag, Anmeldungsende	23 November 2023 12:00
Ort	Hafencity, Adresse wird nach bestätigter Anmeldung mitgeteilt.

Anmeldeformular

Vorname *
 Ich stimme zu, dass das Mittelstand-Digital Zentrum Hamburg meine Daten zur Durchführung der Veranstaltung und zu Zwecken der Evaluation für die Projektaufzeit speichert.

Branche *
 Ich stimme einer späteren Kontaktanfrage - zwecks Durchführung der Evaluation der besuchten Formate zu.

Telefon *
 Ich möchte bitte zukünftig von der Handelskammer Hamburg über weitere Veranstaltungen und Neuigkeiten per Newsletter informiert werden.

Postleitzahl
 Ich akzeptiere die Allgemeinen Geschäftsbedingungen und die Datenschutzerklärung.

Positionsberezeichnung *
 Ich akzeptiere die Allgemeinen Geschäftsbedingungen und die Datenschutzerklärung.

Ich bestätige 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 Projektaufzeit speichert.
 Ich stimme einer späteren Kontaktanfrage - zwecks Durchführung der Evaluation der besuchten Formate zu.
 Ich möchte bitte zukünftig von der Handelskammer Hamburg über weitere Veranstaltungen und Neuigkeiten per Newsletter informiert werden.

Newsletter Anmeldung

Vorname Nachname
 Ich akzeptiere die Allgemeinen Geschäftsbedingungen und die Datenschutzerklärung

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

Prozessinventur		Betrieb: _____	Datum: _____	heute in Software?		
Bereich	Fragestellung	relevant für Betrieb	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 ggf. 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 Eingangsre. 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? Wir läuft das Mahnwesen ab?					

Annex 58. Overview slides of “Digitalization Consultation”



Figure 56: Infographic ERP Software selection “Digitalization Consultation”

Software-Anbieterauswahl*

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

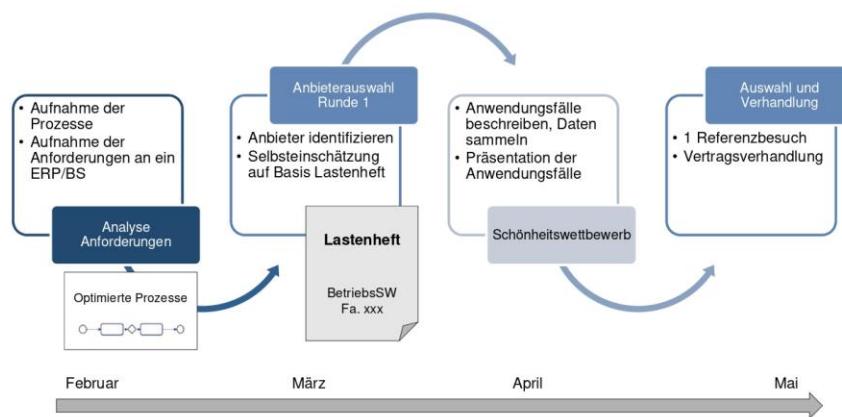


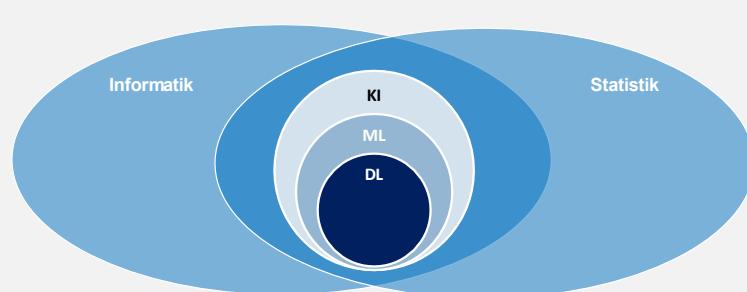
Figure 58: List process inventory for initial interview with SME, “Digitalization Consultation”

Annex 60. Overview slides for “*LLMs in logistics – opportunities and risks of Bard, ChatGPT & Co*”


Agenda

- KI & LLMs – wie funktioniert das eigentlich?
- Anwendungsfälle – wo macht KI Sinn?
- Risiken & Empfehlungen – wo muss man aufpassen?
- Diskussion

Künstliche Intelligenz beruht auf Methoden aus der Informatik und Statistik



KI = Künstliche Intelligenz
ML = Machine Learning
DL = Deep Learning

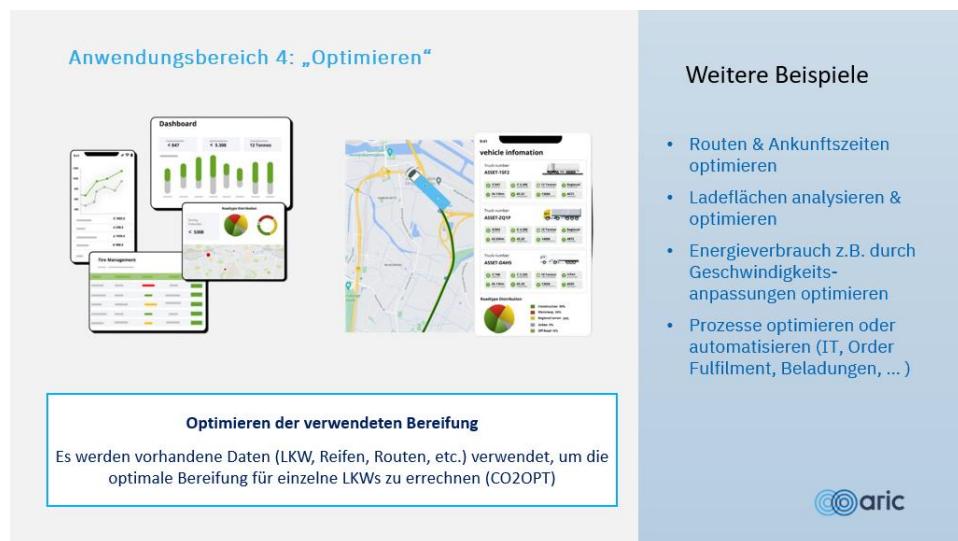
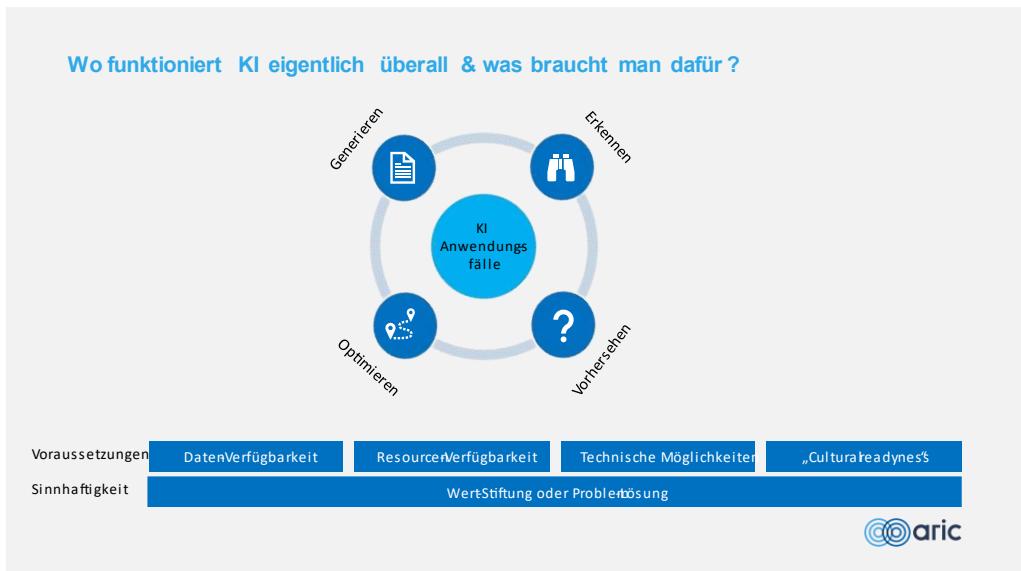
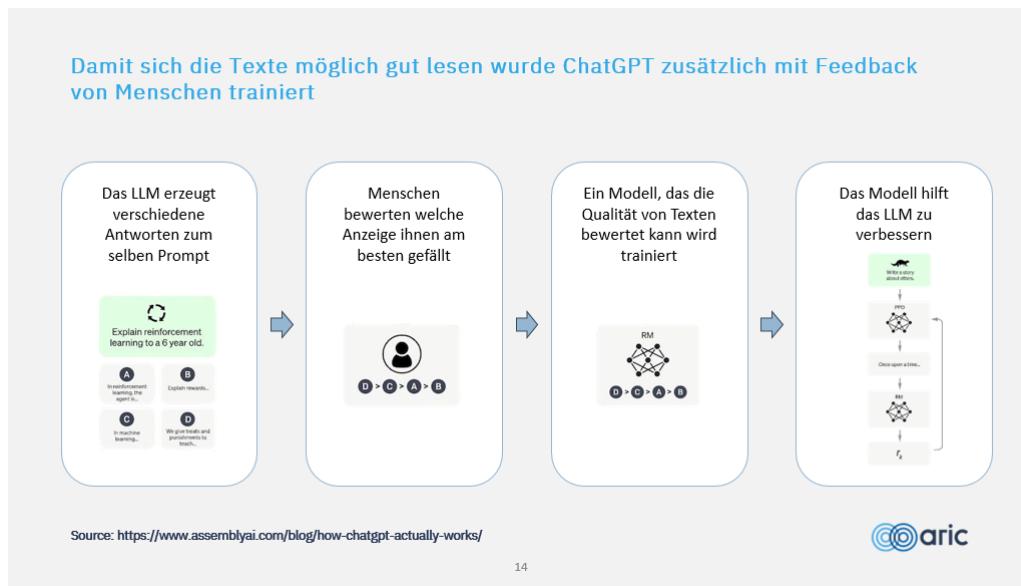


Figure 59: Overview slides of “LLMs in Logistics”

Annex 61. Overview slides for “Workshop for Startup Support Programs: How to identify AI in Startups?”

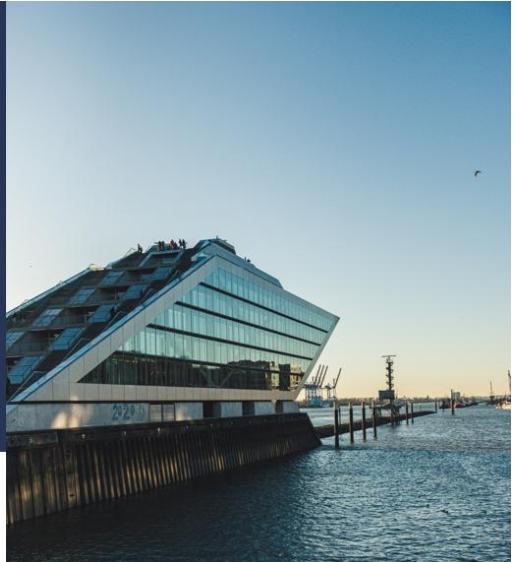


How to KI-Startup?

Artificial Intelligence Center
Hamburg e.V. (ARIC)

Supported as part of the European Digital Innovation Hub (EDIH)

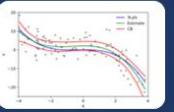
 Co-funded by the European Union  IFB HAMBURG Hamburgische Forschungsförderbank



Künstliche Intelligenz kann für verschiedene Aufgaben genutzt werden



Wahrnehmende Fähigkeiten
Computer Vision
Computer Audition
Klassifikation



Analytische Fähigkeiten
Mustererkennung
Prognosen
Planung und Optimierung



Motorische Fähigkeiten
Steuerung von Regelsystemen
Robotik



Generierende Fähigkeiten
Generierung von Audio-, Text-, Sprach-, Bild- und Videosequenzen



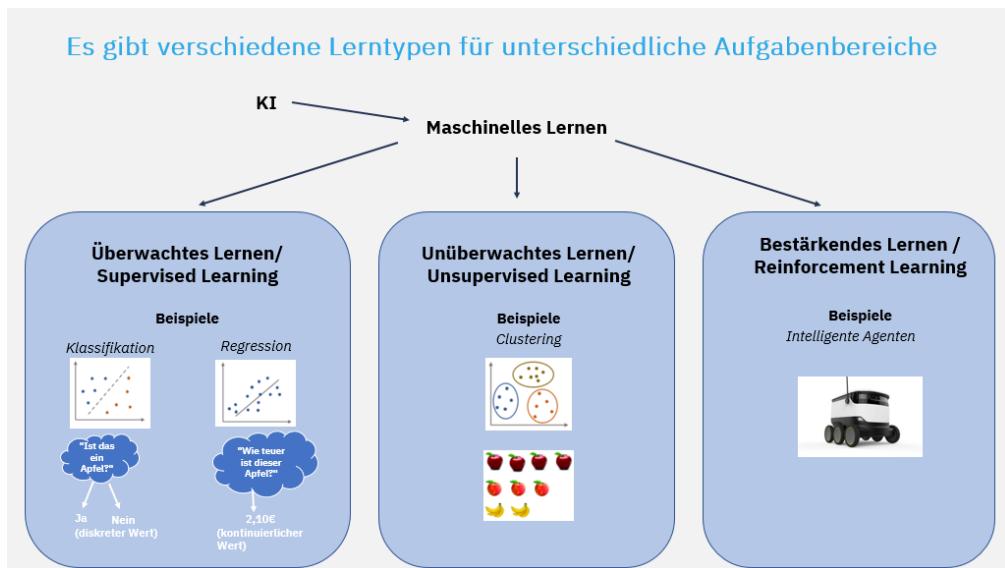
Weak AI / Narrow AI

- 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

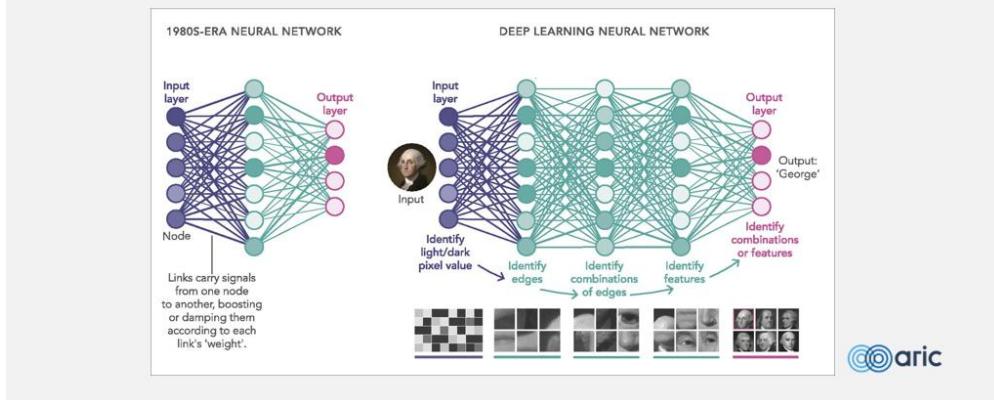
Strong AI / Artificial General Intelligence (AGI)

- 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:



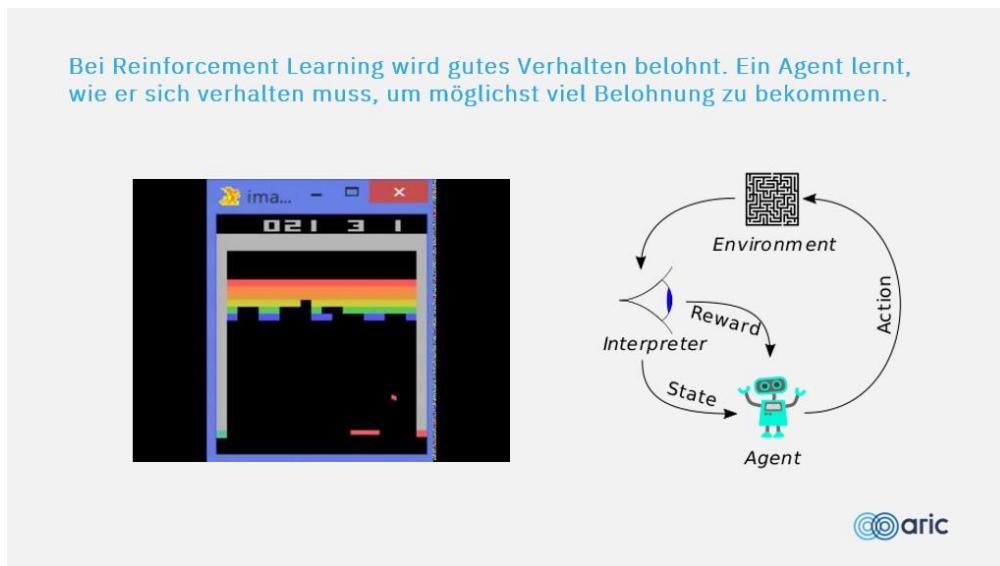


Figure 60: Overview slides of “How to identify AI in Startups?”

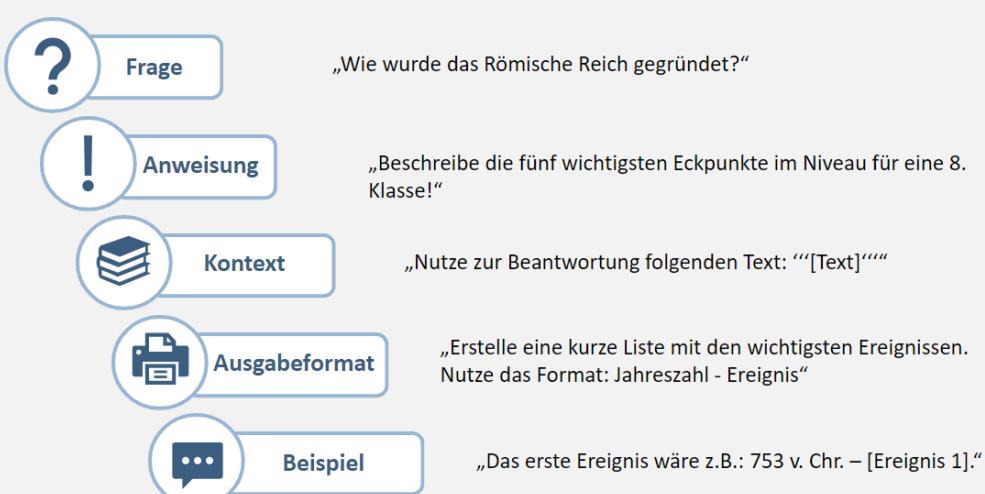
Annex 62. Overview slides for “*Introduction to generative AI*”



The image shows the agenda slide for the presentation. The slide has a light gray background with a decorative graphic of overlapping blue circles on the right side. On the left, there is a vertical list of topics, each preceded by a blue circle connected by a line. The topics are: 'Was ist Generative KI?', 'Wie funktioniert Generative KI?', 'Wie werden gute Prompts geschrieben?', 'Welche Generativen KI-Tools gibt es?', and 'Fragen & Diskussion'. At the bottom right of the slide is the ARIC logo.

Was ist Generative KI?
Wie funktioniert Generative KI?
Wie werden gute Prompts geschrieben?
Welche Generativen KI-Tools gibt es?
Fragen & Diskussion

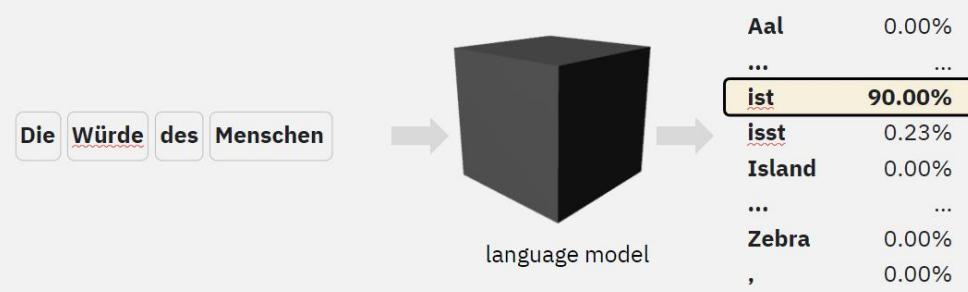
Elemente eines Prompts – Woraus besteht ein Prompt ?



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].“

aric

Noch präziser ausgedrückt sagt ein Sprachmodell die Wahrscheinlichkeit, dass ein Wort das nächste ist – und zwar für alle(!) Wörter im Vokabular des Modells



Wort	Wahrscheinlichkeit
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)

aric

Figure 61: Overview slides of “Introduction to generative AI”

Annex 63. Overview slides for “Responsible AI”



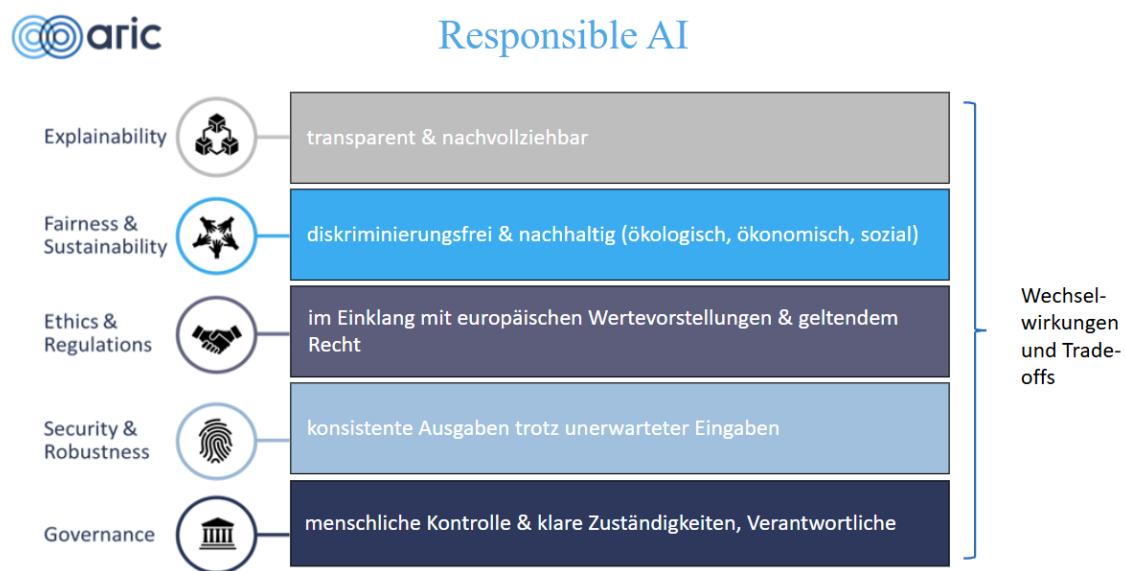
Responsible AI - gesetzliche Anforderungen & Standards

Artificial Intelligence Center Hamburg e.V.

Supported as part of the European Digital Innovation Hub (EDIH)

  Co-funded by the European Union  IFB HAMBURG | Hamburgische Industrie- und Förderbank







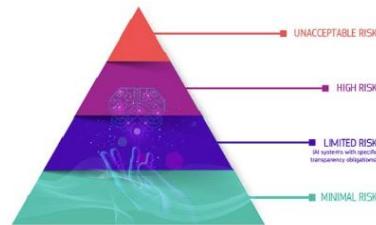
Artificial Intelligence Act (AIA)

- 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

KI kann Ungleichheiten verstärken	KI-Modelle verbrauchen viel Strom
Schlechte Arbeitsbedingungen beim <i>labeln</i>	KI kann zu mehr Konsum / Produktion führen



Figure 62: Overview slides of “Responsible AI”

Annex 65. Illustrations to “Elements of AI for Business”

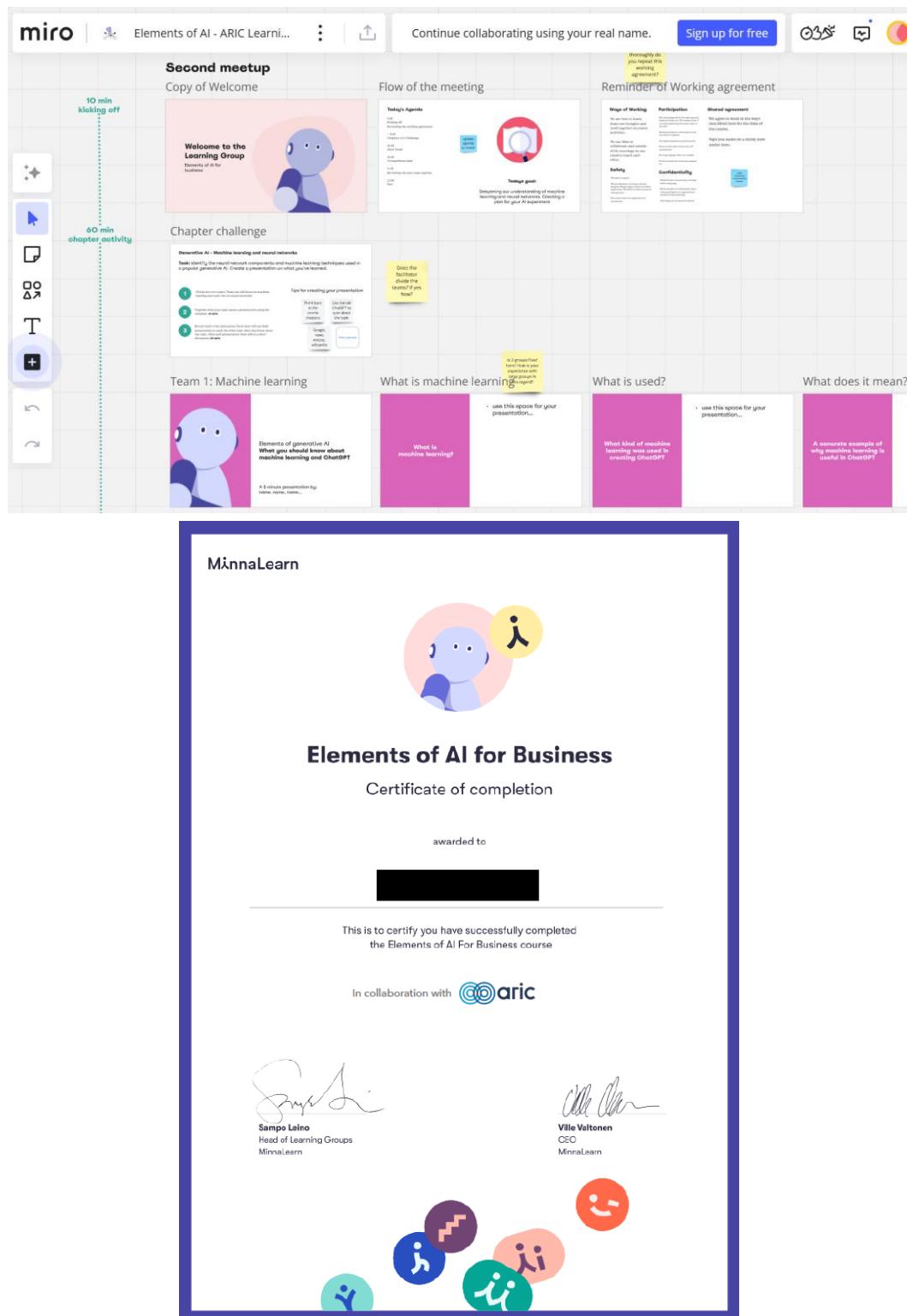


Figure 63: Illustrations to “Elements of AI for Business”

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	unentschlossen	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 Zertifikatkurs 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"/>					
* The course offers starting points for my company.	<input type="radio"/>					
* The content of the course (course structure, material, etc.) met my expectations overall.	<input type="radio"/>					

* The organizational framework (registration, invitation, agenda, etc.) fulfilled my expectations.	<input type="radio"/>					
* There was plenty of opportunity to ask questions and exchange ideas with other participants.	<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 Kurzelemente 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 EDIHamburg.

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 EDIH Hamburg 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