Artificial Intelligence

Strategic objectives and areas of activity for Schleswig-Holstein

Version 2.0

schleswig-holstein.de/kish

AI@SH

SH Schleswig-Holstein
Der echte Norden

Preface

Dear Sir or Madame, and dear AI enthusiasts,

Artificial intelligence has become one of the new megatrends in digitalization. People often looked at us with astonishment when we, the state of Schleswig-Holstein, were the first federated state in Germany to present its own AI strategy in 2019.

Today nobody seriously doubts that we are dealing with a quantum leap in technology that is, at most, comparable with the introduction of the steam engine or even electricity.

With this **continuation of our AI framework of action**, we want to readjust our strategic orientation and take stock of the interim situation. From its state funding, Schleswig-Holstein has provided a total of approximately **45 million euros to promote AI projects**. Our state also uses federal and EU funding to promote measures in a targeted manner. We are supporting projects in the sciences, at small and medium-sized enterprises (SME), and in our own administration.

How can we use AI to optimize the routes used by the global shipping industry in order to **save enormous amounts of fuel and CO_2**? How can we use AI to optimize the **supply and demand for blood donations**? How can we make it possible for the small and medium-sized enterprises in our state to **use AI in their processes** so they can manufacture even more efficiently? And how can we make our own **administration even more transparent and resident-friendly**? There are answers base on algorithms to all of these questions.

We would like to present a small selection of these projects to you to show you some examples of how AI is helping make our state **fit for the future**.

Artificial intelligence, data-guided governance, and even quantum computing all sounded like science fiction not too long ago, but they are now being used in governance processes.

I hope you enjoy reading our publication and look forward to holding exchanges and discussions about the topic.

Sincerely,

Dirk Schrödter
Head of the State Chancellery

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Content

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01 Introduction

As a result of the constantly increasing performance of computers, which continually improves the availability of data and promotes progress in algorithm programming, **artificial intelligence (AI)** has become one of the **most significant technologies of the 21st century**. AI makes it possible to purposefully evaluate enormous quantities of data in order to provide efficient solutions for scientific applications, the economy, and administrative areas.

Like all other topics in digitalization, artificial intelligence is not an end in itself. Instead, AI helps make it possible to achieve political, economic, and social goals more efficiently. These goals include ensuring affluence, the competitiveness of Schleswig-Holstein's economy, resident-friendly policies and administration, and sustainable development of the state.

The state government recognized the importance of AI early on and adopted an AI strategy called the "Strategic objectives and areas of activity for Schleswig-Holstein" back in June of 2019. Since important measures from the strategy that was published in 2019 have already been implemented, it is time to update this framework for action.

▶ We define artificial intelligence as **highly developed software systems that are capable of learning and being trained in order to master complex tasks**. The fields of application include image, speech, and text recognition, as well as robotics.

02

Artificial Intelligence **in the Federation and the EU**

According to the European Commission (COM), the next decade is going to become a **"digital decade" for the European Union (EU)**. Digitalization and the promotion of research and innovation are therefore among the COM's top political priorities. They are going to become **the driving force behind Europe's social and economic recovery** after the corona pandemic, push forward the green and digital revolutions, and also serve as **means of promoting Europe's strategic sovereignty**.

In March of 2021, the COM presented a **strategic paper for Europe's digital transformation** until 2030 with the title "2030 Digital Compass: the European way for the Digital Decade." The development and usage of artificial intelligence (AI) also plays an important role in this paper. **By 2030, for example, approximately 75 percent of European companies** are supposed to use cloud computing services, big data, and AI systems. Where AI is concerned, the COM has already determined the cornerstones of a European approach to developing and promoting a sustainable, trustworthy, inclusive, and human-oriented AI. **In April 2021**, it presented a **package of measures for AI**. Its goal is to promote the development and usage of innovative AI systems while guaranteeing security, supporting basic rights, and, at the same time, stimulating innovation and investments in AI across the EU. A proposal for an AI act and a new coordinated plan for AI are the core points of the package. **The goal of the new AI act** is to provide answers to the risks issuing from AI systems (such as face recognition) in the scope of a value-based regulation framework.
For this purpose, the COM proposes an approach involving graduated levels of regulation that depend on the level of risk AI systems pose to security and basic rights. The scope of constraints ranges from bans on high-risk technology to strict usage conditions and transparency obligations to free usage of AI systems that present only a low level of risk.

The new coordinated plan for AI elucidates the **measures and investments** that both the EU and the member states need to make in order to strengthen **Europe's competitiveness and strategic sovereignty** in the field of innovative AI technologies. Among other things, favorable prerequisites for developing and using AI in economic and social contexts need to be created for this purpose. Other measures include expanding capacities for research and innovation, promoting talent and competence in digital matters, and strengthening the development of innovative and high-quality AI systems in strategic sectors such as **education**, **health**, **administration**, **mobility**, and **robotics**.

EU funding is available for the European digital transformation and for promoting research and innovation in strategic key fields such as AI. In the scope of the program **"Digital Europe,"** approximately **2.1 billion euros are being provided for the field of AI** alone from **2021 to 2027**. Among other things, this funding

is intended to support the development of AI systems in the h**ealth and mobility sectors** and facilitate **cooperation among the member states**. It is also supposed to promote usage of AI at companies and in public administration. There is also funding from the development and resilience facilities, the core of the **new development fund "NextGenerationEU."** 20 percent of the financial resources (approx. 150 billion euros) is to be allocated to member state investments in innovation and the digital transformation. In addition, funding from cohesion policy programs could also come into play (for instance, from the European Regional Development Fund (ERDF)). **We want to use these opportunities to benefit Schleswig-Holstein.**

AI is also an important topic for the federal government. That is why a **national AI strategy**[1] has been drafted. Its declared goal is to make Germany a **global leader** in this technology. Specifically, it pursues the **following political goals**:

- **01** Technological leadership and the quality seal **"AI Made in Germany"**
- **02** Responsible **development and usage of AI oriented towards the common good**
- **03** Development of AI solutions as a contribution to **environmental and climate protection**
- **04** Broad **social dialog**
- **05** Structure a European **AI ecosystem** that increases the competitiveness of the economy and research, promotes various AI applications in **the interests of society**, and is based on European values

[1] Artificial Intelligence Strategy of the German Federal Government (ki-strategie-deutschland.de)

In order to achieve its goals, the European Commission has defined twelve fields of action:

- **01** Strengthen research in Germany and Europe in order to drive forward innovation
- **02** Organize innovation competitions and European innovation clusters
- **03** Transfer to the economy, empower small and medium-sized businesses
- **04** Fuel start-up dynamics and lead to success
- **05** Shape structural change in the employment market and the world of work
- **06** Improve training and acquire specialists and experts
- **07** Use AI for official tasks and adapt competences in administration
- **08** Make data available and facilitate its use
- **09** Adjust regulatory frameworks
- **10** Set standards
- **11** Create national and international networking
- **12** Conduct dialogs in society and further develop the political framework for action

When this strategy was updated in December 2020, the funding for implementing it was **increased from three to approximately five billion euros**.

03

The AI Ecosystem in Schleswig-Holstein

Many different small and medium-sized companies in Schleswig-Holstein use AI. One of the state government's specific goals is to **connect companies with one another and with the sciences** in order to create the greatest possible value. In the year **2020**, the **KI-Transfer-Hub (AI Transfer Hub)** began its work for this purpose.

All of the universities in Schleswig-Holstein, including universities of applied sciences, are carrying out research with and about AI. Several work groups are among the international **leaders in research**. Schleswig-Holstein's institutions of higher education contribute to the transfer of knowledge between the sciences and the economy.
The **Mittelstand-Digital Zentrum Schleswig-Holstein** (Schleswig-Holstein Digital Center for Medium-Sized Enterprises) **at Kiel University of Applied Sciences and the KI-SIGS Consortium** (AI Space for Intelligent Health Care Systems) play a considerable role in this process, for example.

The **core scientific topics of AI research** include not only the fields of medicine/health but also promising approaches in ocean research (such as underwater robotics), **autonomous shipping**, and **smart cities**.

In a comparison of the federal states, Schleswig-Holstein has a **very large number of university places in informatics**, which means the state is **in a good position** to expand AI knowledge. It also has a very active **digitalization network** that meets up at events such as BarCamps or the **Waterkant-Festival**[2].

Start-ups receive support and help from numerous consulting offerings, such as in the scope of **Startup.sh**[3]. Several **digital hubs**[4], the cluster Digital Economy Schleswig-Holstein (DiWiSH), **Fablabs in Lübeck**[5], **Kiel**[6], and **Flensburg**[7], and various **co-working spaces**[8] provide good networking opportunities and **points of contact** for an AI ecosystem.

2 waterkant.sh
3 startupsh.de
4 umap.openstreetmap.fr/de/map/digitale-knotenpunkte-in-scHLESWIG-HOLSTEIN_293372#9/53.9650/10.4979
5 fablab-luebeck.de
6 fablab.sh
7 hs-flensburg.de/hochschule/organisation/einrichtungen/fablab-ideenreich
8 coworkland.de

Map of Schleswig-Holstein © freepik.com/katemangostar

04

Strategic Objectives for Schleswig-Holstein

Schleswig-Holstein is shaped by its **special position as a small state** between the metropolis Hamburg and its Danish neighbor, as well as **an economy that is characterized by small and medium-sized enterprises**.

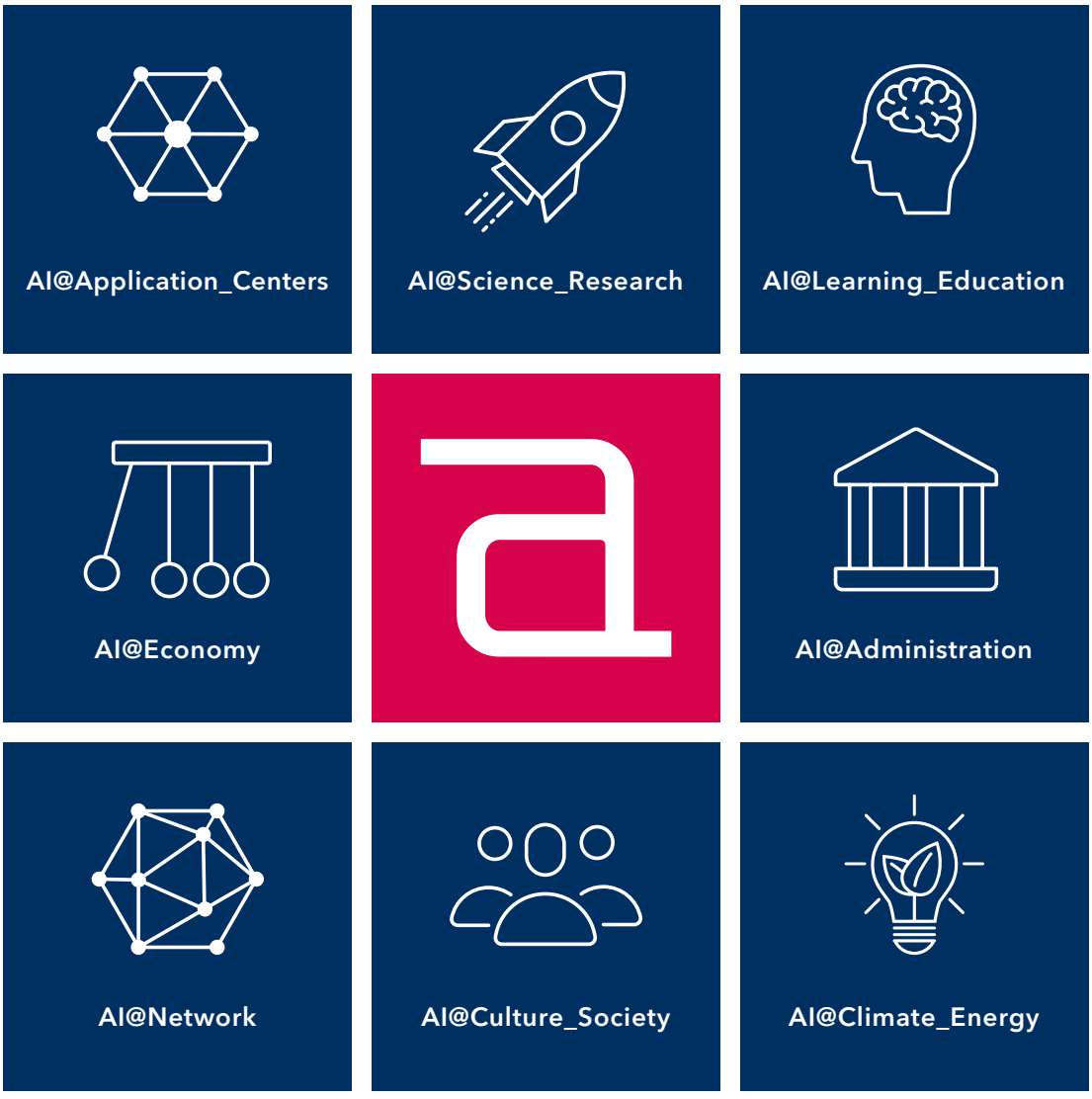
The order of values in the Basic Law for the Federal Republic of Germany and the common European values plays a special role in the development and usage of AI.
"AI made in Schleswig-Holstein" stands for innovations and application orientation in the scope of sustainable growth and in compliance with data security. It also represents a fair and participatory approach **based on humanistic values** with the goal of acting appropriately for members of all genders in various manners and across all social groups. The stakeholders from the sciences, the economy, and civil society will be closely involved in AI policies in the future as well. **The state government is pursuing the following strategic focus in the process:**

- Schleswig-Holstein is supposed to become one of the **most active federal states** where the use of AI is concerned. To this end, the state government is providing support for use of AI to improve the competitiveness of small and medium-sized companies.
- We want to make it possible for a large part of the population to **interact constructively but critically with the topic of artificial intelligence**. We want to make it possible for people to experience AI in order to increase its acceptance in the population.
- Schleswig-Holstein is going to become **even more attractive** as a location for **founding companies and experts**, especially where AI is concerned.
- Schleswig-Holstein will **have protected data platforms** for practice and research purposes.
- Schleswig-Holstein champions usage of AI that focuses on its benefits for people. **Important guiding principles for the state government are:**
  - The primacy of human action and human supervision
  - Technical robustness and security
  - Consideration of privacy and data quality management
  - Transparency and accountability
  - Consideration of social and ecological well-being
  - Acknowledgement of diversity and, accordingly, the requirements entailed by non-discrimination in particular and AI fairness – "made in Schleswig-Holstein"
- In selected fields of artificial intelligence research and during the process of connecting AI with learning, digital learning, and human-machine interactions, institutions of higher education in Schleswig-Holstein are going to gain **global visibility** and work together with companies to translate this competence into **added value**.
- With the goal of creating an even more **efficient and resident-friendly administration**, the state administration is going to be a national pioneer in the use of AI and better use of data with the data privacy standards and guidelines established at the European level.
- Use of AI should contribute to **Schleswig Holstein's sustainable development**. Support is being provided for AI solutions to the main challenges posed by climate protection and the energy revolution.

05

AI Fields of Action

Based on the strategic objectives,
the following eight fields of action can be derived:



AI@**Science_Research**

We are going to **continue to strengthen top-level research** and systematically **harness** its findings regarding AI for our institutions of higher education and extra-university research facilities.

A new level of quality and intensity of interdisciplinary cooperation at the campus locations and transfer to society needs to be achieved for this purpose. The understanding that **AI is significant in all scientific disciplines** is becoming more prevalent.

That is why we are encouraging institutions of higher education to bundle existing competences and work groups and thereby give them greater external visibility. We are explicitly calling upon the non-technical disciplines to help achieve this. We want to discuss the **digital transformation focusing on AI** in a **strategic process with institutions of higher education** and develop it further.

AI@**Learning_Education**

As a basis innovation, AI will have **significant effects on human learning**. At the same time, an increasing number of professional fields will work with AI.

That is why we are advocating that all pupils and students in Schleswig-Holstein **receive basic education in the analysis, usage, and evaluation of data**. Knowledge of AI should be taught across all disciplines at our institutions of higher education. AI technology should also be made available at a low-threshold level in non-technical disciplines.

Furthermore, fields of competence and abilities (including critical thinking) need to be adapted to the requirements of a **world of learning and working that is oriented towards AI**. Our goal is to make more pupils fit in critical and constructive interactions with AI and to win over students to help actively develop AI. In order for this to happen, all phases of **faculty training** must be **further developed** appropriately as well.

In addition to the classic formats, **e-learning and blended learning** are becoming increasingly important. We want to benefit from the chances they offer in all fields of learning. In the process, we are also going to consider the **chances and risks posed by learning analytics**.

AI@**Economy**

Not only have we made Schleswig-Holstein the **federal state that is friendliest to medium-sized enterprises**, it is also taking on a **leading position in the use of AI** in small and medium-sized enterprises.

AI technology is already a **firm component in the research aspirations at our institutions of higher education**. These institutions continually enrich our wealth of knowledge. Ensuring a transfer of this knowledge to the companies in Schleswig-Holstein is a decisive component in creating added value from it. That is why **the KI-Transfer-Hub (AI Transfer Hub)** was launched in 2020. The hub shows small and medium-sized enterprises how they can use AI meaningfully. Schleswig-Holstein therefore has another important tool in addition to the **Mittelstand-Digital Zentrum Schleswig-Holstein (Schleswig-Holstein Digital Center for Medium-Sized Enterprises)** at Kiel University of Applied Sciences and the **economics cluster DiWiSH (Digital Economy Schleswig-Holstein)**, to help it promote digitalization and the use of AI in the economy.

The following examples from practice are convincing. Examples like these are numerous, and they need to become **even more well known**. However, we also want to continue to support communication about experiences among our commercial enterprises. We want to provide a **platform** for all of these important **communication relationships**.

Usage of AI will also lead to profound changes in the world of work. Much like the Industrial Revolution, this **technological change** will have a very wide range of effects on different groups of employees. This change process needs to be structured for the benefit of employees as far as possible. The fact that AI is taking over routine tasks needs to be considered in employment market and training policies because job profiles are going to change considerably. Some professions will cease to exist, and others will be created.

Today it is difficult to imagine an industry in which AI applications do not play a role. That is why we believe professional training needs to encompass both a basic technical understanding of AI applications and critical/constructive interaction with these systems, and we want to realize this.

AI@**Administration**

Public administration fulfills its tasks based on rules and regulations. That means work performed in public administration can be **supported and expanded by using intelligent systems** in organization, planning, and decision-making processes. The state administration plans on further augmenting its role as a **pioneer in the use of AI systems** by doing so.

In modern administration, the state government relies increasingly on the **possibilities offered by data-based decisions**, also referred to as data-guided governance. We are going to improve the exploitation of internal and external data for decision-making processes and **make it usable**. Our aim is to increase the effectiveness and efficiency of administrative action by purposefully using resources. In this context, we will check which processes are suitable for automation in the medium term and in which fields technology can support decision-making processes. The kind of data that will be required to make good decisions also needs to be anticipated in the process. Our goal is to offer citizens **improved administrative services** as a result. AI's fields of application in administration include chat bots and digital language assistants; classification of text data, image data, and sound data; RPA (robotic process automation) applications; and analyzing sensor data from the Internet of Things/IoT.

Freedom from discrimination is an especially important aspect for AI applications in administration in particular. Already in the development stage, such as during the selection of test data, it is necessary to ensure that AI results do not further entrench existing inequalities between men and women – or avoid addressing them.

For administrative employees, the introduction of the new systems leads to changed requirements at the workplace. We are going to make our colleagues fit for this change process by implementing targeted training and personnel development measures.

AI@**Application_Centers**

AI application centers contribute to the development and permanent implementation of an **ecosystem of innovations** and thus help transform Schleswig-Holstein into a **flagship region for AI**.

The EU supports AI application centers that are supposed to benefit the state. To realize these benefits, we communicate with our institutions of higher education and companies I norder to create instruments that can be used to further strengthen Schleswig-Holstein as an economic center. We want to equip our small and medium-sized enterprises with a **set of tools** they can use as needed to find solutions. We are going to make the offer adaptable by having the most important clusters address a wide range of topics, **such as nutrition science**, **maritime industry**, **life sciences**, and **digital economics**. When doing so, we are going to pay special attention to the core topic of sustainability by emphasizing **climate research** and addressing the energy revolution and efficient, **climate-friendly agriculture**.

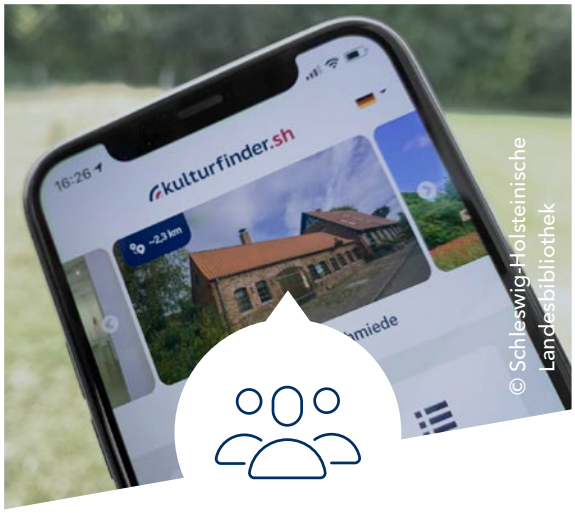
Establishing application centers requires a closely coordinated procedure involving the state chancellery; the Ministry for Education, Science, and Culture; the company Wirtschaftsförderung und Technologietransfer Schleswig-Holstein GmbH; and the **KI-Transfer-Hub (AI Transfer Hub)** that clearly establishes task allocation among the various players early on and avoids double structures.

AI@**Network**

A large number of people, ideas, and projects already involve AI today in Schleswig-Holstein's economy, scientific fields, and civil society.

We are going to **continue promoting** this networking and, in the process, push forward the social dialog about usage of AI.

At the same time, we are seeking **collaboration with other federal states**, the Baltic region, our partners in San Francisco, and other partner regions in the country in order to **achieve more together**.



AI@**Culture_Society**

Using AI entails **enormous chances** but is indisputably associated with risks. To date, there have been no reliable quality criteria and testing procedures for AI systems. That is why Schleswig-Holstein is welcoming the development the federal government has launched with its **standardization roadmap for artificial intelligence called "Normungsroadmap Künstliche Intelligenz[9]."**

The state government has consulted the AI expert committee that was established **in 2020** concerning all of these issues. The committee consists of representatives from institutions of higher education, the economy, and significant social interests. One important finding from the consultations with this committee is that **AI that people can experience in everyday life plays an important role** in reducing reservations against this technology. That is why the state government has decided to establish AI systems in cultural facilities and thus create **tangible experiences for citizens**. We are going to continue down this path. The propagation of AI applications in administration, such as the use of chat bots for communication, will support this process. **Freedom from discrimination** is not only a technical but also a social and political challenge in this context. Our society is **diverse**. Not only the results of AI calculations should and must be free of discrimination. We want the use of AI technology **"Made in Schleswig-Holstein"** to contribute to equal opportunity.

There are plans to implement changes in the legal framework concerning the approval of automated decisions in the medium term. The purpose of subsequent evaluations is to guarantee that the technology fulfills our high expectations.

[9] AI standardization roadmap (din.de)

AI@**Climate_Energy**

Reducing CO_2 emissions in the fields of power generation, heat generation, and mobility is one of the **greatest challenges of our times**.

Artificial intelligence can help us achieve these goals. **Smart grids** support the security of supply and resilience of power networks. **Smart mobility concepts** increase the efficiency of the traffic sector.

Among other things, the state will help the municipalities in this field by ensuring that all traffic data – both on the supply side and anonymized usage data – is provisioned in the state's **open data portal** and taken into consideration when licenses are awarded to traffic companies in the future.

06

Measures

In order to achieve the aforementioned strategic objectives, measures have been defined in the main fields of action.

They are not conclusive. Instead, they are geared towards their significance for achieving the goals and their implementability.

At the same time, this means the process is open for new strategic measures that the state government or third parties initiate at a later point.

The state government is thus **addressing one of the most important topics of the future** and setting developments in motion. Their results will not be visible for a few years or decades, but they will **create added value for the state**. ▶

Stabilizing the KI-Transfer-Hub

The KI-Transfer-Hub (AI Transfer Hub) has proven its value. Through both its wide offering of informational events and workshops about different core AI topics and a large number of intense initial discussions, the KI-Transfer-Hub has already succeeded in forming the **foundation for many AI applications** in small and medium-sized companies. Thanks to the comprehensive support that, in particular, includes conducting scientific feasibility studies, networking project partners, and providing support during funding projects, **projects are being initiated and added value is being made possible** in a wide range of domains. In addition to these activities, the KI-Transfer-Hub (AI Transfer Hub) is succeeding in making AI applications visible in its network. By doing so, it helps additional companies open up to this key technology and plays an important role in **expanding the AI ecosystem in Schleswig-Holstein**. That is why we not only want to further support the Hub at its locations in Kiel and Lübeck but also aspire to **expand it to the northern part of the state and the West Coast**.

Application Centers

The **creation of an AI application center** is supposed to help small and medium-sized enterprises **gain access to AI research** and development at the institutions of higher education in Schleswig-Holstein. Specifically, **projects or project ideas from the economy** are to be analyzed in the application centers and optimized or further developed cooperatively during transfer projects.

The planned AI application center is organized as a state-wide unit distributed among several university locations where AI expertise and, if applicable, technical capacities as well are bundled, used in application-related manners, and further developed. This guarantees the companies that use these resources **access to current scientific findings and methods**. The AI application center therefore serves purposes of developing and permanently implementing an innovation ecosystem for topics related to AI and **more profound digitalization competences**. The establishment of application centers represents a chance for rounding out offerings for the various essential users as a whole. Thus, during both the **further development of the KI-Transfer-Hub (AI Transfer Hub)** and the establishment of the application centers, we will need to ensure that we **allocate tasks efficiently** and create **custom offers** in order to **create the best possible value for our federal state**.

02

03

Supporting Technology

Since October 2020, Schleswig-Holstein has had a **funding guideline** that makes it easier for our companies to **begin their journey in the world of AI**. We want to equip this funding instrument with the **necessary budget resources**.

Expert Committee for the Social Consequences of AI

We will continue to discuss the social consequences of AI with **experts** on a regular basis. These experts advise the state government concerning usage of artificial intelligence for the common good in Schleswig-Holstein. To this end, it is necessary to consider the core components formulated by the EU: **transparency**, **accountability**, **non-discrimination**, **data quality management**, **technical robustness**, **ecological well-being**, and the **primacy of human action**. The target image and position papers should serve as guidelines for **"AI made in Schleswig-Holstein"** and act as a beacon beyond our state borders.

04

Data Strategy

Data is the raw material of AI applications. The state is going to address this important topic with even greater intensity in the future. We have been inspired by the federal government's data strategy, which is why we want to work together with the other states to develop **our own state data strategy** that describes how data from the public sector can be used to create added value, among other things.
The **open data portal** is going to be a considerable building block in this process. It constitutes a growing, solid data basis for developing and training AI applications. Citizens, companies, associations, and research institutions can not only **view data records** concerning numerous topics in the portal but also **supply data** themselves in the future and thus contribute to the **platform's growth**.

06

Social Acceptance of AI

Inspired by the Finnish strategy and its goal of reaching one percent of the population with an online **AI course**[10], Schleswig-Holstein is going to develop an **online course for the general population**. It is going to be differentiated for various target groups (such as SMEs, administrative employees, "for everyone"), relate to Schleswig-Holstein, and have a completion certificate that is acknowledged. In this process, we will seek collaboration with existing training and further education modules, as well as those that are currently being developed, such as **KI#CK**[11] from the Life Science Nord Cluster.
In addition, **physical spaces such as future laboratories**, **maker spaces**, and **digital hubs** need to be made capable of giving interested people a look at the possibilities offered by AI technology. The success of the two state AI conferences shows that there is **considerable interest** in the topic. We are going to create additional formats to **intensify the social dialog process concerning AI**.

[10] elementsofai.com [11] lifesciencenord.de/kick

07

Professional Training

AI needs to be addressed in professional training programs as well. The specialist requirements at vocational schools need to be adapted, and teaching staff needs to be qualified **through continued education offers.**

08

Use of AI in Administration

The program **AI@Administration (KI@Verwaltung) has been launched successfully** and is going to be expanded through additional projects. Currently many different applications are coming into being, such as automatic speech recognition for the police and judicial sector and image recognition for tree population analyses at the State Office for Surveying and Geoinformation.
One important principle is guaranteeing data privacy: citizens' data must not be transmitted to service providers for processing purposes if these providers do not comply with the European data privacy standards. Processing within Dataport's data center is the preferred method. That is why, generally speaking, there are plans to equip Dataport's data center with standard, innovative, and experimental forms of infrastructure so that it is **"capable of AI."** Doing so will expand the infrastructures for chat bots, language recognition systems, and basic text recognition services. The state government is assisting Dataport in its efforts and welcomes the planned creation of a new area where AI and data analysis are bundled.
The implementation of AI systems also entails significant changes for state administrative employees. The state government responded to the changing requirements for employees early on by implementing the program **"digifit."** For the future, it will be necessary to firmly establish the continuing education measures and add AI topics to them. In addition, we want to **add AI topics to the training programs** in the state administration.

09

Schools and Studies

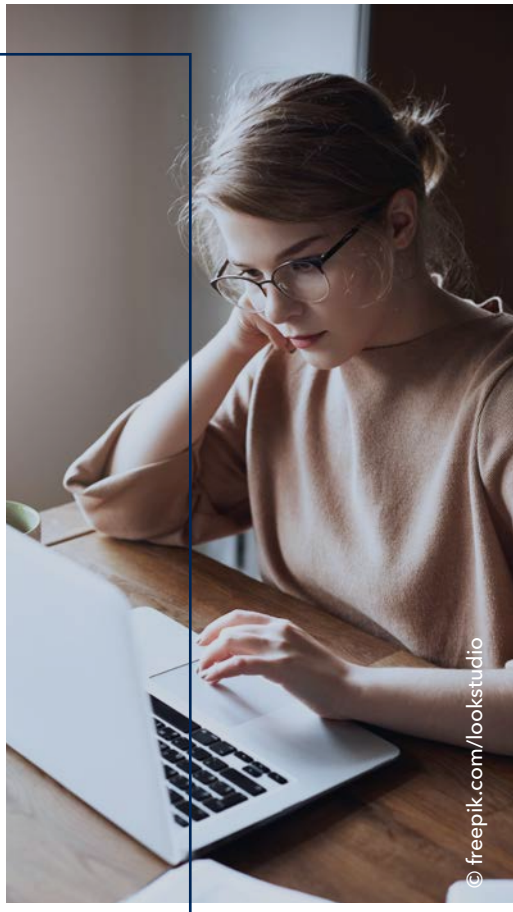
The field of education plays a particularly important role **in the journey towards becoming a model AI region**. We want to use the following measures **to make sure we are fit for the future**:

- **Add AI to teachers' training**, including blended learning methods.
- **Implement informatics as a mandatory subject** for 7th and 8th grade starting in the school year 2022/23.
- **Modify the existing discipline requirements** at schools to convey pupils a basic technical understanding of how AI applications function. At the same time, pupils should acquire the skills required to constructively and critically address the chances and risks posed by AI systems.
- **Create new and expand existing extracurricular learning offerings** in the field of AI for pupils and students.
- **Create appropriate continuing education offerings for teachers** or expand them.
- **Identify the areas in which the use of learning analytics systems can help improve learning success**, taking the associated risks into consideration. Specifically, here we want to promote scientific accompanying research using concrete, practice-oriented application cases.
- **Hold a dialog with institutions of higher education about creating interdisciplinary fields** or core areas in all study programs that make it possible to engage with AI technologies, such as in law school, informatics, the natural sciences, and health care.

10

Strategic Process for Developing Institutions of Higher Education in the Digital Transformation with a Focus on AI

The state government supports and addresses the **development of curricula and strengthening students' digital literacy** in the scope of a strategic process together with Schleswig-Holstein's institutions of higher education. That means promoting digital competences as the basis of interaction with AI as well as discussing interdisciplinary topics that are relevant to AI, such as new approaches for **more self-driven, interdisciplinary learning fueled by curiosity** at institutions of higher education and improving MINT skills, even in unrelated subject areas. A **healthy learn-life balance** in the digital age and the necessity of new digital ethics in handling big data and AI are part of this process.



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07

Annex

Brief Presentations: AI Projects in Schleswig-Holstein

Schleswig-Holstein has set itself the ambitious goal of taking on a leading role in the field of artificial intelligence. For this purpose, the state government adopted a framework for action for using AI in Schleswig-Holstein back in June 2019, the "Strategic objectives and areas of activity for Schleswig-Holstein." **A budget of approximately 45 million euros** was provided in order to achieve the goals it defined. A series of projects has been initiated through this funding.

Some example projects are presented below. ▶

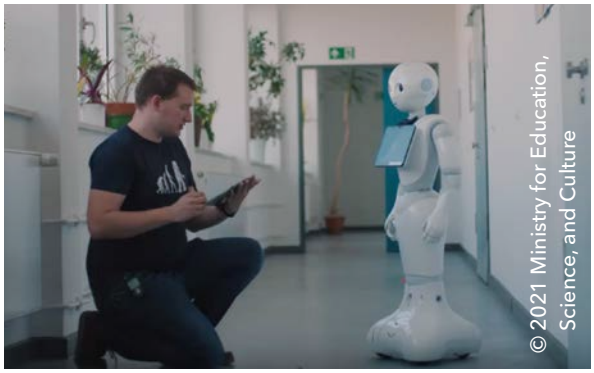
1 Ministry for Education, Science, and Culture – "Future Skills" Teaching and Learning Platform

The project "Future Skills" is creating an **interoperable, cross-institution educational platform** for Schleswig-Holstein. Its content is also supposed to be made available to all members of institutions of higher education in Schleswig-Holstein. **Creditable learning content and free licenses** are among its important goals.

The platform will make it possible for teachers and learners at all institutions to acquire **essential skills for the digital world of work and life**. It offers courses in entrepreneurship, innovation management, IT security, or MOOC Maker, for instance. The project also **focuses on basic training in artificial intelligence** that involves both university content and external content. The goal is to support individual learning experiences by providing a very good user experience. Technical developments, such as recommendation systems and automated learning support, play an important role in the process.

The **Future Skills Platform** relies on networking and scaling. Teaching and learning at institutions of higher education are going to be raised to a new level featuring many possibilities by connecting existing technical learning space systems. The Future Skills Platform is triggering a **change process at the institutions of higher education in Schleswig-Holstein**.

Thanks to the learning research accompanying the project and being carried out at exceptional institutions, such as the Leibniz Institute for Science and Mathematics Education (IPN) and the nationally renowned Institute for Interactive Systems (ISy) at the TH Lübeck (Lübeck Technical University), there is a very good chance that **Schleswig-Holstein will be transformed into a learning hub in the digital age**. Together with additional parties involved in Schleswig-Holstein's educational sector, perspectives for a network for acquiring basic digital skills are being established.



2 Ministry for Education, Science, and Culture – Digital Learning Campus

The basic idea behind the Digital Learning Campus is that all learners at all educational facilities or who are working will need **new places of learning for basic modern training** so they can continually learn **new digital and technological skills**.

That is why places of learning, laboratories, and application centers for digital applications and technologies are being defined and created at all institutional locations in the Digital Learning Campus. Students, instructors, freelancers, employees, and pupils should be able to use it in equal measure. The goal of the Digital Learning Campus is to make it possible for these groups to access gaming, film and video production, avatar development, or coding and be able to realize projects in collaborations between the economy and the scientific world. Furthermore, the campus will also enable and support exchanges, transfers of knowledge, and collaborations among the different user groups in common learning fields.

The establishment of an innovative network in the field of AI transfer bundles the AI competence in the state and makes it visible as a beacon beyond state borders.
The project's mediate goal is the **transfer of knowledge and technology concerning AI and applications** from applied scientific research to companies and start-ups, as well as networking stakeholders. That way, they can implement their own innovative products and services, **improve their competitiveness**, and **secure jobs in the future**. That is because AI can improve the products and services in an industry to an extreme degree or even make completely new solutions possible. Very good examples of this are speech recognition algorithms and the assistants based on them or the use of pattern recognition algorithms, such as in medical image processing. Furthermore, AI is going to revolutionize the way (IT) systems are currently built.

KI TRANSFER-HUB.SH

3

Schleswig-Holstein KI-Transfer-Hub

The primary goal of the Schleswig-Holstein KI-Transfer-Hub (AI Transfer Hub) is to **establish a national AI ecosystem in the field of AI transfer**. The aim is to open up Schleswig-Holstein's economy for the application of AI technologies as an **important factor in future innovative and competitive capabilities**.

Most information processing programs are still programmed by people today. However, the future belongs to the learning systems that have only a manually programmed basis and, beyond that, constantly acquire new knowledge and use it for optimum operations.

Seven partners are involved in Schleswig-Holstein's KI-Transfer-Hub project:

01 Kiel University

02 Kiel University of Applied Sciences

03 Mittelstand-Digital Zentrum Schleswig-Holstein (Schleswig-Holstein Digital Center for Medium-Sized Enterprises)

04 Technische Hochschule Lübeck (Lübeck Technical University)

05 The company UniTransferKlinik Lübeck GmbH

06 Lübeck University

07 The company WTSH GmbH

4

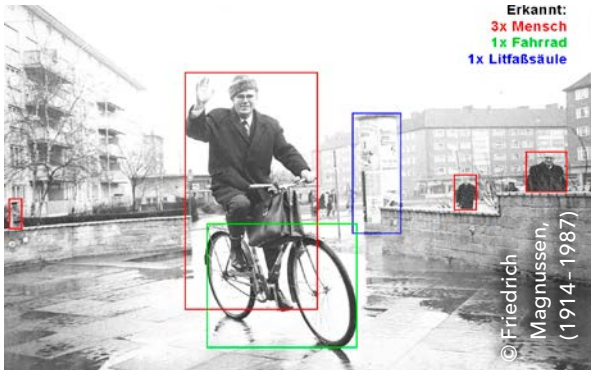
University of Lübeck – Establishing a Branch of the DFKI

The German Research Center for Artificial Intelligence (DFKI) is the largest industry-oriented research institution in Germany in the field of AI-based software technologies. The projects address an extremely wide range of topics ranging from application-oriented foundational research to market- and customer-oriented development of product functions.

Since January 1, 2021, the DFKI has had a branch in Lübeck that is adding the usage of **AI methods in medicine and medical technology** to the center's portfolio. The state of Schleswig-Holstein is supporting the establishment of the branch in Lübeck until 12/31/2023 by **providing a total of three million euros**. This branch is going to contribute to networking in the field of AI both within Schleswig-Holstein and throughout the entire federal territory.

5 Schleswig-Holstein State Library – AI at Cultural Infrastructure Facilities

The goal of the project "KI in Einrichtungen der kulturellen Infrastruktur" ("AI at Cultural Infrastructure Facilities") is to investigate **possible applications for AI in cultural facilities**, identify best practices, and document application experience. Cultural institutions receive help when formulating their strategic objectives and implementing them. **Recommendations for cultural policies** are developed based on these findings.



AI-based image recognition – photo from Kiel City Archive

The aim is to use AI applications to improve the quality of offerings at cultural facilities, for example, by using **AI-supported market monitoring and analysis** to create and re-conceptualize offers for wide ranges of user groups. Needs-appropriate staff deployment is also calculated, for instance, which creates latitude for the core tasks of cultural facilities. Other approaches focus on ways of experiencing culture, which could also be adapted to the respective wishes and expectations using AI-supported systems. Initial findings are compared and discussed with cultural sectors from other federal states and also presented to a broader public during online conferences.

As a result of the project, an **active, national network** with players from the field of culture, AI, and digital affairs is taking place. Through both cooperations and individual publications in the field of cultural policy and culture management, a network for **"AI in culture"** is being systematically established. The social dialog about AI is thus being driven forward not only in Schleswig-Holstein but throughout Germany. This is also making a significant contribution towards **establishing an awareness of the benefits of AI applications** in the cultural scene. As meeting centers, forums for exchanges, and spaces that enable social participation, places of cultural education are predestined to spread this awareness to the rest of the world.

6 Institute for Quality Development an Schools in Schleswig-Holstein – 120 Words per Minute – a Training App for Basal Automated Reading

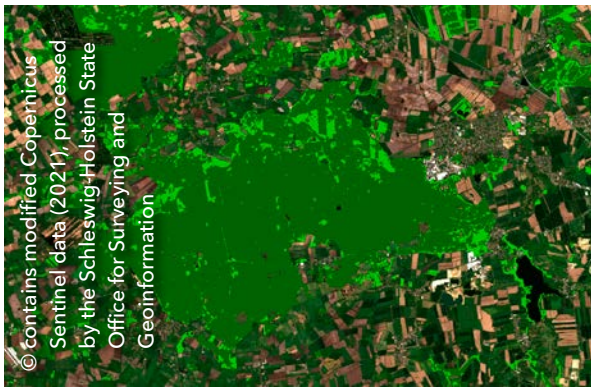
Studies for recording **pupils' basic skills** demonstrate that their **reading skills are continually deteriorating**. Particularly weak readers are becoming even weaker.

The purpose of the project "120 Words per Minute" is to break this vicious cycle. 120 words per minute is the target speed children should have reached by the end of the fourth grade. However, **around 20 – 30 percent of pupils** remain considerably below 100 words per minute and often do not improve this rate later on during school. An **app** is going to be developed that maps **all phases of the program "Lesen macht stark" ("Reading makes you strong")** – training for the 1st and 2nd grades that is used in printed form in over 100 schools in Schleswig-Holstein. In particular, it will make the level check the children use to verify their reading skills superfluous using an **AI algorithm – speech to text**. The children can practice in tandem or alone. A parent mode is also planned to allow pupils to do additional work at home or distance learning. Teachers can use the app continuously during education starting with the first training sequence.

It is expected that using the app will **promote both reading fluency and the implementation of a material-supported diagnostic and support program** at school when children learn to read.

7 Schleswig-Holstein State Office for Surveying and Geoinformation – KI4Forst – Monitoring the Forest with Satellite Data and AI

The state government and state forests intend to **increase the amount of forest in Schleswig-Holstein from 11 percent to 12 percent** and thereby contribute to climate protection.



Classification of deciduous / pine forest in Segeberger Forst (Segeberg Forest), background: sentinel 2 recording from May 2018

Through the development of an automated process chain, the project KI4Forst of the Schleswig-Holstein State Office for Surveying and Geoinformation (LVermGeo SH) is supposed to be able to detect **forest areas and changes to them** using **deep learning techniques** and present them on maps. Using the evaluations of the satellite data, it should then be possible to localize and assess the vegetation state and any damage (for example, as a result of drought or bark beetle infestations), as well as take targeted measures. Based on an artificial neural network (ANN) from the field of deep learning, an image classification algorithm is developed and implemented in an automatic process chain for processing satellite data. The trained ANN is able to automatically recognize forest in new data and differentiate between deciduous and conifer forests.

8 ane.ernergy GmbH – PEER – Platform for Renewable Energy in the Region

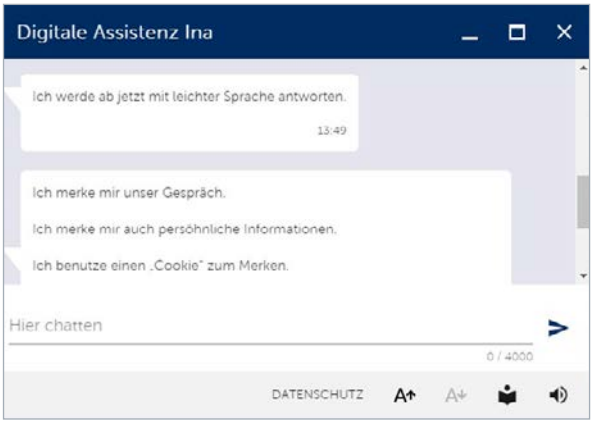
As the importance of renewable energies (RE) increases, more attention is being paid to integrated, coordinated behavior of active players on the generation and consumption side.

For the energy revolution to succeed, the interests and interactions of the network participants must be coordinated, especially at a regional level. Managing various forms of data in the (regional) network from a wide variety of RE plants (most of which are small), interested parties, customers, various needs and products – combined with the energy market roles of generator, supplier, and consumer – **requires highly innovative database and IT solutions**. Dynamic storage in an intelligent database and presentation alone would constitute an important step, but the decisive factor is actually **methodical data analysis** and the **generation of integrated customer solutions using artificial intelligence** as a learning system on an innovative platform.

Based on this, ane.energy GmbH is developing an **intelligent platform for renewable energy** in the region (German acronym: PEER). The project is (as of July 2021) in the **surveying phase**, involving systematic recording and structuring of the existing master and movement data, as well as data for RE plants, operators, customers, needs, and product solutions. In addition, the performance and support processes are being documented, and a **market analysis on competition activities and existing product and IT solutions** is being performed. In the next step, the areas of application will be localized, and methods involving artificial intelligence will be developed for effective and efficient data analysis and product development. An integrative IT and process landscape that will constitute a firm foundation for regional supply solutions involving renewable energy will also be designed.

9 InA– The Chat Bot at the Office of Integration

The Office of Integration of the Ministry for Social Affairs, Health, Family, Youth, and Senior Citizens integrated **a chat bot into its website in February 2020**. This chat bot is being further developed in a follow-on project.

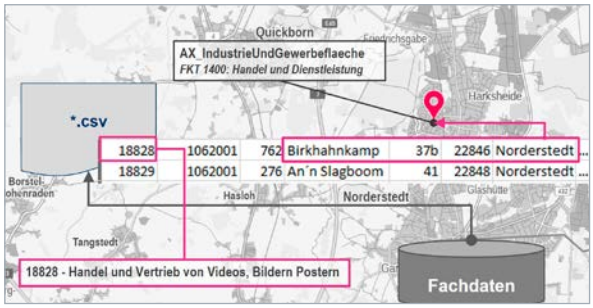


© Integrationsamt SH

Using the chat bot, people can call up **general information**, **arrange for callbacks**, and determine **time windows for contact purposes**. It is also possible to use the chat bot to submit an initial application for accompanying assistance. One challenge during the chat bot's creation was that the underlying knowledge database needed to be structured to cover a wide range of topics and specialized fields. Additionally, the bot needed to be able to recognize fields of responsibility and the heterogeneity of the user group as far as possible. That is why it was **tested and optimized** in user tests involving parties concerned.

10 Schleswig-Holstein State Office for Surveying and Geo-Information – KI4GeoSeDa – AI-Based Georeferencing of Specialist Data Pools for Semantic Data Integration

In the scope of the project KI4GeoSeDa, together with Karslruhe Institute of Technology (KIT) as the project partner, **algorithms are being developed** that operationally evaluate address data and other natural linguistic spatial references using AI methods. The goal of this process is to enable **georeferencing of specialist databases** and then semantically integrate them into the spatial base data pool of the State Office for Surveying and Geo-Information (LVermGeo SH).



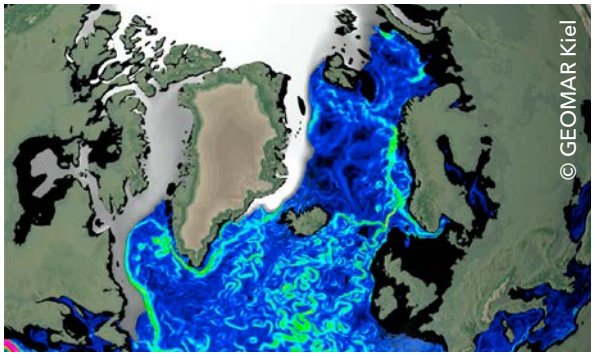
© LVermGeo SH

Specialist data pools exist in most administrative fields. Many of these registers are currently being digitized. One of them is the trade register, which is being transferred to the **digital trade register "eGewerbe SH."** In the course of such digitalization processes, it is possible to achieve **comprehensive usage** by georeferencing the data pools. For this purpose, a corresponding **address catalog in the form of building coordinates** is available as a product. This catalog is managed based on the real estate cadaster and currently comprises **approx. 920,000 address entries in Schleswig-Holstein**. Integrating eGewerbe SH into the spatial base data of the LVermGeo SH makes it possible to continually update the geodata using few personnel resources. In addition, the integrated specialist data can be used for geospatial economy and location analyses in state planning. For disaster control in crisis situations, **critical production structures** could be determined ad hoc, to mention just a few scenarios. The goal is to create nearly **complete and secure georeferencing**. AI methods are especially well-suited for this purpose, which is why they are currently being used frequently in natural language processing (NLP). In this context, as a combination of a street, house number, ZIP code, and city, invalid address information forms a signature or pattern that can be detected in the spatial base data. It is very easy to find these address patterns and structures by **using deep learning algorithms** like the ones utilized in text and data mining.

11 TrueOcean GmbH / GEOMAR – The RASMUS Research Project

Real-Time Analysis and Optimization of Shipping Routes by Linking AI and Oceanographic Models – A Step Towards Reducing CO_2 in Shipping Traffic

90 percent of world trade takes place along sea routes. According to the Third IMO GHG Study 2014, the shipping industry is one of the **world's leading producers of CO_2** with emissions amounting to 796 million tons. At the same time, the international maritime shipping industry has set ambitious goals to reduce its greenhouse gas emissions by 2030 and adapt them to the NetZero goals on the whole by 2050. **Optimizing shipping routes** and thus **reducing the fuel consumed** can lead to considerable **CO_2 emission savings**.



For a long time, we have known how large ocean currents determine the transportation of energy and water masses in the world's oceans.
These large currents, such as the Gulf Stream, have been thoroughly researched, and their basic structures have already been considered in navigation. However, surface currents are subject to constant changes over periods ranging from days to months. The significance of small-scale structures in particular, such as meanders and vortices, for the shipping industry is hardly considered, even though they exert **considerable influence** on ships' courses over ground. Therefore, we expect that **optimizing ships' routines** by considering the present ocean currents and their small-scale vortices will lead to **better fuel economy (and thus reduced CO_2 emissions)**.

The research project **RASMUS** has set itself the goal of developing a **practical and innovative AI-based application** to help support nautical fleet planning using predictions that are current to the day. The application maps these current developments and translates them into **smart route options**. On the basis of data available from operational oceanographic models, route parameters are calculated in order to **save fuel** and, in turn, **reduce CO_2 emissions**.

12 nAIture GmbH & Co. KG – Laser-Supported Weeding in Organic Agriculture

One of the **largest ecological problems** in agriculture is the use of chemical herbicides. **115,000 tons of herbicide are applied every year** in Germany alone.

This has unsettling effects on humans and nature. nAIture GmbH & Co. KG was founded at the end of 2018 and is a spin-off from a research project at the Westküste University of Applied Sciences that lasted many years.
The project is d**eveloping an autonomous weed regulation system** for organic agriculture.

© DRK-Blutspendedienst Nord-Ost gGmbH

13 geconomy – Using AI to Secure Blood Donations

Every day, approximately 15,000 blood donations are needed in Germany. Even though approximately 33 percent of the population could donate, **only about 3 percent** do so. As a result of demographic change, Germany is expected to face an **increased need for blood reserves**, since the people needing medical care are living longer, and the number of possible donors is decreasing.

Hospitals are already reducing their use of blood reserves by using patient-oriented blood management. Because there is, nonetheless, no alternative to blood donations at this time, blood donation services are facing the challenge of continuing to supply the population with sufficient blood reserves on a daily basis and in the long term.
The company **geconomy from Kiel** is a scientific service provider in the field of geoinformatics, geomarketing, and geocontrolling. Earlier, the company's main focus was on assessments from the fields of location analysis, reachability calculations, potential evaluations, and prognoses. Today, geconomy writes programs for issues such as **dynamic geo-BI applications and web-based planning tools**.

The current project encompasses an **AI-based model for spatiotemporal predictions for the blood reserve volume**. Blood donation services depend on being able to use this kind of spatial prediction model to estimate and plan the volume of donations in the short, medium, and long term so they can optimally deploy staff – the shortage of experts is increasing – and, above all, **guarantee the blood supply** by using measures designed to convince people to donate and do so regularly.

Using AI gives blood donation services support during their everyday operational work and strategically helps them fulfill their mandate of supplying the population with blood reserves.

14 Westküste University of Applied Sciences – AI-Supported UAVs for Ecological Agriculture and Forestry


© Westküste UAS

Using the BoniRobs to regulate weeds around organic carrots in the fields at Westhof.

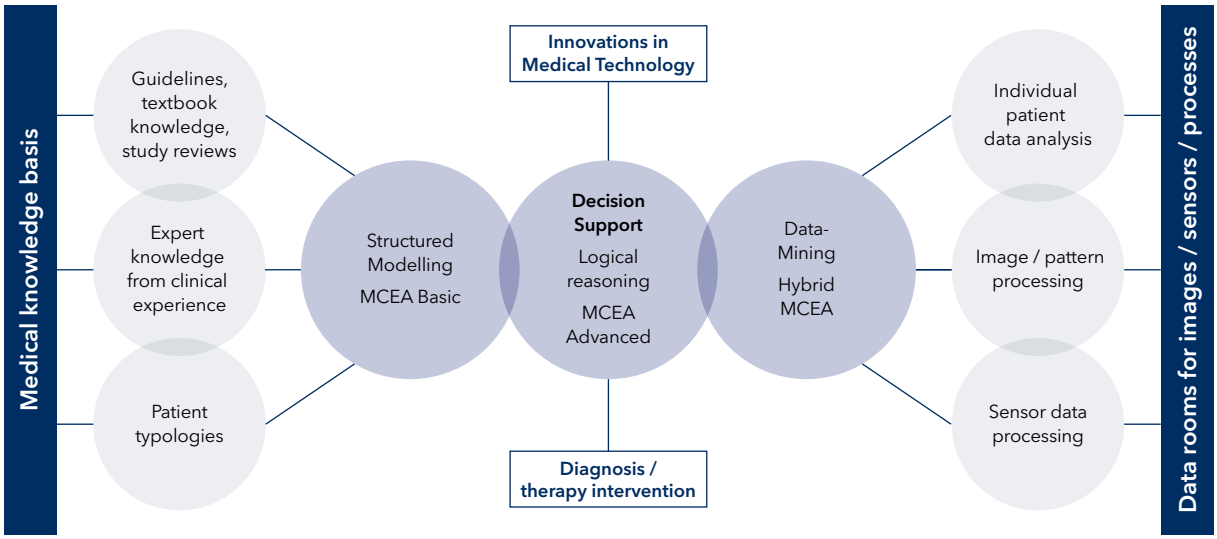

© Westküste UAS

Examining the flight behavior of a drone with moderate wind at the fields at Westhof.

The goal of this project is to examine the **transferability of the PC-based AI weed regulation system developed at the Westküste University of Applied Sciences** to a "light" low-power embedded AI system and implement it. The system is then going to be mounted on a **drone**. The project will also investigate whether it is possible to use the AI algorithms developed for **forestry** as well.

15 UniTransferKlinik Lübeck – Medical Cause and Effects Analysis (MCEA)

MCEA's AI task consists of **making it possible to structure medical knowledge across disciplines at a high level** and with an appropriate depth and breadth of the expert knowledge that needs to be acquired. It is also supposed to **expand access to specific relevant patient / case / device data and textual information**, such as medical guidelines.



To date, medical expert systems have **hardly been the object of current developments.** In addition to a lack of methodical support, this circumstance is essentially due to the fact that knowledge bases are often restricted to data issuing exclusively from the direct environment of a single isolated application topic and therefore do not map interdisciplinary matters. However, the latter become increasingly important the more complex and diffuse the medical problem field is, the less homogeneously the knowledge concerning it is structured, and whenever the knowledge in this domain only partially exists in a precise, formal way.

In order to model a structured medical knowledge basis (MCEA Basic), the **FMEA (Failure Modes and Effects Analysis) method** is being adapted to analyze complex technical systems using software and conceptionally enhanced by adding AI methods. The semantic and methodical restrictions posed by the software are being conquered with regard to different medical topics as well as case- and rule-based incorporation of data or sources of information (data spaces) for logical reasoning. Furthermore, AI-supported processing and evaluation are **facilitated through machine learning procedures (MCEA Advanced)**. Therefore, in terms of the general AI development in MCEA, the act of systematically networking (hybrid AI) a methodical expert system basis with machine learning applications with causally justified data acquisition is conceptually addressing nothing less than the creation of a universal basis for the development of comprehensive AI ecosystems using all AI methods.

MCEA is being processed by a total of **six informatics institutes at the University of Lübeck** as well as **clinics affiliated with the UKSH (University Medical Center Schleswig-Holstein)** that are **coordinated by the UniTransfer-Klinik**. The company **PLATO AG** is also involved.

16 Kiel University of Applied Sciences – AI for Target Group Segmenting and Using Measures when Dealing with Customers at the Jobcenter

AI can make a **valuable and innovative contribution** to promising solutions for **challenges and problems on the employment market**, such as during the process of reintegrating people seeking employment into the employment market.

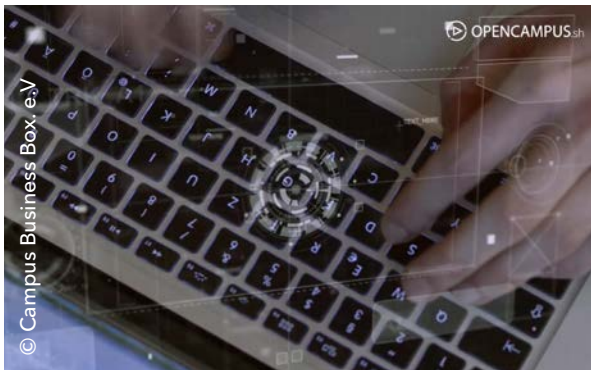
Especially in light of the current coronavirus pandemic and its effects on the employment market, which are already visible in many areas, a project like this **acquires additional meaning**.
In order to carry out integration work successfully and lastingly, it is generally necessary to **master numerous heterogeneous challenges**. Integration specialists face these challenges anew every day.

Kiel University of Applied Sciences and Jobcenter Kiel are investigating possible ways of **using artificial intelligence (AI) to improve integration work**. The Institute for Employment Research (IAB) North is supporting them by providing data and consulting. The goal of this research and cooperation project is to **develop AI-based best practices**. For one thing, they will be used to create custom offerings **for the customers at Jobcenter Kiel** and, for another, **to create IT-based solutions for its employees**.

AI algorithms and models, such as **self-organizing maps (SOMs)** are used to segment target groups. The resulting clusters then serve as a basis for deriving recommended actions for dealing with customers from the respective segment later on. Above all, AI techniques are suitable for combining several recommendations that conform to the target group and implementing them. **Reinforcement learning** in particular is a suitable procedure in this instance. It determines an action strategy based on the principle of maximum rewards, such as the success of integration measures. The IT instruments, apps, chat bots, and so on that are developed based on AI are **soon going to be put at the disposal** of both the employees at the Jobcenter and their customers.

17 opencampus.sh – MAGNET – Blended Learning for Teaching AI to SMEs and Students

The goal of this project is to develop a **new and innovative educational offering about artificial intelligence (AI)** based on the blended learning approach in the scope of the educational program hosted by opencampus.sh. **The project comprises the following essential sub-goals:**



- Realizing and testing an **innovative AI certificate program**
- **Exploratory further development** of a platform for organizing blended learning formats and including business partners
- **Connecting the educational offering to the Future Skills Platform** of the state of Schleswig-Holstein
- **Establishing partnerships with SMEs** to guarantee the educational program for the future

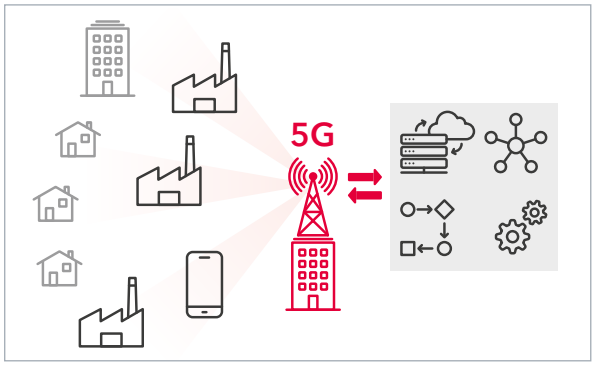
18

nAIture GmbH & Co. KG – Autonomous fawn Tracking System AROS

The agricultural industry is facing a problem: f**awns hide in fields** that are supposed to be processed by **heavy machines**.

Unfortunately, when the machines approach, fawns continue to hide in the high grass instead of running away. If this is not realized in time, machines seize the fawns and, in most cases, kill them. Even combing the fields does not always ensure that all deer are discovered.
The search for fawns currently **consumes a great amount of time and human resources**. The batteries of the drones used thus far have not had enough energy to maintain the position for the entire tracking process. Another challenge is that the search can take place **only at night or very early in the morning** so that the thermal imaging cameras can be used optimally. That results in a **short overall time window** when drones and hunters can be deployed.

nAIture GmbH & Co. KG wants to develop an **efficient technical solution** for this problem. **In this solution, a drone autonomously flies over the field to be processed and scours it**. The drone uses AI that is capable of learning to **search for hidden deer**. It is going to be developed using various sensors so the device can carry out **precise detection** during all kinds of weather and at all times of the day. As soon as the AI discovers a fawn, it sends a prepared **aerial view of the location** and the **GPS coordinates** of the fawn to a hunter and the farmer. The hunter is now able to bring the fawn to safety.



© Technische Hochschule Lübeck

19

Technische Hochschule Lübeck – AI and 5G – AI-Supported Resource Allocation in Private 5G Networks

The innovation report from Smart Service Welt indicates that mobile and dynamic radio networks are **being used increasingly in the industrial and medical care sectors** in order to make it possible to respond to changing ambient parameters.

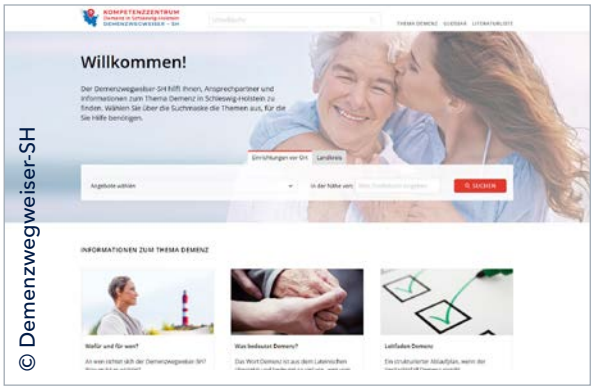
A new solution is the 5G mobile radio network that also allows for local installations called **private 5G networks**. The dynamic network configurations associated with them place increased requirements on the performance, reliability, and distribution of the communication resources that are available. AI methods are a good option not only for **better distributing communication resources** but also for structuring the highly dynamic system **more reliably**. The goal of the project is to **optimize private 5G networks with AI solutions** so that the dynamic system behavior is improved through AI-enriched transfer protocols, and the reliability is increased.

The use of AI and 5G is practically demonstrated and shown to SMEs in the laboratory network and the test field. The AI solutions can be **transferred to other fields of application**.

At Technische Hochschule Lübeck (Lübeck Technical University), a **test laboratory for 5G infrastructure** is being developed. It consists of flexible hardware and software components that are available to students and companies for training, learning, and research purposes. The measurement data will continue be available to companies and researchers after the end of the project through an **Open Data Platform**.

20 Kompetenzzentrum Demenz in Schleswig-Holstein – Demenzwegweiser-SH

"Demenzwegweiser-SH" (Schleswig-Holstein Guide to Dementia) is a **database** that is updated using only artificial intelligence. The guide to dementia provides **information about the disease and regional counseling centers, specialist doctors, forms of living and care**, and all further offerings.



© Demenzwegweiser-SH

Additionally, it provides **concise information on nursing care insurance, legal support, selected therapies without the use of medication**, and **general information on the topic of dementia**.
This guide to dementia is a **further development** of the guide that the Kompetenzzentrum Demenz (Dementia Competence Center) in Schleswig-Holstein has already published in printed form for nearly all of the districts in the state. By making countless phone calls and performing a great amount of research, the Kompetenzzentrum Demenz compiled all **the relevant data** together with nursing care facilities. It is updated using artificial intelligence that is continually further developed.

▶ demenzwegweiser-sh.de

21 University of Lübeck – Setting up a Multi-Agent Intelligent Resource Regulation Simulation for the Integration of Energy and Mobility (MASIRI)

The goal of the **interdisciplinary project MASIRI** is to construct a **multi-agent simulation** using intelligent energy agent modeling that is based on a psychological evaluation of the behavior of energy users. The project addresses the question of how **human experiences and behavior influence use of mobility and energy** in vehicle-x-grid (VxG) systems and how this knowledge can be used to **optimally structure these systems**.

The requirements that arise as a result of the shared usage of available energy by the mobility sector and the power network is one of the **largest foreseeable additional loads on our energy networks**. That is why, for optimum efficiency and sustainable development of our common mobility and energy system, we need a **particularly effective structure** in order to integrate the two system components – humans and technology – and create synergies. For this purpose, in this project the **Institute for Medial and Interactive Systems (IMIS)** and the **Institut für Software Engineering und Programmiersprachen (Institute for Software Engineering and Programming Languages, ISP)** are working together to model human behavior in relation to energy and mobility and use this model to set up a simulation with intelligent and self-learning agents. The purpose of an overarching **optimization algorithm** is to propose changes in the system. The agents need to be able to adapt to these changes, which is realized using machine learning applications. Thus, an **intelligent system** is structured that is able to **optimize energy management** and propose **strategic decisions** relating to the development of new business fields, infrastructure measures, and energy policy interventions in order to integrate the system components pertaining to energy and mobility and create synergies.

© University of Lübeck, IMIS

08

Glossary

Source: Plattform Lernende Systeme – Germany's Platform for Artificial Intelligence (the glossary is available only in German)
plattform-lernende-systeme.de/glossar

01 Algorithm

An algorithm is a precise calculation rule for solving a task for one or more computers. Learning algorithms are a special class of algorithm: they are special machine learning procedures that abstract a model from sample data (learning data or training data), and it can be applied to new sample data.

02 Autonomous systems

Machines, robots, and software systems are considered to be autonomous if they achieve a stipulated goal on their own, without human guidance and detailed programming, and in a situation-specific manner. Autonomous systems are able to adapt to their surroundings, learn, and (if necessary) cooperate with other systems or people.

03 Big data

Data quantities that are characterized by their volume, the variety of data types and sources, the speed or velocity at which they are accumulated, and the uncertainty of the data quality (its veracity). The term often refers to largely unstructured data issuing from social networks or mobile devices, for instance. An additional aspect of big data encompasses the solutions and systems that help handle these data quantities in order to detect new patterns and relationships, for instance.

04 Chat bot

Virtual dialog systems that are increasingly used in customer service and for user interfaces at a general level. They communicate with people using natural language via a text input and output mask (such as a dialog window on a website). Machine learning methods make it possible for chat bots to continually learn new things based on input, for example, in order to interpret a person's mood or to provide personalized responses.

05 Data mining

Using methods from statistics or machine learning to detect new associations and patterns in a quantity of data. The goal is to make recommendations for decisions or predictions. Cluster analysis and decision-making trees are used for this purpose in addition to artificial neural networks.

06 Deep learning

Machine learning methods in artificial neural networks. They involve several layers, typically an input and an output layer and more than one "hidden" layer between the two. The individual layers consist of a large number of artificial neurons that are interconnected and respond to input from neurons in the respective previous layer. In the first layer, for instance, a pattern is recognized. In the second, a pattern of patterns is recognized, and so forth. The more complicated the network (measured by the number of layers of neurons, the connections among the neurons, and the neurons per layer), the higher the possible level of abstraction – and the greater the complexity of the issues that can be processed. Deep learning is used in image, speech, and object recognition as well as in reinforcement learning.

07 Explainable AI

Black box models, especially deep artificial neural networks, are difficult for people to understand. Explainable AI looks for ways to make it easier to understand or explain the hidden logic or individual output.

08 Internet of Things (IoT)

The increasing networking of tools, devices, sensors, vehicles, etc. through installed computer systems and the assignment of unique digital identifiers (IP address). With the help of their sensors, the networked devices collect data that they can exchange and make available amongst themselves and using the Internet. This process results in extremely large data volumes (big data) that, in turn, can serve as the basis for learning systems.

09 Artificial neural network

This refers to machine learning models that are motivated by aspects of the human brain. They consist of layers of nodes that are realized in software and designated as artificial neurons. The individual connections among the neurons have a numeric weighting that is adjusted during the training process so that the results constantly improve. In this process, increasingly abstract representations of the input are generated from layer to layer. Thus, if there is a very large number of layers (deep learning), very complex patterns can be mapped and recognized.

10 Machine learning

Machine learning is one of the fundamental methods in artificial intelligence (AI). Its goal is to enable machines to automatically deliver meaningful results without a specific solution path having been explicitly programmed. Special algorithms learn models from the available sample data and can then apply these models to new data they have never seen before.

11 Robotics

The term "robot" is derived from the Czech word for "work": "robota." A robot is a system that performs work for people. However, only machines that perform physical work are designated as "robots." Learning systems are being used to control robots more and more often. Robotics is a research field in AI whose goal is to develop robots that use algorithms to autonomously interact with the physical world.

12 Weak AI

Systems that act intelligently in a specific, narrowly defined context and, in such contexts, can even surpass human skills. Examples of specific applications are strategic games like chess and Go, product recommendations, and medical diagnoses. All of the artificial intelligence available today is defined as weak AI. The counter model is strong AI.

13 Strong AI

Hypothetical AI systems that have at least a level of intelligence similar to human intelligence in all areas and not only in narrowly defined fields of application (weak AI). Artificial superintelligence would be far superior to the most intelligent person.

14 Turing test

A test developed by the British mathematician in order to determine whether a machine can be classified as intelligent. During the test, a human asks questions and uses a keyboard to communicate with a human counterpart and a machine. If the human cannot tell which of the counterparts is a machine at the end of the test, the machine is considered intelligent.

09

Sources of **Information**

AI@Participation

On Plattform Lernende Systeme – Germany's Platform for Artificial Intelligence of the Federal Ministry of Education and Research, you will find a "map on AI."

Are you researching AI?
Is your company developing AI projects or products?

Then take a moment and see if you can add an entry to Schleswig-Holstein's AI map:

- plattform-lernende-systeme.de

AI@Network

- **Schleswig-Holstein KI-Transfer-Hub (AI Transfer Hub)**
  kuenstliche-intelligenz.sh
- **Artificial Intelligence Working Group at Lübeck CCI**
  Dr. Dirk Hermsmeyer
  hermsmeyer@ihk-luebeck.de
- **DiWiSH (Digital Economy Schleswig-Holstein) Artificial Intelligence Professional Group**
  diwish.de/ki-kuenstliche-intelligenz
- **MeetUp Kiel-AI**
  meetup.com/de-DE/kiel-ai

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