



AI Made in Hesse

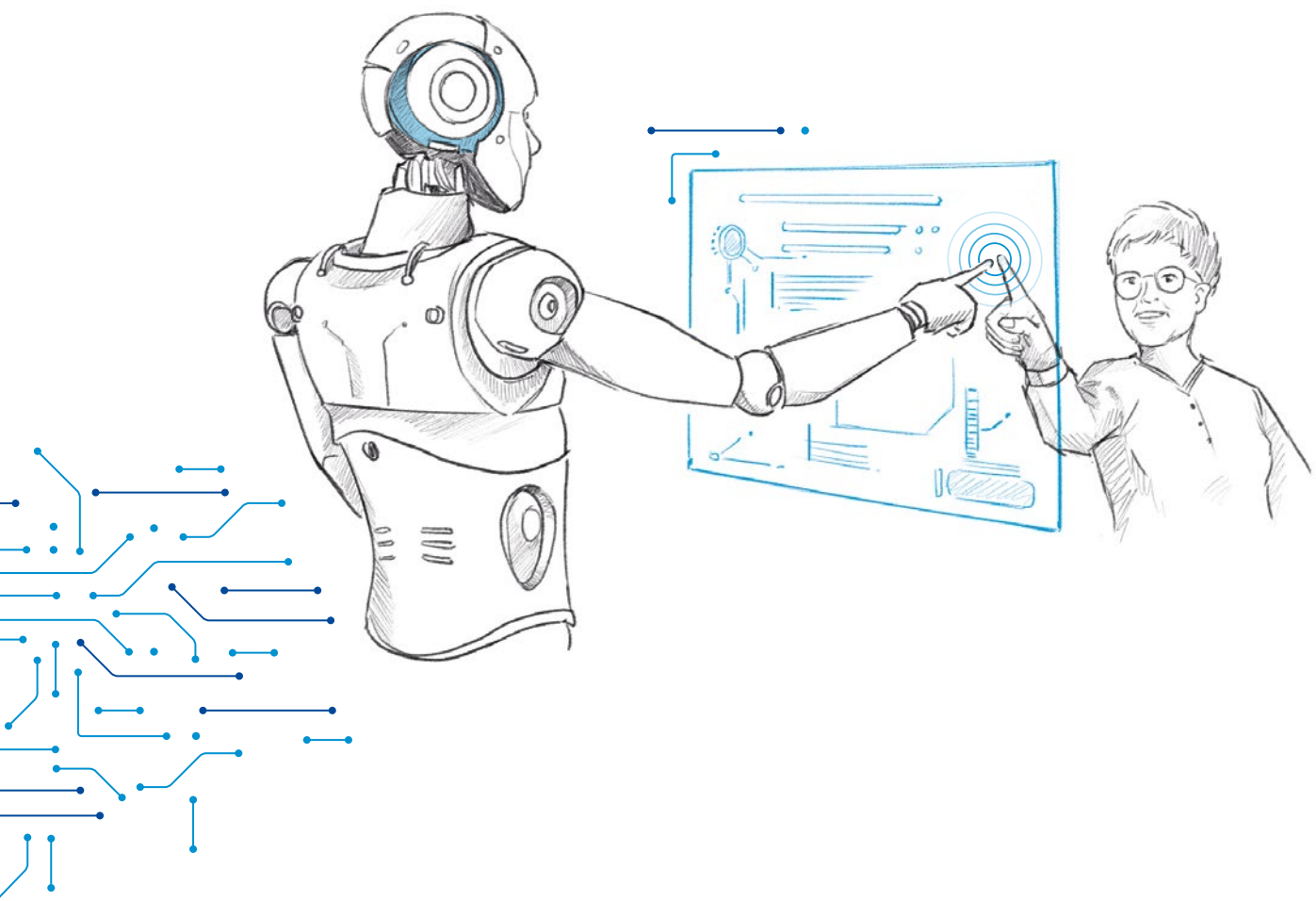
Our agenda for
an innovative and
responsible future





AI Made in Hesse

Our agenda for an innovative and responsible future



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Foreword

When the term 'artificial intelligence' was coined in 1956, computers weighed several tonnes and filled huge rooms. These monstrous machines looked like something out of a sci-fi movie - yet only had as much processing power as a modern pocket calculator. Despite that, they inspired in scientists the grand vision of machines that could simulate intelligent behaviour.

Nowadays, we carry around artificial intelligence (AI) on our smartphones. It guides us through rush-hour traffic and gives us recommendations for shoes, lawnmowers and TVs when we're shopping online. In healthcare, AI helps doctors make diagnoses and contributes to the development of effective medicines. In factories, autonomous robots carry out maintenance tasks. And on the financial markets, AI detects fraud and monitors high-frequency trading. These examples illustrate that AI is a key enabling technology, which is pivotal to growth and prosperity.

The scientists of 1956 couldn't imagine what AI would be capable of. We're in a similar position today. There seem to be no limits to the potential applications. Some we can foresee today, others we cannot.

»» *In Hesse, we want to create socially responsible AI that will benefit people.* ««

Whatever the future may hold, the Hesse State Government has a vision: we want to create socially responsible AI that will benefit the people living in our state. In other words, we believe AI should serve people rather than the other way round. We want to empower and enable, explore and expedite, cultivate and facilitate, while always putting people first. And this detailed agenda for the future of AI in our state sets out just how we plan to do so.

The AI Agenda was produced in collaboration between all Hesse State Government departments, since AI (just like digital transformation in general) is something that affects every ministry and almost every area of our lives. As the Hessian Minister for Digital Strategy and Innovation, I'm responsible for coordination, for pooling together expertise and resources and for managing a €1.2 billion digital budget. Since 2019, that work has helped Hesse's digital sector achieve tremendous success and created a blueprint for other German states to follow.

This agenda sets out our aspirations for the future of artificial intelligence, and the specific steps we will take to achieve them. The new brand AI Made in Hesse rests on four cornerstones: 1. We will conduct cutting-edge interdisciplinary research in a socially responsible manner, and facilitate transfer of the findings into practice. 2. We will focus on Hesse's strengths: healthcare, mobility and finance. 3. We will develop and support sustainable data centres. 4. We will build a strong start-up ecosystem. By doing so, we will make AI Made in Hesse into a globally recognised brand.

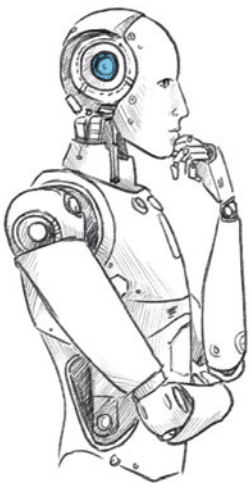
Prof. Dr. Kristina Sinemus

Hessian Minister for
Digital Strategy and Innovation

Our brand: AI Made in Hesse

Few technologies have greater potential to make our lives easier than artificial intelligence (AI). And no other technology is set to so profoundly transform work and the economy. As a key enabling technology, AI has the potential to fundamentally improve the conditions of our lives and economic activities, just like the railway or electricity did in the past. Using AI, we can automatically learn from the experiences of other people and businesses. We can precisely predict traffic jams or machine failures. AI can create educational programmes tailored to individual children and help older people live independently in their own homes for longer. AI can make products better, analyse X-rays and MRIs in a matter of seconds, monitor our health 24/7, speed up administrative procedures and automate dreary routine tasks. It's even taken the wheel in the first autonomous cars.

Though there isn't a single universally accepted definition of AI, the definitions that are most commonly used do broadly agree on certain points. AI is based on algorithms: sequences of instructions that are carried out step by step in order to complete tasks. As a subfield of data science, AI attempts to use these algorithms to recreate cognitive abilities such as learning, planning and problem-solving in computer systems. The goal of modern AI technology is to enable machines, robots or software systems to independently perform abstract tasks/solve abstract problems without each stage needing to be programmed by human beings.¹ Nowadays, AI can do a lot within a precisely defined field of application, but one thing it can't do is autonomously develop in a direction that would bring the greatest benefits for people, society and the economy.



Just as in earlier times it was first necessary to build railways, train stations and power stations so that goods could flow and machines could conveniently operate with electricity rather than muscle power, we need to develop AI for the digital age in a way that serves our interests. AI also brings risks with it, ranging from incomprehensible or discriminatory results to invasions of privacy. So we need to set the direction we want AI technology to develop in - an approach we call 'innovation with responsibility'. We believe that AI can only achieve its potential if people are able to trust that it is being developed and deployed in a responsible manner. For us, that means ensuring that fundamental rights are protected and supporting innovations that benefit people and society.

AI Made in Hesse - innovation with responsibility

Technical progress doesn't come from nowhere. It's something you have to work towards - and that's what we've been doing in Hesse for years. In our 2030 digital strategy, 'Digital Hesse - Where the Future Begins', we set the goal of making AI Made in Hesse into our brand. By the start of the next decade, we want Hesse to be known throughout Europe for innovative, trustworthy AI, and so the Hesse State Government has a raft of new and existing initiatives to promote AI innovation. They include the funding programme Distr@l, the AI Quality & Testing Hub, the AI Innovation Lab and the planned Start-Up and Transfer Centre. Moreover, as a leading centre for research on socially responsible digitalisation, Hesse is developing AI that's responsible by design. A key role is played in this process by ZEVEDI (Centre Responsible Digitality), a research and expertise network set up in November 2019. Our 'responsible by design' principle means that we always factor in the social impact right from the outset when developing and deploying new technology.

»» *For us, responsible development and deployment of AI means ensuring that fundamental rights are protected and supporting innovations that benefit people and society.*

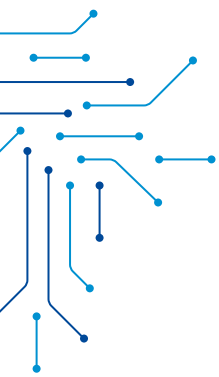
The Hesse State Government is engaging with the ethical issues around AI by seeking and encouraging dialogue with academia, industry and society. We're being supported on this front by the Digital Ethics Council, which is chaired by the Hessian Minister for Digital Strategy and Innovation. The council was set up in autumn 2018. It advises the Hesse State Government on the delivery of digitalisation projects, in particular the delivery and development of the state's digital strategy, and deals with selected issues of digital transformation policy. In 2021, the Digital Ethics Council published its position paper 'Trust in AI',² whose recommendations have been incorporated into our AI Agenda.



Digital Ethics Council:
<https://digitaless.hessen.de/Themen-A-Z/Rat-fuer-Digialethik>



VISION



In 2030, AI Made in Hesse is an internationally recognised brand synonymous with innovative, trustworthy AI:

- Researchers carry out cutting-edge research in our state, supported by a vibrant innovation ecosystem and a high-performance computing and data infrastructure. Our research centres hessian.AI (Hessian Centre for Artificial Intelligence) and ZEVEDI (Centre Responsible Digitality) attract students, early-career researchers and professors from across the world, and serve as showcases for how AI expertise and technology can be transferred to industry, academia and society. As well as developing AI technology and new AI applications, that also includes formulating ethical and legal guidelines.
- Hessian companies are pioneers and early adopters of AI applications. That applies not just to start-ups and major international corporations, but also to local skilled trade businesses, which use robots to help out in the workshop, chatbots to talk to customers, data analytics to analyse building sites and wearables to monitor physical strain.
- Hesse's state government agencies use AI wherever it brings the most benefits, making it easier for people and businesses to get in touch and allowing staff to spend more time talking with service users.
- People in Hesse are very familiar with AI and can confidently integrate it into their day-to-day routine, both at work and in their free time. AI makes their lives easier - from bins that alert their owners when they're full and need to be put out for collection, to roads free of congestion.
- Generally speaking: in Hesse, AI is always developed and deployed in a way that benefits people, because AI Made in Hesse stands for innovation with responsibility.

AI Made in Hesse: our agenda

The Hesse State Government has developed a cross-ministerial agenda for the future of AI. The agenda formulates key priorities for AI Made in Hesse for the first time, and categorises new and existing initiatives into **five action areas**:

- Supporting AI Innovations and Applications
- Strengthening Research and Teaching on AI
- Generating Interest in AI and Building AI Expertise
- Developing the Use of AI in E-Government
- Building a Sustainable Data Infrastructure for AI

These action areas are discussed in detail in chapter 2. They do not map directly onto different ministries' portfolios, but rather have been designed to cut across them. In each area, we set specific goals that will help to advance AI Made in Hesse. To help us meet these goals, we've launched a host of initiatives and programmes that we will continue to develop. We will also be introducing new ones. One of our top priorities is to take a socially responsible approach to AI. That's why we didn't make responsibility a separate action area in the agenda. Rather, it's a common thread that runs through all the different areas, and is intended to be integral to all projects and activities in Hesse. In developing the measures, we followed the recommendations of the Digital Ethics Council.

We place a particular focus on **three innovation areas**, each of which spans multiple action areas: **AI & Healthcare**, **AI & Finance** and **AI & Mobility**.

Another key element of the agenda process is the new website www.ki-hessen.de, which will share information about current initiatives, training/development opportunities and projects.

Responsible AI is, of course, only possible if there is collaboration between the various levels of politics that exist in Europe, which is why Hesse has been involved at German and European level in creating a framework for AI. The advantage to our approach is that our plans for AI are directly geared towards Hesse and the people living here, with a view to transformation on the ground.

Our measures are devised in concert with the federal government's AI strategy and proposed European AI regulations. We support a risk-based approach that classifies AI systems according to their risk level, as this is the best way to protect basic and consumer rights. It also strengthens European innovation by providing legal certainty.



State of Hesse
AI website:
www.ki-hessen.de



Action and innovation areas

INNOVATION AREAS - to be developed over the longer term:

→ AI & Healthcare

→ AI & Finance

→ AI & Mobility

ACTION AREAS

Supporting AI Innovations and Applications



What's already in place:

- Distr@I funding programme
- Hessian Centre for Artificial Intelligence (hessian.AI)
- AI Trainers programme at SME Digital Center Darmstadt
- House of Digital Transformation
- Future Hub for Human-Centric Artificial Intelligence in Manufacturing (ZuKIPro)
- Centre for Expertise in Work and Artificial Intelligence (KompAKI)

What we're planning:

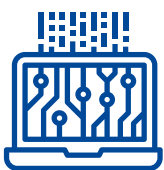
In the short term:

- AI Quality & Testing Hub
- Specific call for Distr@I funding applications for AI projects
- AI Innovation Lab

In the medium term:

- Start-Up and Transfer Centre
- European Digital Innovation Hubs (EDIHs) (under the Digital Europe programme; application submitted)

Strengthening Research and Teaching on AI



What's already in place:

- Excellent research on AI at Hessian universities
- Hessian Centre for Artificial Intelligence (hessian.AI)
- State/Federal Initiative to Promote Artificial Intelligence in University Education
- Funding for AI research from LOEWE, the Cluster Building funding line and other research funding programmes run by the state government
- ZEVEDI (Centre Responsible Digitality)
- Honors Degree Program in Artificial Intelligence and Entrepreneurship

What we're planning:

In the short term:

- DFKI (German Research Center for Artificial Intelligence) laboratory
- AI Quality & Testing Hub
- AI Innovation Lab

Generating Interest in AI and Building AI Expertise



What's already in place:

- How Digital Am I? (website)
- DigiCheck Kompetenzen (digital skills check)
- Digital im Alter - digital guides for older people
- DigitalTruck
- Numerous AI-related degree programmes
- Hessian Centre for Artificial Intelligence (hessian.AI)
- Future Hub for Human-Centric Artificial Intelligence in Manufacturing (ZuKIPro)
- eGov-Campus
- AiTalents

What we're planning:

In the short term:

- Website for AI in Hesse
- Website on AI problems/questions, currently being developed by the House of Digital Transformation's AI Mission

In the medium term:

- Digital Hesse: AI Made Simple! (project)
- European Digital Innovation Hubs (EDIHs) (under the Digital Europe programme; application submitted)
- Start-Up and Transfer Centre

Developing the Use of AI in E-Government



What's already in place:

- Numerous AI projects by state government agencies
- AI Agenda Working Group
- Use of AI in smart cities and smart regions
- Funding for AI from the Starke Heimat Hessen programme

What we're planning:

In the short term:

- Chatbots in State Government Agencies (project)

In the medium term:

- AI Dialogue: State Government Meets Science (initiative)
- AI Ideas Competition
- Focus on AI in the work of the Smart Region agency

Building a Sustainable Data Infrastructure for AI



What's already in place:

- Competence Center for High Performance Computing in Hessen (HKHLR)
- Hessian Centre for Artificial Intelligence (hessian.AI)

What we're planning:

In the short term:

- AI Innovation Lab
- Hesse Centre for Applied Quantum Computing



This combination of measures at state, federal and European level provides a foundation we can build on to master the big challenges of our time using AI-based applications. For instance, AI can help us with key issues in healthcare, mobility and sustainability, as well as with climate action and resource management.

Data access, privacy and cybersecurity are crucial factors to making successful use of AI. They are also relevant to many other areas of digitalisation. Under the direction of the Hessian Minister for Digital Strategy and Innovation, we are therefore, firstly, working to strategically expand access to and improve the quality of usable data across a range of fields, and exploring open data approaches. Secondly, the Hessian Ministry of the Interior and Sports' cybersecurity strategy provides a common framework for cyber- and IT security in Hesse.

Hesse's AI ecosystem

Our vision of AI Made in Hesse will take shape within a vibrant AI ecosystem:

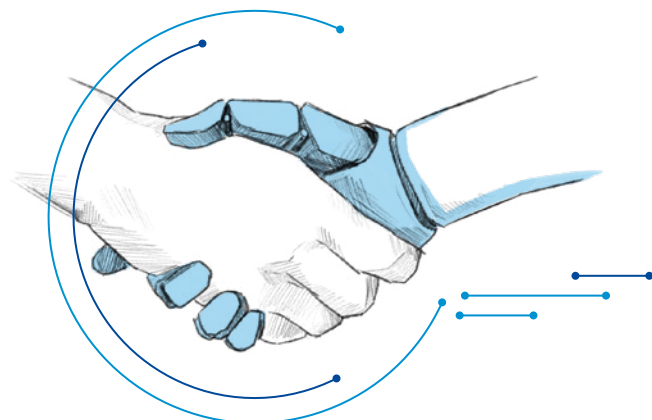
- Hessian businesses in the automotive, chemicals and pharmaceuticals sectors are already making significant use of AI. For instance, AI Made in Hesse helped with the search for new APIs during the Covid-19 pandemic.
- Many start-ups are developing AI-based applications for fields such as mobility, energy, healthcare and finance. For instance, thanks to AI Made in Hesse people can have their own financial assistant that manages contracts and accounts in a single app.
- At Hessian universities, exceptional researchers are conducting theoretical and applied research on AI. The Hessian Centre for Artificial Intelligence (hessian.AI) serves as a new hub for AI research. AI Made in Hesse spans everything from research on driverless cars to optimised weather forecasts to service robots.
- The ecosystem also includes interested civil society organisations and state government agencies, which are already using AI. For instance, AI Made in Hesse is helping the police to detect hate speech and terrorist propaganda.

The stakeholders in Hesse's AI ecosystem are also key partners in national, European and international AI organisations. Hesse is pushing for greater cooperation between the EU, the federal government and the individual states, and has actively embraced its role in implementing the federal government's AI strategy. So we welcome the fact that there are regular opportunities for dialogue between the coordinating federal ministries and federal states, in particular the federal/state

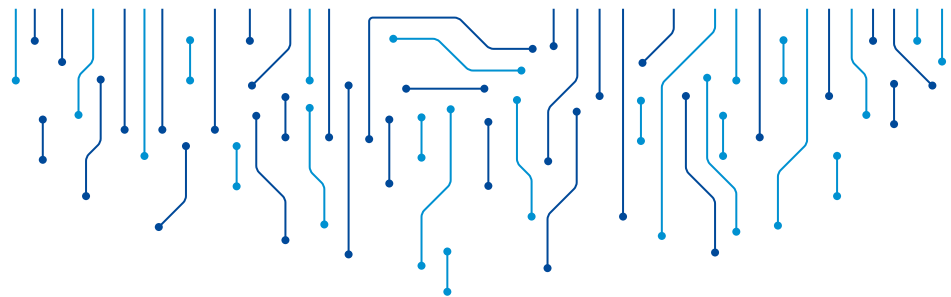
meetings on AI and the federal/state working group on measures to promote quantum technology. The State of Hesse is actively involved in developing a national and European framework for AI. In June 2020, for instance, we hosted the Germany-wide consultation event on the European Commission's white paper on AI, and Hessian experts regularly liaise with European institutions regarding current AI issues, as a clear legal framework is crucial to building trust in AI. We will look closely at AI-related proposals made at the Conference on the Future of Europe and adopt them where it makes sense to do so.

We believe that creating a socially responsible framework for AI requires collaboration between the various levels of politics that exist in Europe. That relates, firstly, to the European legal framework, which we want to see both supporting people's digital autonomy and enabling innovation. AI systems should be subject to quality and regulatory standards – and the riskier a given AI application, the more demanding the requirements should be. To achieve this, it will be necessary to develop standards and testing procedures. We have already taken a first step in this direction in Hesse with the AI Quality & Testing Hub.

Secondly, it relates to specific applications. AI Made in Hesse transcends borders. In future, we will expand our cooperation with partners in Europe, especially Hesse's partner regions. An international perspective is already the norm in academia: Hessian universities are involved in international AI research projects and major European AI networks such as ELLIS (European Laboratory for Learning and Intelligent Systems) and CLAIRE (Confederation of Laboratories for Artificial Intelligence Research in Europe).



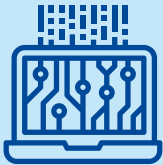
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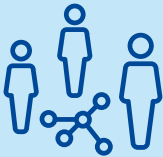
Action areas



SUPPORTING AI INNOVATIONS
AND APPLICATIONS



STRENGTHENING RESEARCH
AND TEACHING ON AI



GENERATING INTEREST IN AI
AND BUILDING AI EXPERTISE



DEVELOPING THE USE OF AI
IN E-GOVERNMENT



BUILDING A SUSTAINABLE
DATA INFRASTRUCTURE FOR AI



SUPPORTING AI INNOVATIONS AND APPLICATIONS

GOAL
→•

We want to harness momentum and make Hesse into a leading hub for AI innovations and applications. Our goal is to turn AI Made in Hesse into a brand for our state that is synonymous with innovation, responsibility and the future.

ACTION AREA 1

Supporting AI Innovations and Applications

Hessian start-ups and other businesses are already developing AI solutions and making use of AI today in sectors such as manufacturing, mobility, logistics, pharmaceuticals, healthcare and finance. Key applications include production, automation and smart maintenance. Hesse offers ideal conditions for our vibrant AI start-up scene, thanks to hubs such as TechQuartier in Frankfurt, HUB31 in Darmstadt and the Science Park in Kassel.

Start-ups and SMEs face particular challenges when it comes to developing and using AI, such as difficulties accessing a dedicated AI data infrastructure. Implementing AI is by no means a simple task for SMEs. In the manufacturing sector, around 25% of larger companies use AI technology today, but only 15% of SMEs.³ Keeping the Hessian economy competitive greatly depends on whether we can also unlock the potential of AI for our SMEs.

In its position paper 'Trust in AI', the Digital Ethics Council calls for funding for advice and support services for start-ups and SMEs. We're now acting on that recommendation and strengthening Hesse's AI ecosystem. The European Commission, meanwhile, has proposed introducing AI living labs as spaces for experimentation. That would be a particular help to start-ups and SMEs, and so we are actively supporting the proposal.

We are developing three new initiatives that will offer advice and assistance at different phases: the AI Innovation Lab, the Start-Up and Transfer Centre (currently at the planning stage) and the AI Quality & Testing Hub. They are intended to help Hessian researchers, company founders, SMEs and industry to develop, research and use new products and to integrate AI into existing ones.



Strengthening the AI ecosystem

The **AI Innovation Lab**, which is being funded by the Hessian Minister for Digital Strategy and Innovation, will be a one-stop shop for researchers and businesses/start-ups of various sizes and from various sectors. It will provide shared access to an AI supercomputer infrastructure and extensive AI expertise, removing the high financial barriers that prevent organisations from procuring their own AI data infrastructure. It will also allow outstanding research to be translated into products and services for people: the lab will be a place where innovative systems and applications can be developed, trained, tested and evaluated. Companies, in particular SMEs and start-ups, will benefit from experienced AI developers, who will assist them in the use of AI technology. This will enable innovative medicines, materials, APIs and industrial products to be developed. The AI Innovation Lab will be a particular help to start-ups and provide a basis for breakthrough innovations.

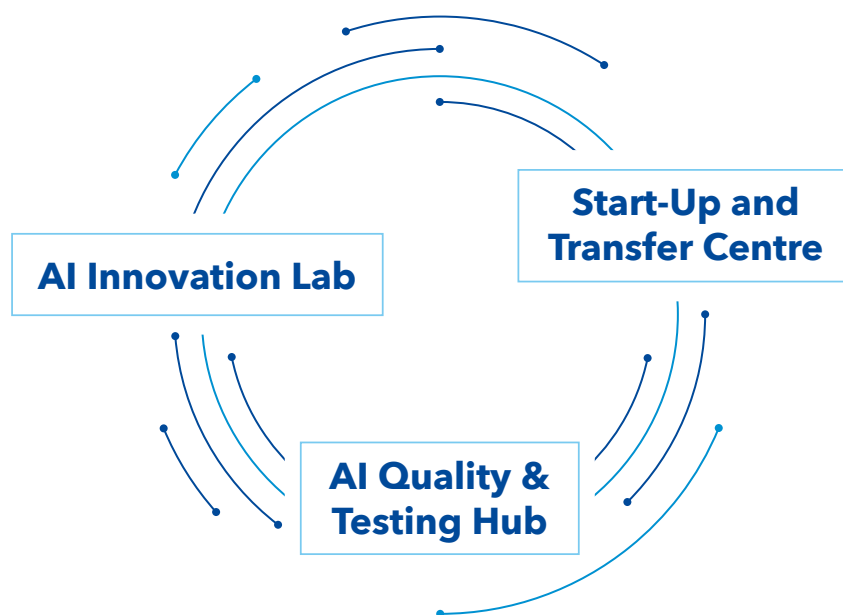
The **Start-Up and Transfer Centre**, funded by the Hessian Ministry of Economics, Energy, Transport and Housing, is a new initiative designed to foster innovation by linking up its target groups – current and prospective students and graduates – with start-up, transfer and AI programmes. It will draw on existing best practices and involve institutions from academia and industry as well as other innovation hubs so as to build a Hesse-wide organisation that manages and coordinates education, training and professional development activities. Its programmes will be decentralised and delivered through local/regional activities. We will closely involve universities, start-ups and established businesses so that we can offer tailored innovation programmes to as many students, graduates, professionals and executives as possible. The initiative will also seek to encourage spin-offs from cutting-edge AI research, and to supplement and build links between existing institutions and programmes such as hessian.AI and TechQuartier.

Our third initiative, the **AI Quality & Testing Hub**, addresses a critical issue in the European debate about AI and its overall development: the quality of AI systems. The Hessian Minister for Digital Strategy and Innovation, the electronics industry association VDE and the TÜV Association are jointly developing a hub that combines R&D, standard-setting, testing methods/infrastructure and ‘regulatory sandboxes’ for AI applications.

This will serve to bolster Germany’s reputation as a country of engineers and high-quality, reliable products, in the face of global competition. But this can only work if the quality, security and ethical soundness of AI systems can actually be proved by testing.

The goals of the AI Quality & Testing Hub align with the proposed legislation for a European regulatory framework for AI published in April 2021. The hub will take a participatory, interdisciplinary approach. As well as certifying quality, it will also promote dialogue and debate and seek to educate and inform, working in partnership with hessian.AI and ZEVEDI. The hub will also deal with the procurement and responsible use of relevant datasets, and work to position and integrate itself within the national, European and international context.

The three initiatives will work closely together and offer Hesse’s AI stakeholders coordinated support and consultancy services, which will sustainably strengthen AI Made in Hesse. The AI Innovation Lab, the Start-Up and Transfer Centre and the AI Quality & Testing Hub will also complement other existing or planned projects and initiatives to promote AI innovation and applications in Hesse, including the funding programme Distr@I, the AI Trainers programme at SME Digital Center Darmstadt, the House of Digital Transformation and two new centres, the Future Centre for Human-Centric Artificial Intelligence in Manufacturing (ZuKIPro) and the Centre of Excellence for Work and Artificial Intelligence (KompAKI), which are described in the next section.



Supporting AI innovations in Hesse

Supporting AI innovations, encouraging more AI start-ups and facilitating transfer from research to industry and from the AI sector to the companies that use AI products: these steps will do a lot to make Hesse's economy more competitive and innovative, and the state has brought in specific programmes to fund them. The main one is **Distr@I**, which was launched by the Hessian Minister for Digital Strategy and Innovation. It has €40 million of funding for the period 2020–2024, which is being used to financially support Hessian SMEs and start-ups from all sectors in the development of digital products, services and processes. There is also funding for knowledge and technology transfer, so that universities can share their research findings with businesses.

By the end of 2021, 79 research and development projects had been approved or recommended for funding across all funding lines, with the total funding awarded coming to some €23 million.

DISTR@L

- > A robotic wheelchair that allows wheelchair users to overcome almost any barrier they encounter in their day-to-day lives for the first time. An assistance system that uses data on household energy and water use to help older people to live independently. A piece of software that monitors machinery and technical systems in real time. These are three of the innovative AI projects being funded by Distr@I. The funding programme supports research and development projects by Hessian SMEs, start-ups and universities. Funding is provided for feasibility studies (funding line (FL) 1), for digital product and process innovations (FL 2), for knowledge and technology transfer (FL 3) and to stimulate university spin-offs and start-up growth (FL 4).

The funding programme explicitly places no restrictions on the topics of applications it will consider, but it may temporarily choose to emphasise areas that are of particular relevance at a given point in time. For instance, in the first quarter of 2022, Distr@I will be publishing a separate call for **funding applications for AI-related projects**, in order to stimulate the integration of AI into SMEs' business processes.



SME Digital Center Darmstadt, which is funded by the Federal Ministry for Economic Affairs and Climate Action, is home to the **AI Trainers** programme. The AI Trainers deliver workshops, online seminars, expert consultations, talks and projects on the topic of AI. They enable SMEs to recognise the opportunities and challenges of AI, and work with them to implement specific applications. The association **House of Digital Transformation** has a dedicated AI Mission that supports SMEs with advice and networking opportunities, drawing on the expertise of association members from academia and industry.

The **KompAKI** network has been awarded €10.75 million in funding by the Federal Ministry of Education and Research for a five-year period, commencing on 1 October 2020. It comprises 11 research partners - TU Darmstadt (which coordinates the initiative), Darmstadt University of Applied Sciences, eight companies and the Darmstadt-Rhine-Main-Neckar Chamber of Industry and Commerce - and a number of associate partners. Among other things, KompAKI is helping to unlock new potential for human-centric AI applications and business models, developing collaborative AI approaches that make AI easier and more transparent for users and coming up with new methods for evaluating performance in AI-supported work systems.

Applications are currently being prepared for two **European Digital Innovation Hubs (EDIHs)** in North/East and South Hesse as part of the **Digital Europe programme**. The two hubs will work to advance digital transformation in SMEs, with a particular focus on AI.

AI's reach also extends into the depths of space, as it is being used to share and analyse satellite data. The (geo)data that is generated offers great potential to find answers to key social, economic and scientific challenges in areas such as mobility, agriculture, climate and the environment, securing a sustainable supply of resources and bringing about energy transition. It also provides an important foundation for digital value chains.

As the home of leading global institutions and companies in the aviation and aerospace engineering sector, combined with scientific research expertise and a flair for digital innovation, Hesse is perfectly placed to develop and implement new applications for satellite technology. On behalf of the Hessian Minister for Digital Strategy and Innovation, we will continue to consolidate, stimulate and cultivate the integration of satellite technology with the myriad possibilities opened up by AI, as well as the great research and development potential of Hesse's private and public sectors.



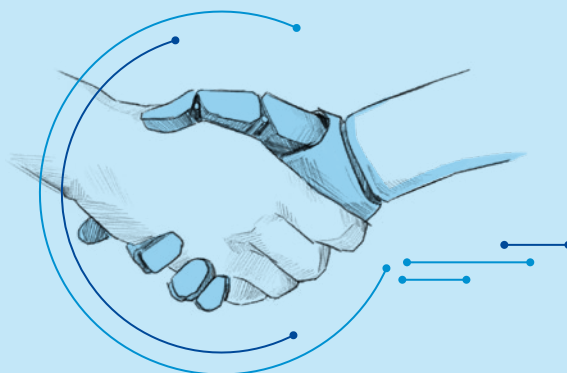
What's already in place:

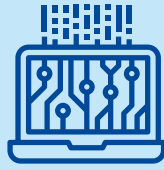
- **Distr@I funding programme**
- **Hessian Centre for Artificial Intelligence (hessian.AI)**
- **AI Trainers programme at SME Digital Center Darmstadt**
- **House of Digital Transformation**
- **Future Centre for Human-Centric Artificial Intelligence in Manufacturing (ZuKIPro)**
- **Centre of Excellence for Work and Artificial Intelligence (KompAKI)**

What we're planning:

- **Start-Up and Transfer Centre**
- **AI Quality & Testing Hub**
- **AI Innovation Lab**
- **Specific call for Distr@I funding applications for AI projects**
- **European Digital Innovation Hubs (EDIHs) (under the Digital Europe programme; application submitted)**

»» *Creating a socially responsible AI framework requires an interdisciplinary approach: technical expertise must go hand in hand with theoretical reflection on technology; academia, industry and society need to work closely together. ««*





STRENGTHENING RESEARCH AND TEACHING ON AI

GOAL
→•

We want to provide sustainable, sustained support to Hessian research (both theoretical and applied) and teaching on AI. We see interdisciplinary research as key to innovation and prosperity in Hesse.

ACTION AREA 2

Strengthening Research and Teaching on AI

AI Made in Hesse also includes outstanding research and teaching on AI. At Hessian universities, exceptional researchers are conducting a wide range of theoretical and applied research on AI, in fields as varied as information technology, engineering, the humanities and the natural and social sciences. Topics include the use of AI in medicine, AI-based weather forecasting, autonomous driving and ethical and legal issues raised by AI.

Hessian universities leading the way

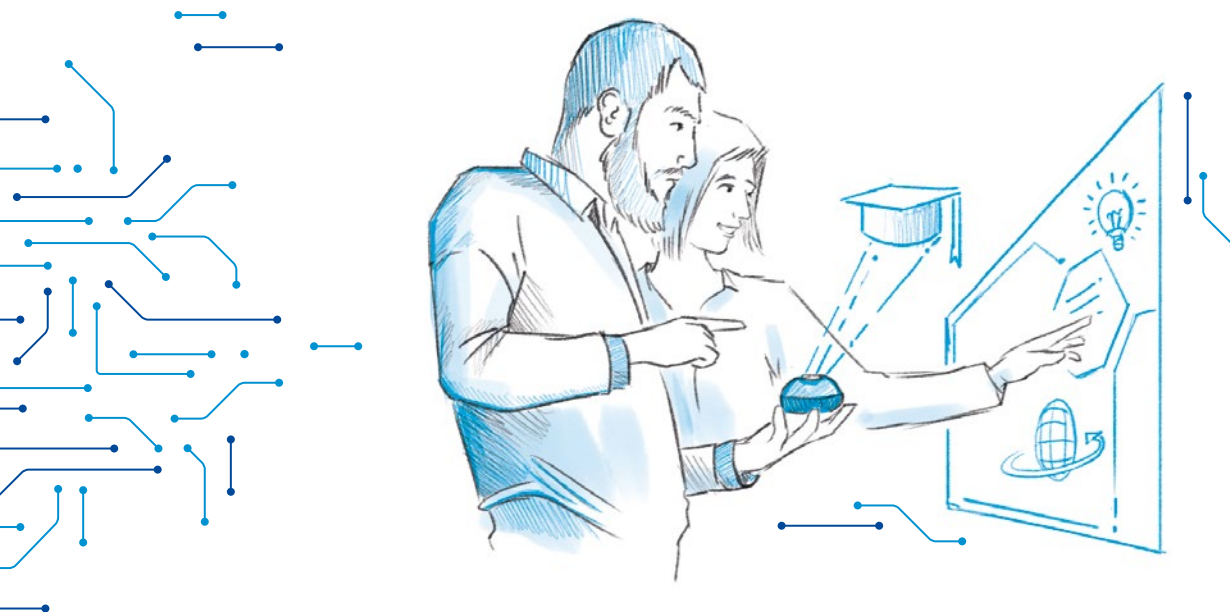
Hessian universities recognised the importance of AI early on and initiated research projects on the topic. There are many examples demonstrating the excellence of AI research in Hesse:

- TU Darmstadt is considered one of Germany's leading universities for computer science.⁴
- Nine of hessian.AI's founding professors have an h-index⁵ of 40 or more, which is internationally regarded as evidence of research excellence.
- Hessian researchers have successfully secured funding for AI research projects from the EU, the German Research Council (DFG), the federal government and various foundations.
- Hessian researchers have received prestigious awards for their research on AI, such as the German AI Award, ERC grants and the DFG's Heinz Maier-Leibnitz Prize.
- Numerous AI start-ups have been spun off from Hessian universities and gone on to win awards. In 2020, TU Darmstadt ranked in the top three German universities for securing EXIST Business Start-Up Grants from the Federal Ministry for Economic Affairs and Climate Action, with seven in total being approved.
- TU Darmstadt was among 17 institutions in Europe and Israel selected in the first round of applications to host one of the prestigious European Laboratory for Learning and Intelligent Systems (ELLIS) research units.

Studying AI in Hesse

Many school-leavers want to study AI, including – and indeed especially – in Hesse. Hessian universities were quick to respond to this demand and develop suitable courses. Students interested in AI can now choose between numerous degree programmes, including data science, autonomous systems and digital medicine.⁶ Hessian universities also offer modules on AI as part of other degree programmes, and these too are being expanded. On top of that, the University of Frankfurt, the University of Marburg, TU Darmstadt and TechQuartier have jointly developed the **Honors Degree Program in Artificial Intelligence and Entrepreneurship**, on which professors from all three participating universities teach. The programme is funded by the Federal Ministry of Education and Research and provides students with both theoretical and entrepreneurial perspectives on AI.

The **State/Federal Initiative to Promote Artificial Intelligence in University Education** has provided €6.6 million of funding to projects at the University of Frankfurt, the University of Kassel, Frankfurt University of Applied Sciences and HfG Offenbach. The programme has two goals: to train future graduate workers by including AI in study content, and to improve the quality, performance and effectiveness of university education through the use of AI.



Supporting AI research in Hesse

The State of Hesse's flagship initiative **hessian.AI** (the Hessian Centre for Artificial Intelligence) has given a significant boost to research on AI. It provides a central hub for all areas of AI in Hesse, with 20 new AI professorships, 13 participating universities, outstanding research, a practical focus, support for early-career researchers and transfer of knowledge and technology to industry and society. Twenty-two founding professors are involved in developing **hessian.AI**, which was founded in August 2020. The State of Hesse is providing up to €38 million in funding for the five-year initial development phase.

HESSIAN.AI - THE THIRD WAVE OF AI

- In future, machines will be more than just tools that follow rules programmed by humans. We envision them functioning more like colleagues than tools, capable of adapting to new situations and interacting with people. To help usher in this third wave of AI, **hessian.AI** is advancing a systematic perspective on AI that - on the basis of mathematical and computational models - understands and utilises the interplay of algorithms, data and systems as building blocks for a complex and comprehensive AI system. This will require every aspect of information technology to be rethought through the lens of AI, from hardware to database systems to programming and software development.

The State of Hesse also supports AI research through the **LOEWE** programme, which was launched in 2008 to build long-term research excellence and promote new science policy ideas, and through the new **Cluster Building funding line**. Examples include the LOEWE research cluster WhiteBox and the project 3AI - The Third Wave of Artificial Intelligence, which is being coordinated by researchers at TU Darmstadt and is funded under the Cluster Building funding line. Together, these projects have been awarded almost €10 million in funding. WhiteBox helps to make AI-based predictions and decisions easier to understand, while 3AI seeks to develop theoretical foundations for the third wave of AI, which will see AI systems with human-like capabilities that can adapt to new situations.



Learn more about
hessian.AI:
<https://hessian.ai>



LOEWE's funding line 3 seeks to bridge the gap between academia and industry, and promote collaboration between Hessian SMEs and universities. Thirty collaborative R&D projects involving an AI-related company have been selected for funding, with LOEWE covering over €10 million of the approximately €17 million total project costs. Almost all Hessian universities are represented in the projects, with TU Darmstadt, Darmstadt University of Applied Sciences and the University of Kassel playing an especially prominent role.



Learn more
about ZEVEDI:
<https://zevedi.de>



Creating a socially responsible AI framework requires an interdisciplinary approach: technical expertise must go hand in hand with theoretical reflection on technology; academia, industry and society need to work closely together. With that goal in mind, in late 2019 the Hessian Minister for Digital Strategy and Innovation founded **ZEVEDI (Centre Responsible Digitality)**. The Hesse State Government has provided the centre with €8.7 million of basic funding up until the end of 2023.

ZEVEDI brings together Hessian experts from various disciplines and universities and universities of applied sciences. It takes an interdisciplinary, connected and dialogue-focused approach to ethical and legal issues around digitalisation, working at the intersection between academia, industry and society to unlock the potential of digital technology, and in particular AI, for Hesse. One area of work is ethics guidelines: the project group NOKI is producing a guide to help ethics committees at Hessian universities conduct ethics assessments on applications for AI research projects.

ZEVEDI's transfer activities provide Hessian companies with forums for dialogue, generate recommendations for action and help put those recommendations into practice. In the pilot project RoboTrust, researchers from various disciplines are studying anthropomorphic (i.e. human-like) service robots. Specifically, they are looking into how the now highly advanced robots can be used responsibly, in a way that is safe and beneficial for people.



As two new hubs for AI Made in Hesse, ZEVEDI and hessian.AI will work closely together, in line with the recommendation from the Digital Ethics Council's position paper 'Trust in AI' that interdisciplinary research on AI be promoted, as it has an important role to play in strengthening the Hessian public's trust in the development and deployment of AI.

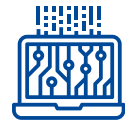
In addition, the State of Hesse and the **German Research Center for Artificial Intelligence (DFKI)** have agreed to open a DFKI laboratory in Darmstadt. The DFKI was founded in 1988 and, with some 670 scientists, is Germany's leading industrial research organisation in the field of innovative AI-based software technology. The collaboration will enrich Hesse's AI ecosystem with a partner whose profile extends far beyond the German borders.

What's already in place:

- **Excellent research on AI at Hessian universities**
- **Hessian Centre for Artificial Intelligence (hessian.AI)**
- **State/Federal Initiative to Promote Artificial Intelligence in University Education**
- **Funding for AI research from LOEWE, the Cluster Building funding line and other research funding programmes run by the state government**
- **ZEVEDI (Centre Responsible Digitality)**
- **Honors Degree Program in Artificial Intelligence and Entrepreneurship**

What we're planning:

- **DFKI (German Research Center for Artificial Intelligence) laboratory**
- **AI Quality & Testing Hub**
- **AI Innovation Lab**





GENERATING INTEREST IN AI AND BUILDING AI EXPERTISE

GOAL
→•

We want to empower people to come on board with the key enabling technology AI. Only if people have a basic understanding of how AI works can they realistically appraise the opportunities and risks that come with it.

Hesse's industry and public sector are dependent on professionals and executives who possess expertise in AI. Suitable professional development opportunities will allow people to develop the specific skills that are needed and so improve their career prospects.

ACTION AREA 3

Generating Interest in AI and Building AI Expertise

AI is already making our day-to-day lives easier, often without us even noticing. Smartphones, navigation systems and modern workplace software wouldn't be possible without AI. Most of these applications are developed by US-based tech companies.

In Germany, only one in ten companies currently use AI. That won't be enough over the longer term to remain competitive. In a study by Mittelstand-Digital, 77% of the surveyed experts said that AI will be important to the future of German SMEs, while 70% feared that Germany's SME sector could fall behind. The biggest barriers to the use of AI in SMEs were believed to be a lack of expertise and skilled workers.⁷

Generating interest in AI

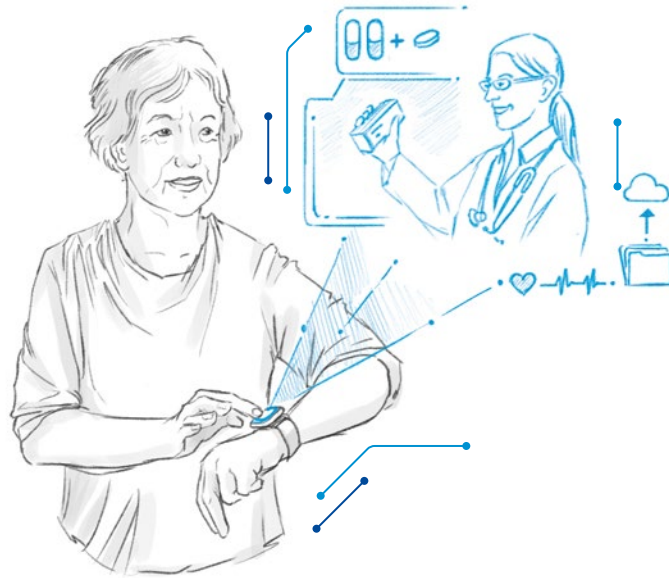
The Digital Ethics Council has drawn attention to how important AI literacy is for people's day-to-day lives. In its position paper 'Trust in AI', it calls for people in Hesse to be given opportunities to acquire knowledge about AI technology, enabling them to achieve digital autonomy and to use AI-based products and services in line with their needs.

We therefore want to offer everyone in Hesse the opportunity to learn more about AI, so that they can seize the opportunities and assess the risks that it presents. Chambers of industry and commerce already offer the online course 'Elements of AI'. The Hessian Minister for Digital Strategy and Innovation has also developed the website **How Digital Am I?**, where users can easily access information about digitalisation and AI, online courses on digital skills, digital projects being run by the State of Hesse, people's success stories on their digital learning journeys and the **DigiCheck Kompetenzen** (digital skills check).



How digital are you?
<https://www.wie-digital-bin-ich.de>





DIGICHECK KOMPETENZEN (DIGITAL SKILLS CHECK)

→ Computers, information from the Internet and video conferencing tools have become integral to our day-to-day work. In our personal lives, apps help us to keep in touch with friends. And digital transformation is ongoing in other areas too, such as schools, medical care and public administration. This raises questions about how data is processed, which is something that often prompts feelings of uncertainty. On the website www.wie-digital-bin-ich.de, Hesse offers the DigiCheck Kompetenzen (digital skills check), a free online test that allows people to gauge their knowledge of all things digital in a few minutes. The test also offers advice on how people can improve their digital literacy.

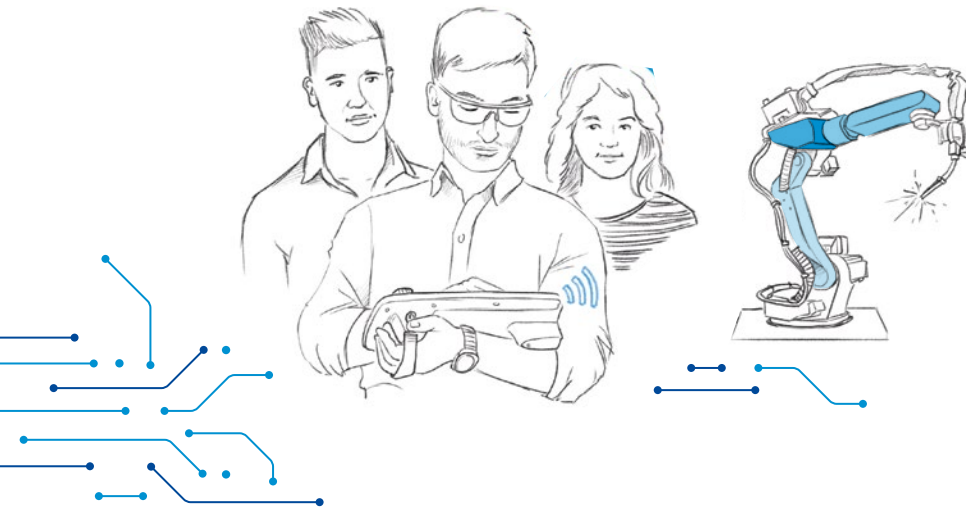
It's now hard to imagine our day-to-day lives without AI-based assistance systems, especially for older people. The project **Digital im Alter**, a joint initiative by the Hessian Ministry of Social Affairs and Integration, the Hessian State Chancellery and the Hessian Minister for Digital Strategy and Innovation, is specifically aimed at older people. Since July 2021, the project has been funding digital support centres, where digital guides are trained. These volunteer guides are digitally savvy older people who can teach digital skills to other older people, answer questions about software and hardware, explain AI technology such as voice assistants and offer advice on purchasing devices.

Meanwhile, for younger people the state government has initiated the project **DigitalTruck**. The DigitalTruck will be visiting primary schools in all Hesse school districts. Its mission is to get kids curious about the possibilities offered by cutting-edge technology from an early age and to inspire teachers with some modern lesson ideas. The project is a joint initiative between the Hessian Ministry of Education and Religious Affairs and the Hessian Minister for Digital Strategy and Innovation. It will be delivering workshops on topics such as artificial intelligence and robotics.

We want to expand these kinds of formats, which offer a fun way for people to learn about AI applications. New formats will focus on encouraging interest in AI among girls and women too. In the first stage, the Hessian Minister for Digital Strategy and Innovation, working with partners from industry, academia and civil society, will launch the project **Digital Hesse: AI Made Simple!** The project will develop and bring together digital and analogue resources that provide easy-to-understand information about AI. The aim is to generate interest in AI among the general public in Hesse, and help them to better understand how AI works and what opportunities and risks it presents. AI Made Simple! will explain how and where AI is used in everyday life and expand the range of media and information resources that are currently available.

A new website, www.ki-hessen.de, provides an important entry point to learning about AI Made in Hesse and AI technology. The website shares information about Hesse's vibrant AI ecosystem and success stories from academia, industry and government. It also allows people unfamiliar with the topic to easily access basic information about AI and how it works, while experts can learn more about AI Made in Hesse developments and find information about new projects.





Fostering AI expertise

AI is set to play a growing role in the future world of work. Hesse's industry and public sector need professional and managerial staff who possess AI expertise, as well as movers and shakers who will launch AI start-ups.

Hessian universities offer a wide range of degree programmes on AI and related topics. **hessian.AI** will also contribute to the training and upskilling of professional and managerial staff, and - complementing the planned Start-Up and Transfer Centre - provide support to start-ups. Frankfurt's TechQuartier is likewise committed to cultivating AI expertise: the programme **AiTalents** is aimed at young professionals and advanced students with an interest in AI and machine learning. Over the course of nine weeks, participants work in small teams on concrete AI solutions. The programme is run online and receives funding from the Federal Ministry for Economic Affairs and Climate Action.

FUTURE HUB FOR HUMAN-CENTRIC ARTIFICIAL INTELLIGENCE IN MANUFACTURING (ZUKIPRO)

→ ZuKIPro, which opened in spring 2021, provides consultancy services and innovative training/learning resources on digitalisation and AI that are geared towards Hesse's regional needs. These resources include a digital learning and knowledge platform and massive open online courses (MOOCs). The free training and resources offered by ZuKIPro will be of particular benefit to Hessian SMEs and their employees in the manufacturing industry and skilled trades. The centre is funded by the Federal Ministry of Labour and Social Affairs.⁸

The **House of Digital Transformation's 'AI Mission'** is planning a project that seeks to promote professional development and build links between companies and prospective future employees: on a **dedicated website**, companies will be able to post questions and problems relating to their AI applications, which students can then address in their master's projects. This will allow companies and the professionals of the future to connect at an early stage and work together to optimise those companies' AI applications.

AI also has the potential to bring about improvements in public administration, which will require professional and managerial staff with experience in AI. This was why the State of Hesse set up the **eGov-Campus**, which is funded by the IT Planning Council. The eGov-Campus provides university-level courses on e-government and the use of IT in government agencies. A new module developed at the University of Lübeck, 'Artificial Intelligence in Public Administration', will address AI for the first time. The eGov-Campus is overseen by the Hessian Minister for Digital Strategy and Innovation and her steering committee. The content of the courses is coordinated by the RheinMain University of Applied Sciences' 'Administrative Informatics/eGovernment' course leaders.

What's already in place:

- **How Digital Am I? (website)**
- **DigiCheck Kompetenzen (digital skills check)**
- **Digital im Alter - digital guides for older people**
- **DigitalTruck**
- **Numerous AI-related degree programmes**
- **Hessian Centre for Artificial Intelligence (hessian.AI)**
- **Future Centre for Human-Centric Artificial Intelligence in Manufacturing (ZuKIPro)**
- **eGov-Campus**
- **AiTalents**

What we're planning:

- **Website for AI in Hesse**
- **Website on AI problems/questions, currently being developed by the House of Digital Transformation's AI Mission**
- **Digital Hesse: AI Made Simple! (project)**
- **European Digital Innovation Hubs (EDIHs) (under the Digital Europe programme; application submitted)**
- **Start-Up and Transfer Centre**





DEVELOPING THE USE OF AI IN E-GOVERNMENT

GOAL
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We want to support and strategically expand the use of AI in public administration, in order to facilitate contact with businesses and members of the public, to improve the level of service and to make staff's work easier.

ACTION AREA 4

Developing the Use of AI in E-Government

From state to local level, there is great potential for the use of AI in e-government. AI allows rapid analysis of large volumes of data and better decision-making. It can optimise processes and make it easier for businesses and members of the public to communicate with government agencies. Surveys show that 73% of people want public authorities to make use of AI. There are few other areas where so many people see potential for using AI.⁹ But in public administration just as in other areas, the State of Hesse always prioritises benefits for people, businesses and staff and is committed to responsible use of AI technology.

AI in state government agencies

The following examples from state government agencies illustrate some of the possibilities opened up by AI:

- The Hessian Ministry of the Environment, Climate Protection, Agriculture and Consumer Protection and the Hesse Department of Agriculture Affairs (LLH) want to use AI to help provide advice on reducing resource consumption (especially fertiliser, pesticides, energy and water) and improving animal welfare.
- The Hessian Ministry of Finance is using AI in its tax investigation offices to combat tax crime, and in future plans to roll it out to other departments so it can assist them in their work too.
- The Hessian Ministry of Justice is piloting the use of AI in electronic record-keeping.
- The Hesse Statistical Office is using machine learning to run plausibility checks on statistics and analysing satellite images with the help of AI, for instance in order to identify farmland and record crop yields.
- The Hessian Ministry of Social Affairs and Integration introduced the chatbot Leon, which allows people to straightforwardly get answers to their questions about Covid-19 round the clock.

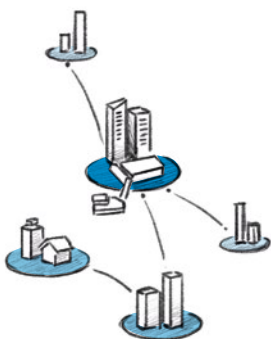
Chatbots also feature in the projects funded under the Hessian Ministry of the Interior and Sports' funding guidelines 'Cybersecurity Research in Hesse'. One example is a project at Darmstadt University of Applied Sciences that is developing AI chatbots and studying their effectiveness for awareness measures, schools and digital cybersecurity training.

INNOVATION HUB 110

→ At Innovation Hub 110, the only institution of its kind in Germany, the Hessian police have been planning, developing and testing smart software systems and new technologies in a start-up-style atmosphere since August 2020. The hub brings together state and federal police forces with science and technology experts in order to get innovative programmes off the ground. AI can be used, for instance, to detect hate speech and terrorist propaganda, to analyse large datasets in order to combat child pornography or to track the finances of organised crime.

The full service provider for IT and communication technology to the State of Hesse (HZD) is helping the state to move towards e-government. Its tasks include ensuring secure access to AI-related computing and data infrastructure and procuring AI services. Among other things, the HZD is trialling the use of AI in minutely meetings and translating documents.

A cross-departmental approach to AI



To strengthen synergies between the ministries and identify common projects, in early 2021 the Hessian Minister for Digital Strategy and Innovation launched the **AI Agenda Working Group**. Through this group, the ministries oversee the implementation of Hesse's AI Agenda and initiate cross-departmental AI projects. The first steps in its work are a new project, **Chatbots in State Government Agencies**, and the planned initiative **AI Dialogue: State Government Meets Science**, which is intended to foster dialogue between AI stakeholders in state government agencies and Hessian universities so that they can identify common AI projects and benefit from each other's expertise and resources.

In the AI Agenda Working Group, ministries can mutually benefit from each other's experiences and pool their resources to drive AI projects forward. We want the expertise of state government employees to feed into this process too, as they know from their day-to-day work where AI-based solutions add value, which is why we launched the **AI Ideas Competition**. The establishment of the cross-departmental AI Agenda Working Group makes Hesse a pioneer in Germany.

AI in smart cities and smart regions

Hesse's municipal authorities are also already using AI - for smart traffic control, for load management on power grids and for public administration. Rising investment in the Internet of Things and growing data traffic will further fuel this trend in the coming years.

The Digital City Darmstadt, funded by the State of Hesse, operates a data platform that is regarded as a trailblazer in Germany. In future, the data that is collected on the platform will only be analysable with the help of AI, something that is considered a particular advantage for complex applications such as infrastructure management.

The Smart Region agency, overseen by the Minister for Digital Strategy and Innovation, provides municipal authorities with information about how AI can be used in their activities, ensures transfer of tried-and-tested solutions and advises on funding for smart cities and regions through the programme **Starke Heimat Hessen**, which is also open to applications for AI innovations in cities. AI in smart cities will be a focal point both for funding and for the work of the **Smart Region agency**, which seeks to bring AI expertise to the Hessian smart city community.

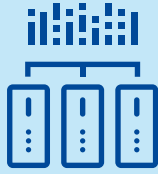
What's already in place:

- **Numerous AI projects by state government agencies**
- **AI Agenda Working Group**
- **Use of AI in smart cities and smart regions**
- **Funding for AI from the Starke Heimat Hessen programme**

What we're planning:

- **Chatbots in State Government Agencies (project)**
- **AI Dialogue: State Government Meets Science (initiative)**
- **AI Ideas Competition**
- **Focus on AI in the work of the Smart Region agency**





BUILDING A SUSTAINABLE DATA INFRASTRUCTURE FOR AI

GOAL
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We regard a high-performance AI data infrastructure and simple access to this infrastructure as key to successful research on and use of AI in Hesse. The existing potential of Hesse's AI data infrastructure needs to be better used and coordinated, and expanded in concert with federal and European initiatives.

ACTION AREA 5

Building a Sustainable Data Infrastructure for AI

Access to high-performance AI data infrastructure is essential for the success of AI Made in Hesse and for a dynamic AI innovation ecosystem. That's true for industry, academia and public administration. By AI data infrastructure, we mean the necessary hardware and software to research, develop and use AI.

Hesse already has an outstanding data infrastructure. It has the most data centres of any German state¹⁰ and the largest Internet exchange in the world in terms of average traffic throughput, DE-CIX in Frankfurt. We also attach great importance to environmental issues: the 2030 digital strategy, 'Digital Hesse - Where the Future Begins', sets the target of making Hesse a pioneer in the field of sustainable, energy-efficient data centres and green IT.

Infrastructure is also in place at universities, in particular TU Darmstadt, the University of Frankfurt and TH Mittelhessen University of Applied Sciences. The state-funded **Competence Center for High Performance Computing in Hessen (HKHLR)** is a collaboration between the universities of Darmstadt, Gießen, Kassel and Marburg that provides a strong network for advice and support. On top of that, TU Darmstadt was accepted into the National High-Performance Computing Alliance (NHR Alliance) in November 2020. In October 2021, the University of Frankfurt was also accepted into the NHR Alliance as a partner of the NHR Süd-West high-performance centre (alongside the University of Mainz, TU Kaiserslautern and Saarland University). This ensures researchers from a wide range of disciplines have access to high-performance computing in Hesse.

As a result, Hesse starts out in a superb position in terms of conventional data centres and high-performance computing, which also provides a very good foundation for the development and deployment of AI. However, there are some challenges:

- At present, large-scale language and image models are mainly being produced in the US and China. European industry needs its own models tailored to its own needs, but lacks the AI data infrastructure required to develop these large-scale models.
- State-of-the-art AI models, especially large-scale ones, require special AI infrastructure. The use of adapted hardware and software architectures offers significant advantages over standard architectures and conventional high-performance computing.



2030 digital strategy, short version as PDF:
<https://digitales.hessen.de>



- Demand for processing time on specially adapted architectures, and hence for available AI infrastructure and simple access mechanisms, is rising exponentially. This poses a great challenge. In Hesse, hessian.AI and the associated strengthening of the AI ecosystem are set to further increase demand.



We see this challenge as an opportunity, since a strong AI data infrastructure is necessary for AI to succeed. And only with a high-performance AI data infrastructure will we be able to attract outstanding researchers to Hesse from other parts of Germany and abroad, and then retain them. While several large companies in Hesse possess this kind of AI data infrastructure, researchers, SMEs and start-ups lack adequate access to a specialist AI supercomputer infrastructure due to the high investment and operating costs. We're working to change that.

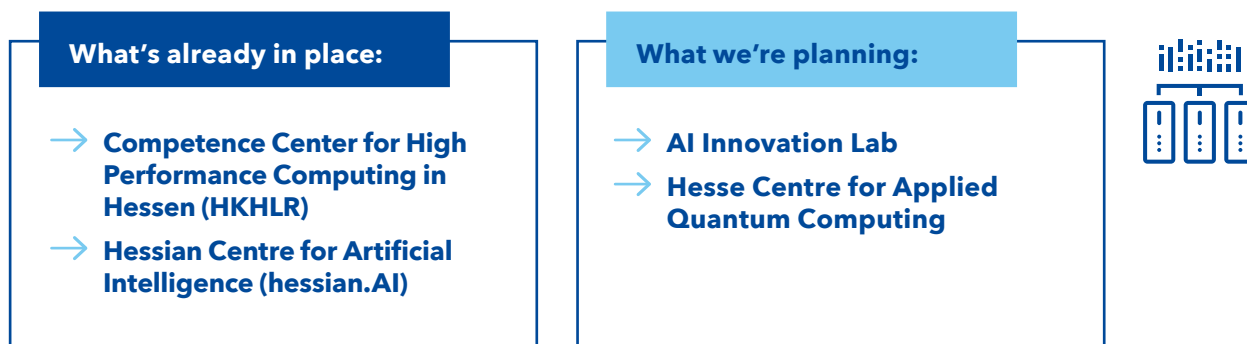
**AI Innovation Lab -
easy access to shared
computing power**

In partnership with hessian.AI, we will build a high-performance AI data infrastructure for Hesse: under the direction of the Hessian Minister for Digital Strategy and Innovation, we are developing the **AI Innovation Lab**, which will provide researchers and businesses (in particular SMEs and start-ups) with an AI supercomputer infrastructure. That will mean easy access to shared computing power, which is especially important for SMEs and start-ups and will allow them to complete AI-based projects that require a high level of processing power. Industries that will benefit include the finance, biotech, material tech, pharmaceuticals, mobility, logistics and aerospace sectors. Hesse is already strong in all these areas, and the AI Innovation Lab is intended to help keep it that way. The lab will also provide a platform for advice and support from qualified specialists, for collaboration between industry and academia and for dialogue between different user groups.

The AI Innovation Lab will encourage more start-ups in Hesse, boost the state's innovative power, significantly increase digital sovereignty and provide a major competitive edge.

Hesse is already preparing for the next generation of supercomputers, which are known as quantum computers. These computers can enable the use of AI to solve problems that currently confound even the most powerful conventional computers. We want to integrate existing research activities and bring together stakeholders from industry and academia. Again, we're not just interested in theoretical research, but want to transfer promising findings from the lab into practice. That's why the Hessian Minister for Digital Strategy and Innovation and the Hessian Ministry of Higher Education, Research, Science and the Arts are funding and supporting the development of the Fraunhofer Society's **Hesse Centre for Applied Quantum Computing (ZACQ)**. The centre will focus on making quantum computers easier to use and opening them up to new applications. That includes developing middleware to facilitate programming on quantum computers and enable a large pool of programmers to develop suitable software. The centre will give Hesse a pivotal role in the Fraunhofer Competence Network Quantum Computing.

These projects offer tangible benefits to Hesse as a place to do business and research. They will enable whole industries, including the materials science, chemicals, pharmaceuticals and medical sectors, to make a genuine quantum leap in product development and process optimisation. Quantum computing would make it possible, for instance, to model complex molecular formations far more efficiently and to speed up test cycles in wet labs. In logistics, quantum computers could improve fleet planning, while in cybersecurity they could make it possible to develop long-term secure encryption methods, which are of great interest to many sectors, including finance and insurance.



In focus: The AI innovation areas Healthcare, Finance and Mobility

Hesse is one of Europe's top places to do business. We're innovative and international to our very core, and known for the quality and expertise of our businesses, ranging from SMEs to major global corporations.

Hesse is especially strong in three areas that are well suited to the use of AI: healthcare, finance and mobility. We will be paying particular attention to these innovation areas.

INNOVATION AREA
AI & Healthcare



INNOVATION AREA
AI & Finance



INNOVATION AREA
AI & Mobility

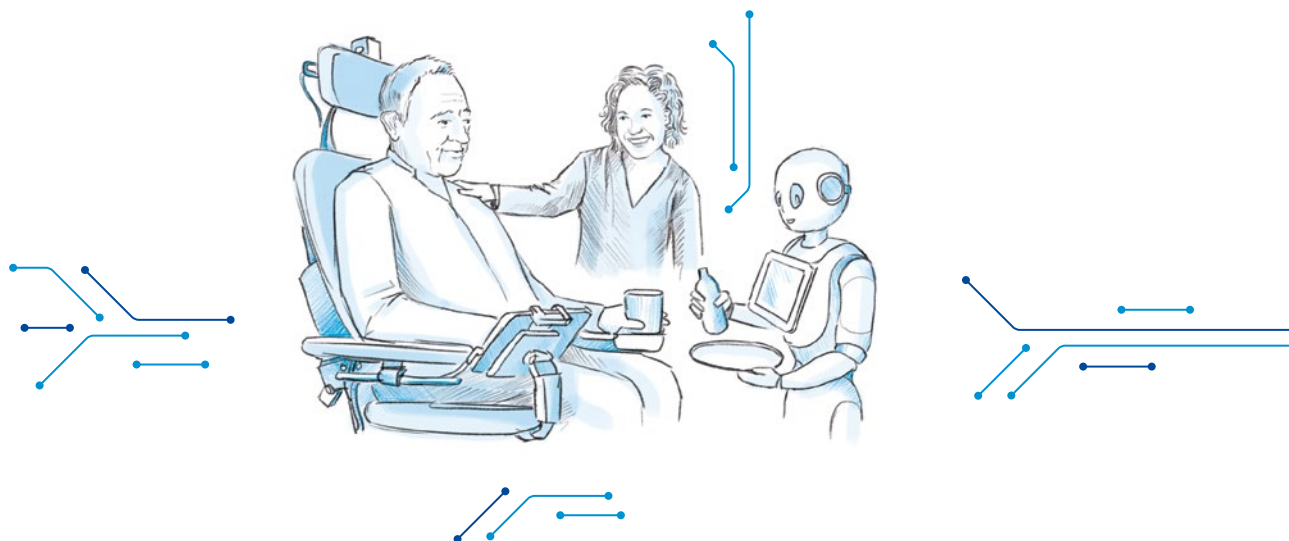
»» *With our innovation areas, we want to bring AI technologies from the lab into practice.* ««

Innovation area: AI & Healthcare

In healthcare, people can directly witness the benefits that AI brings to society and to each and every individual. AI helps doctors to analyse MRIs and diagnose medical conditions, it helps pharmaceutical companies to develop new medicines and it helps take the load off medical staff and allow them to provide better patient care. It also enables new treatment methods, such as personalised cancer treatments and apps for early detection of illnesses.

Health data is one crucial factor to successful employment of AI, and the State of Hesse has been very active in this area. Among other things, it submitted the initiative 'Protecting European Data Sovereignty' to the Bundesrat and ran the event 'Healthcare - Will Coronavirus Bring About Digital Medicine?' as part of the dialogue series #DigitalesHessen. We plan to build on this work in future and further explore the topic of health data.

In the coming years, we can expect further AI innovations in the healthcare sector, including at the Research Campus of Central Hessen (FCMH), which is already running a number of projects on AI and healthcare. For instance, acclaimed researchers from the University of Gießen, the University of Marburg and TH Mittelhessen University of Applied Sciences are studying the use of AI in caring for patients with Parkinson's and in fast, reliable analysis of ECG measurements.



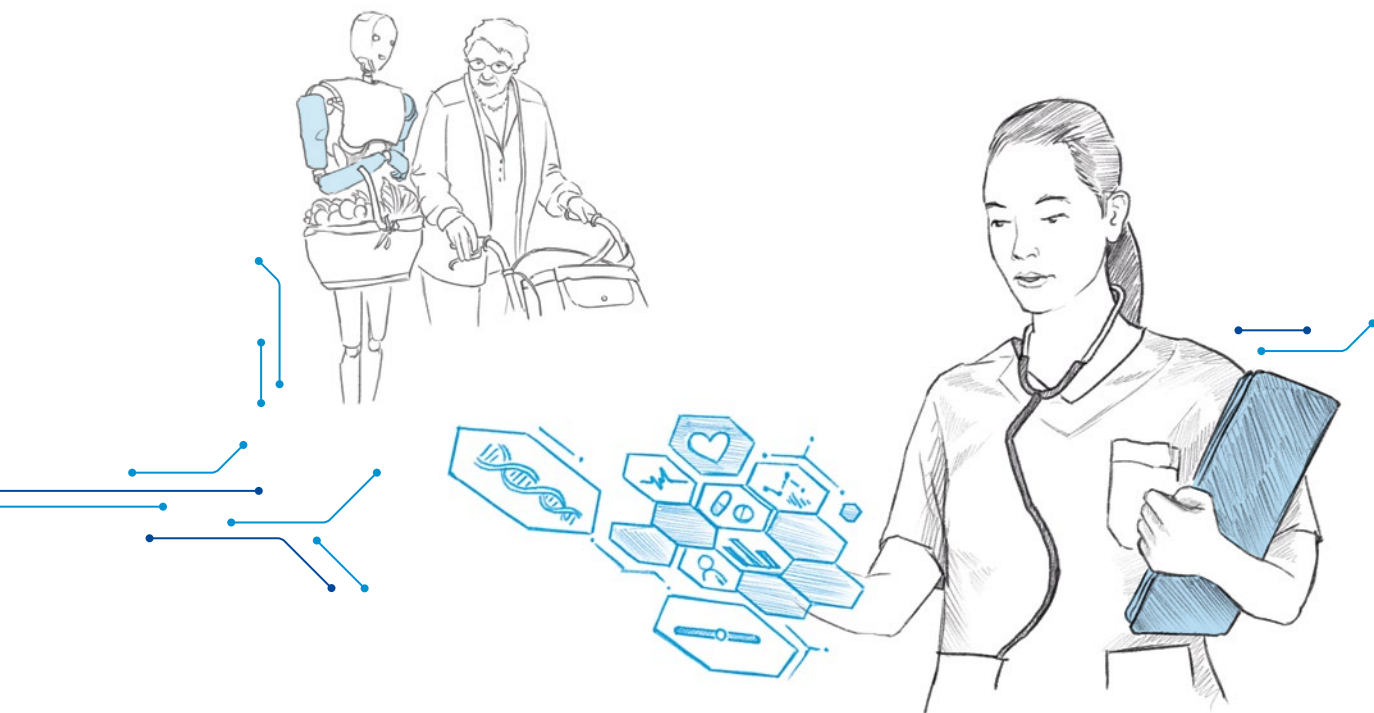
What is still lacking is an intermediary between researchers and doctors' surgeries that allows these innovations to reach patients quickly and comprehensively. This is something the Hesse Centre of Excellence for Telemedicine and E-Health (KTE) could provide support with. The KTE helps GPs and their teams to adopt digital processes and applications. As a result, the KTE has a lot of experience and close contact with doctors' surgeries throughout Hesse.

We will now be combining the KTE's and FCMH's expertise: the Hessian Minister for Digital Strategy and Innovation, the FCMH and the KTE are embarking on a **close, strategic collaboration under the heading 'AI & Healthcare'**, which will put research findings to the test of practice. The KTE will provide technical infrastructure and support for small, innovative AI projects and start-ups, and we will make use of its new, secure video training platform (the 'Digi-Trainingsplattform').

The Hessian Minister for Digital Strategy and Innovation, the FCMH and the KTE will be signing a letter of intent setting out the plans in more detail. The primary goal for all three partners is to deliver clear added value for research and practice.



**Hesse Centre of Excellence
for Telemedicine and
E-Health (KTE Hesse):**
[https://www.ehealth-
zentrum.de/](https://www.ehealth-zentrum.de/)



Innovation area: AI & Finance

AI is a key innovation driver in the finance sector. It powers chatbots that talk with customers, automatically carries out high-frequency trading, detects fraud and monitors compliance with legal requirements.

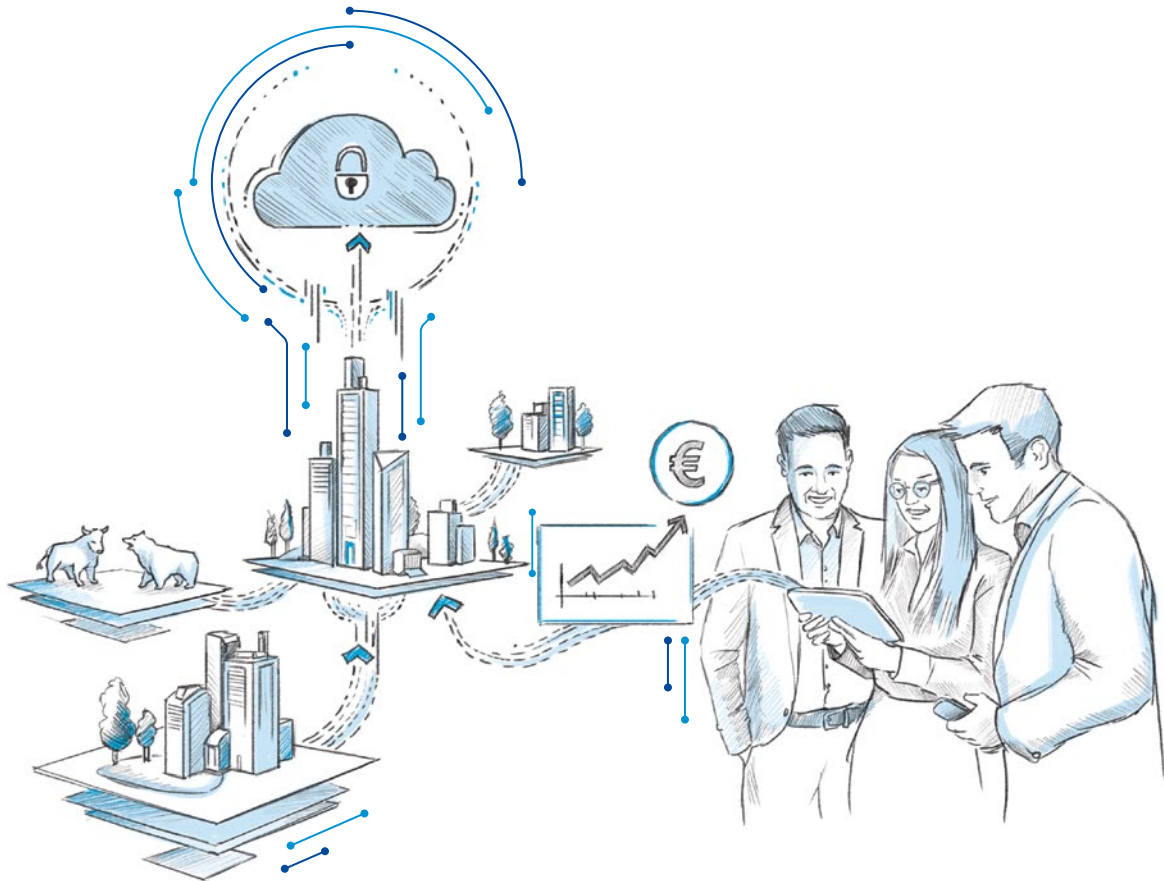
A data platform for the finance sector

As befits its status as a world-leading financial centre, Hesse wants to be a trailblazer in the use of AI in the finance sector. We've already initiated some key activities as part of the GAIA-X project, which aims to create a secure, federated European data infrastructure that meets the highest standards of digital sovereignty and fosters innovation. The Hessian Ministry of Economic Affairs, Energy, Transport and Housing is a 'patron' of GAIA-X's Finance domain working group, whose **Financial Big Data Cluster (FBDC)** brings together industry stakeholders to build a data platform for the finance sector.

Another closely related initiative is the research and development project **SafeFBDC**, which has been awarded some €10 million of funding by the Federal Ministry for Economic Affairs and Climate Action up until the end of 2023. Project partners include the Frankfurt-based innovation centre TechQuartier and Deutsche Börse, alongside ten other partners from industry and academia.

Another project with Hessian involvement also recently secured funding from a Federal Ministry for Economic Affairs and Climate Action funding competition: **EuroDaT: The European Data Trustee** aims to establish an independent data trustee in accordance with the EU's Data Governance Act. A total of 11 partners are collaborating on the project, including the Hessian Ministry of Economic Affairs, Energy, Transport and Housing, TechQuartier, the University of Frankfurt and ZEVEDI. Four concrete use cases are being implemented, which are intended to stimulate AI innovations at finance institutions and start-ups.

The State of Hesse wants to build on this strong foundation and address other challenges in the field of AI and finance. It is focusing on two key areas: skills development and responsible use of AI applications.



The Hessian Minister for Digital Strategy and Innovation is planning a **mentoring programme** to spark interest in the finance sector among AI specialists. At the same time, finance experts will learn about the potential that AI offers for their industry. The programme is intended to build links between high potentials from the finance sector and mentors working in academia, and between exceptional graduates and finance industry experts. The aim is to foster a creative, productive, practically focused dialogue and strengthen the finance sector's AI ecosystem by building an enduring talent base. The programme will build on existing initiatives and involve relevant stakeholders in Hesse, such as the House of Finance, the University of Frankfurt, hessian.AI, TechQuartier and the EFL Data Science Institute.

Just as people trust their bank, they should be able to trust the AI that's working on their behalf in the financial world, which is why ZEVEDI has been exploring **responsible use of AI in the finance sector** through its events, project groups and podcast series. It is planning further activities to spark more public discussion about digital transformation in the finance sector.

Innovation area: AI & Mobility

AI is forging the future of mobility. It allows more precise traffic forecasting, more efficient logistics processes and better traffic control. AI provides support not just on the roads, but also on rails, on water and in the air. It can help to increase traffic safety, prevent congestion and reduce harmful emissions. That's why we and our partners are already laying the groundwork for AI-based mobility in Hesse.

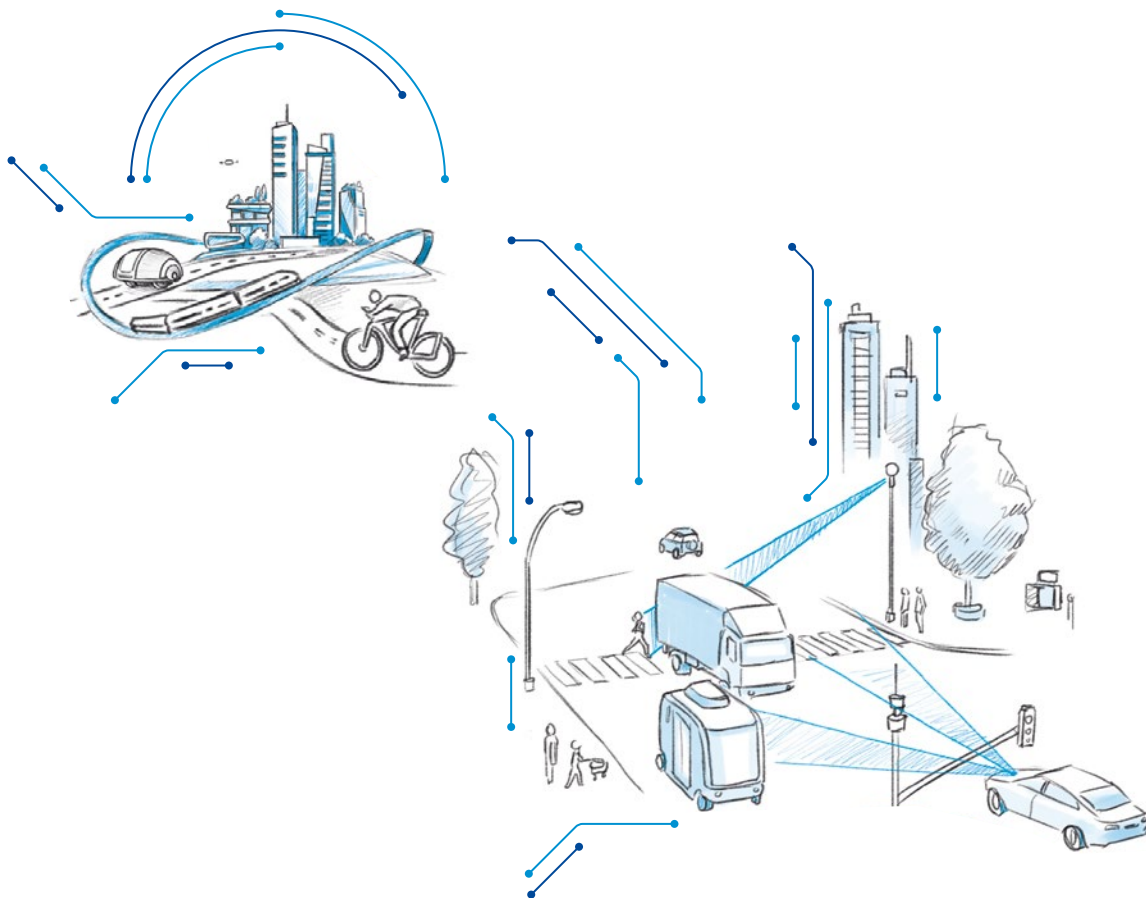
Thanks to its location in the heart of Europe, Hesse is a key transport hub and home to many mobility service providers and vehicle manufacturers. Those spearheading the use of AI include the Rhine/Main Regional Transport Association (RMV), the Edag Group and Wingcopter GmbH. A key role is also played by the **House of Logistics and Mobility (HOLM)**, which connects stakeholders from all the main branches of the mobility sector and develops ideas and applications for the future of mobility. This work provides a basis for assembling research and development teams, for implementing funding and knowledge transfer projects and for developing new applications. One area where HOLM is especially active is the planning of a dedicated traffic data infrastructure. HOLM discusses and develops solutions for how mobility data can be used to improve and manage traffic flows, and identifies what infrastructure this will require.

Frankfurt Airport, one of Europe's largest airports, is a prime example of the central role mobility plays in our state. Fraport AG, Lufthansa Cargo AG, Frankfurt University of Applied Sciences and the Fraunhofer Institute for Material Flow and Logistics (IML) are working to set up the **Frankfurt Air Cargo Digital Test Field**. The project is funded by the Federal Ministry for Digital and Transport's innovation programme Logistics 2030 and, among other things, will establish a data hub that connects all relevant stakeholders, including airports, airlines, ground handlers and state/federal agencies.

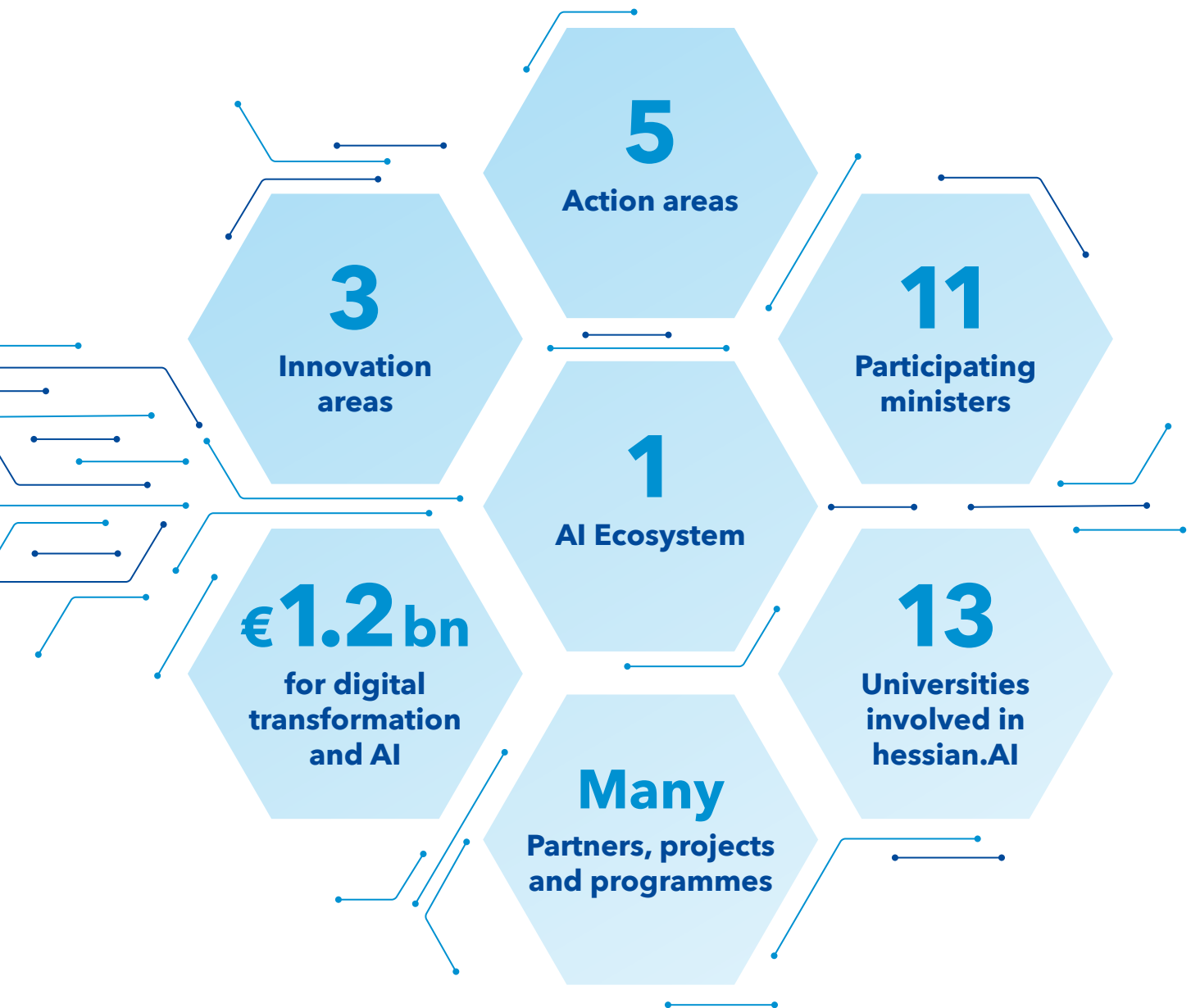
Mobility doesn't end at state borders, which is why the Frankfurt-Rhine-Main Strategy Forum's **Smart Region Group** brings together representatives of cities, regions, businesses and academia from Hesse, Bavaria, Baden-Württemberg and Rhineland-Palatinate. The group facilitates dialogue between individuals and organisations working on ideas for interstate data infrastructures, and supports research activity.

**'Digital Cities -
Digital Regions' -
planned conference
on AI and mobility**

The Hesse State Government plans to provide further support to the innovation area AI & Mobility. Municipal and regional authorities have a key role to play here, which is why back in March 2021 the programme **Starke Heimat Hessen** began funding smart cities and regions. One key element of the programme is the implementation of smart, AI-based mobility solutions. To make further progress in this area and embed these solutions at local level, the Minister for Digital Strategy and Innovation's department is planning to host the **conference 'Digital Cities - Digital Regions'** on the topic of AI and mobility, to provide municipal authorities with **newsletters and advice** on AI and mobility and to run a **workshop** as part of the House of Digital Transformation's **Smart Region mission**.



At a glance: AI Made in Hesse - Innovation with responsibility



All these things taken together make up our agenda for the future of socially responsible AI Made in Hesse

We're starting out from a strong position. The State of Hesse has already embraced artificial intelligence. We have the skills, the knowledge and the experts. Hessian companies, especially start-ups and fintechs, are successfully developing AI-based systems. Hesse has more data centres than any other German state. Our universities began to focus their research and teaching on AI from an early stage, and TU Darmstadt is one of Europe's leading universities in this field. Moreover, with the financial centre of Frankfurt, with its pharmaceutical and healthcare industries and with its mobility and logistics sectors, Hesse is home to major developers and users of AI-based products and processes. The state has a vibrant and highly dynamic AI ecosystem.

The AI Agenda seeks to continue Hesse's track record of success as a place to do business and as a centre of digital excellence. We want to foster innovation, entrepreneurship and start-up activity. We want to embolden those who are hesitant, cater to those with inquisitive minds, support those who need help. We want to build trust, expertise and knowledge.

All our projects, initiatives and activities are guided by one principle: AI should serve people and not the other way round. Innovation is only possible with responsibility. That's the course we seek to set, the fundamental constant that Hesse stands for.

AI isn't standing still, but developing at a rapid pace. We're aware of that and are rising to the challenge. So this AI Agenda isn't a finished document; our initiatives and activities will continue to evolve and expand. If you'd like to stay updated on these activities, you can find information about new projects, funding opportunities and the latest news about AI Made in Hesse on the State of Hesse's new AI website: **www.ki-hessen.de**. We'd also love to hear any tips, suggestions and advice you might have. Because one thing's for sure: for artificial intelligence to work, it's still going to need human intelligence too.



State of Hesse
AI website:
www.ki-hessen.de





»» *As a key enabling technology, AI has the potential to fundamentally improve the conditions of our lives and economic activities.* ««

Glossary

AI-based assistance systems

AI-based assistance systems use artificial intelligence methods to support health-care staff with medical, organisational and administrative processes. This can help improve these processes, take some of the strain off the staff and leave more time for patient care and treatment.

Algorithm

An algorithm is a sequence of steps for completing a task, similar to a recipe.

Artificial intelligence

Artificial intelligence (AI) is a collective term for applications that attempt to recreate human learning and thinking in computers, so that computers can independently (i.e. without detailed programming) answer questions or solve problems.

Autonomous systems

Autonomous systems can independently adapt to their situation and achieve a preset goal without human control or detailed programming. Many methods from the field of AI can be classified as autonomous systems.

Autonomous vehicles

Autonomous vehicles can independently perceive and navigate their environment and the traffic around them using technology such as sensors, cameras, radar and GPS.

Big data

Big data refers to datasets that due to their size, variety of data types and rapidly changing nature cannot be analysed by conventional methods of data processing. AI offers a way to deal with these datasets.

Chatbot

A chatbot is a system that enables dialogue in response to text input. Chatbots can use AI methods to communicate with people using natural language.

CLAIRE

CLAIRE (Confederation of Laboratories for Artificial Intelligence Research in Europe) is a pan-European network of laboratories conducting research on AI. It was founded in 2018 and aims to strengthen European excellence in AI research and innovation.

Data science

Data science is a field of study that uses methods from mathematics, statistics and IT to analyse and find patterns in sets of data.

ELLIS

Founded in 2018, ELLIS (European Laboratory for Learning and Intelligent Systems) is a Europe-wide organisation that seeks to build a distributed research institute for high-quality research on AI, with a particular focus on machine learning.

Fintech

Fintech, short for financial technology, is a collective term for digital business processes and technologies in the finance sector. Fintech companies, including many start-ups, want to improve or replace traditional ways of doing things in the finance industry using digital innovations. Examples include mobile payment methods and digital investment solutions.

GAIA-X

GAIA-X is a European project whose aim is to develop a European data infrastructure for the general public, businesses and governments. It wants to build a common EU data space where data can be securely and straightforwardly shared in an environment of trust. This data space will be based on a network of decentralised infrastructure services.

Geodata

Digital information associated with a specific location on the earth's surface. It may refer to that location directly, for instance in the form of coordinates, or indirectly, for instance by mentioning a city, country or point of interest.

Industry 4.0

Industry 4.0 refers to the wholesale digitalisation of industrial production, based on systems that are interlinked by smart sensors. The aim is to enable maximally self-organised production in which people, machines, systems, logistics and products communicate and cooperate.

Internet of Things

In the Internet of Things (IoT), physical devices are connected to the virtual world, allowing communication and coordination between them.

Machine learning

Machine learning refers to methods that allow computers to 'learn' from examples. Through this learning process, computers build up a wealth of experience and gain the ability to independently find solutions to problems.

Open data

Open data is data that can be used and distributed by anyone and for any purpose. It is generally not subject to any licensing costs.

Quantum computers

Quantum computers, by contrast with conventional computers, operate with quantum bits (qubits). This technology can be used in various fields, such as AI research, medicine or materials science, to answer questions that exceed the capabilities of even the highest-performing conventional computers.

Start-ups

A start-up is a relatively new company with an innovative business idea. Start-ups attempt to grow quickly and bring a profitable product or promising service to the market. They are usually reliant on venture capital, which is money provided by off-market investors.

Sources/endnotes

- ¹ This definition of AI is based on that given by Plattform Lernende Systeme: <https://www.plattform-lernende-systeme.de/glossar.html>.
- ² 'Vertrauen in KI' (Trust in AI), position paper by the Hesse State Government's Digital Ethics Council, February 2021, https://digitales.hessen.de/sites/digitales.hessen.de/files/2021-06/20210205_thesenpapier_ethikrat_vertrauen_in_ki.pdf.
- ³ 'Potenziale der Künstlichen Intelligenz im produzierenden Gewerbe in Deutschland: Studie im Auftrag des Bundesministeriums für Wirtschaft und Energie', 2018, <https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/potenziale-kuenstlichen-intelligenz-im-produzierenden-gewerbe-in-deutschland.html>.
- ⁴ In the most recent edition of the DFG Funding Atlas, TU Darmstadt was ranked third in the category 'Computer science, systems and electrical engineering'. See German Research Council (DFG), 'Funding Atlas 2021: Key Indicators for Publicly Funded Research in Germany', https://www.dfg.de/sites/fundingatlas2021/download/dfg_fundingatlas_2021.pdf.
- ⁵ h-index according to Google Scholar: <https://scholar.google.com>.
- ⁶ The website Plattform Lernende Systeme has a map of AI degree programmes in Germany: <https://www.plattform-lernende-systeme.de/map-on-ai-map.html>.
- ⁷ Mittelstand-Digital, 'Künstliche Intelligenz im Mittelstand: Relevanz, Anwendungen, Transfer', 2019, https://www.mittelstand-digital.de/MD/Redaktion/DE/Publikationen/kuenstliche-intelligenz-im-mittelstand.pdf?__blob=publicationFile&v=5.
- ⁸ The lead institution behind the project is RWTH Aachen University's Laboratory for Machine Tools and Production Engineering (WZL), which is supported by six partners: the German Research Center for Artificial Intelligence (DFKI), the University of Kassel, TU Darmstadt, IHK Kassel-Marburg, IHK Hessen Innovativ and Regionalmanagement Nordhessen GmbH.
- ⁹ See Bitkom, 'Die Menschen wollen KI - und haben auch Angst vor ihr', 28 September 2020, <https://www.bitkom.org/Presse/Presseinformation/Die-Menschen-wollen-KI-und-haben-auch-Angst-vor-ihr>.
- ¹⁰ See Borderstep Institute for Innovation and Sustainability, 'Potenzial von Energieeffizienztechnologien bei Colocation Rechenzentren in Hessen: Studie im Auftrag des Hessischen Ministeriums für Wirtschaft, Energie, Verkehr und Landesentwicklung', March 2018, https://www.borderstep.org/wp-content/uploads/2018/04/TLH-Studie_Colocation_Hessen_final-screen.pdf.

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