



AI in research.
AI for research?
How the AI revolution
impacts the German
research sector

Long gone are the times when artificial intelligence (AI) was merely the thing of science fiction movies and dystopian novels. In 2024, the topic of AI is everywhere and all around us. Rapid technological progress in recent years has meant that AI tools and solutions have penetrated every aspect of our lives, from healthcare and finance to transportation and entertainment. It has already revolutionised the way we shop and communicate, how we travel, and the media we consume.

It can assist us in automating mundane tasks, improving decision-making processes, and easily solving complex problems that we, as mere mortals, struggle with. Its potential – we are told – is endless! Yet, at the same time, cautionary voices are becoming louder. Just last year, an open letter signed by a variety of experts in the field called for a temporary halt to further development of the technology.

Against this backdrop, it is important to consider the impact and potential of AI technology in research as well. AI has expanded beyond the science and technology sector, affecting all research areas. The impact of AI is accelerating exponentially.

The use of AI is also no longer merely about speeding up time-consuming tasks – its powerful computational tools may reveal questions researchers did not even know to ask. To name but one example, AI can use visual characteristics inaccessible to humans. In the field of medicine, this could mean that AI can recognise features in images that can help with the lifesaving work of hypothesis generation. To put it simply: AI is a pretty ‘big deal’.

AI, ML, NLP, LLM - AI jargon de-mystified

First things first: How can AI be defined? AI is the theory and development of computer systems capable of performing tasks that historically required human intelligence, such as recognising speech, making decisions and identifying patterns. AI is essentially an umbrella term that encompasses a wide variety of technologies, including machine learning (ML), deep learning and natural language processing (NLP).

In everyday usage, the terms ‘artificial intelligence’ and ‘machine learning’ are often used interchangeably, but the two are meaningfully distinct. While AI primarily refers to replicating human-like cognitive abilities, ML specifically refers to the use of algorithms trained on data sets. These are used to create machine learning models that allow computer systems to perform tasks like making song recommendations, identifying the fastest way to travel to a destination or translating texts. AI has already become commonplace with multiple everyday applications, such as:

- **ChatGPT:** uses large language models (LLMs) to generate text in response to questions or comments posed to it
- **Google Translate:** uses deep learning algorithms to translate text from one language to another
- **Netflix:** uses machine learning algorithms to create personalised recommendations for users based on their previous viewing history

Future visions for AI research in Germany

Considering the importance of the topic, it is no surprise that a number of German and European research funders have laid out their strategic plans or recommendations about AI for the future. On 7 November 2023, Bundesministerium für Bildung und Forschung (BMBF – Federal Ministry of Education and Research) launched a new action plan for AI, which sets out the Ministry’s objectives and priority areas for AI research in Germany.

The primary aim of the action plan is to support the competitive position of Germany and its European partners in AI development by building on existing research strengths and developing a distinct profile for AI ‘Made in Germany’. At the same time, BMBF intends to drive forward the current discourse around the risks associated with AI by supporting the development of legal framework conditions based on scientific and empirical evidence.

BMBF sets out the following 11 fields of action:

1. Consistently strengthen the research base.
2. Design a research agenda for new perspectives and approaches.
3. Expand targeted AI infrastructure.
4. Intensify the development of AI-related expertise and competencies.
5. Promote AI-related knowledge transfer to support economic growth and future opportunities.
6. AI in the area of healthcare: unlock societal benefits for all.
7. Exploit the social and scientific benefits of AI in a targeted manner.
8. Investigate and design AI-based technologies for the educational sector.
9. Seek even closer alliance with European and international partners.
10. Promote social dialogue and multidisciplinary research.
11. Enact appropriate, agile, innovation-friendly regulation.

Another influential German funder, the **Alexander von Humboldt Stiftung (Alexander von Humboldt Foundation)** published a press release on ‘**How Germany can become competitive in the international AI arena**’ in late 2023. The document that emerged from the Future of AI Summit held during the Aachen AI Week offers a list of seven recommendations on AI for the German government. In addition to the issue of research financing, the recommendations focus on ensuring technological independence and building advisory structures.

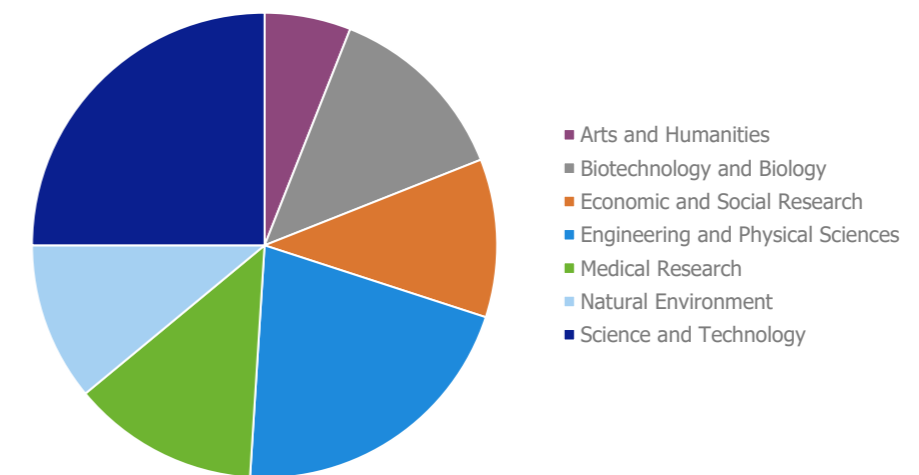
At the EU level, the **European Commission** is also markedly shaping the landscape for AI research. A **policy brief on the role and potential of AI** in science and innovation was published by the Commission in December 2023. The document advocates a tailored ERA (European Research Area) policy to speed up and facilitate the adoption of AI in science. This will harness the potential of the technology to accelerate breakthroughs, foster innovation and drive economic growth. Included in the brief are also infrastructural aims such as strengthening of the data and computer ecosystems that enable AI use in research. At the same time, the European Commission acknowledges AI-related ethical challenges and highlights the need to monitor the impact of AI on careers in research as well as on the public trust in science in general.

The interdisciplinary expansion of AI research

To understand the significance of AI technologies, one only needs to look at its pervasiveness across the research funding sector. The ResearchConnect database, which reports on thousands of funding opportunities worldwide, currently includes hundreds of grants, fellowships and awards supporting AI-related activity for researchers in Germany and internationally.

The ResearchConnect database also showcases the remarkable inter- and cross-disciplinary nature of the topic. Instead of focusing primarily on research in the areas of science, technology and engineering, many funders view the AI research they support as part of a much wider context. While almost half of funding opportunities on AI are targeting researchers in fields like engineering, computer science and maths, the figure below shows that the overall distribution across the other disciplines is almost even. 13% of programmes offer support for AI-related research in biology and biotechnology. Another 13% are open to medical researchers. 11% link up AI research and economic and social research, and the same share of programmes also fund research that combines AI technologies with research relating to the natural environment. Even the arts and humanities are encouraged to address the topic of AI as 6% of opportunities target researchers in this field.

AI related funding opportunities across different disciplines on ResearchConnect



For researchers in Germany, AI research funding is offered by a wide range of funding organisations, from federal and state ministries to membership organisations. Examples of opportunities that are currently open for applications in this sector include the **Deutsche Forschungsgemeinschaft (DFG) Priority Programme: Machine Learning in Chemical Engineering. Knowledge Meets Data – Interpretability, Extrapolation, Reliability, Trust (SPP 2331)**, which is inviting proposals for the second funding period. The programme funds collaborative research projects addressing the topic of ML in chemical engineering (CE). It brings together CE and ML communities, including chemical engineers, mathematicians and computer scientists working in Germany, who may examine fluid processes with or without chemical reactions. The submission window closes on 4 June 2024.

AI as a strategic resource for banks is the topic of the 2024/25 funding period of the **DZ BANK Stiftung (DZ BANK Foundation) Research Grants programme**. The Foundation offers funding of up to €100,000 for research projects and scientific events in the areas of banking and finance. Submissions for this programme are open until 30 June.

Fonds der Chemischen Industrie im Verband der Chemischen Industrie e.V. (FCI – Fund of the Chemical Industry) provides **Funding for New Teaching Materials and Methods in Chemistry** to improve methods and concepts of teaching and the purchase of associated materials and equipment for chemistry programmes at institutions of higher education in Germany. The focus for 2024 is on promoting higher education in AI and ML in (in)organic synthesis and catalysis. Institutions of higher education may apply for funding of €50,000. The application window closes on 30 April 2024.

AI for medicine

One of the most powerful application areas for AI today is in medical research. An exciting example of the type of research that is currently being funded in this field is **Swarm Learning for the Medicine of the Future**. The project, which is funded by **VolkswagenStiftung (Volkswagen Foundation)** and coordinated by Prof Joachim Schultze, director for system medicine at DZNE (German Centre for Neurodegenerative Diseases), investigates how swarm learning can be used for precision medicine in infectious diseases and pandemic preparedness.



Precision medicine specialists employ precise data to identify diseases, but as the amount of data available increases, technological help is needed to identify these patterns. AI is a suitable tool here, since its learning algorithms perform better on large amounts of data. In order to obtain the data, the research team led by Prof Schultze applies swarm learning – blockchain technology to connect different institutions into a network, the swarm. In this swarm, they conduct learning sessions in which the algorithms learn with the data from the respective clinics on their own servers, and then they exchange the results. In this way, the entire swarm can continue to improve while the data remains in the respective institutions. In the current project, six German university hospitals in Berlin, Bonn, Gießen, Hamburg, Cologne and Homburg form the swarm, and together they are learning to better diagnose infections.

Another notable project is underway at **Helmholtz-Gemeinschaft Deutscher Forschungszentren (Helmholtz Association of German Research Centres)**. The large-scale project dedicated to **AI-Based Support System for Skin Cancer Diagnostics** was coordinated by DKFZ (German Cancer Research Centre) and brings together over 100 dermatologists from 33 countries. It is known that AI can help detect skin cancer as it distinguishes early stage melanomas from other skin tumours more accurately. However, many dermatologists distrust the algorithms' decisions, which they cannot comprehend.

As part of the project, scientists have now developed an AI-based support system for skin cancer diagnostics that explains its decisions. The system uses established diagnostic features that relate to specific areas of suspicious lesions. The participating dermatologists diagnosed a test panel of digitised images of various lesions in three different ways: based on their experience alone; with the support of a conventional AI system; and with the XAI (explainable artificial intelligence). The results did not disappoint: The XAI explanations increased doctors' confidence in the machine's decisions, as well as in their own diagnoses.



AI in the research sector: possibilities and pitfalls

The results of a [survey](#) conducted among researchers in the UK in 2023 suggest that the AI revolution will particularly affect the research sector. When asked if they use generative AI tools (like ChatGPT) for work-related purposes, about half of the respondents admitted to already using these tools. The vast majority (83%) expected to use AI tools more in the future, and many (72%) believed that these tools are changing how academics work.

In this context, it is no surprise that DFG issued a [statement](#) discussing the influence of generative models of text and image creation on science and the humanities in September 2023. The statement, which was also [endorsed by Volkswagen Foundation](#), offers initial guidelines for dealing with generative AI tools in the context of scientific and scholarly research, as well as within the framework of the review, evaluation and decision-making process of research funders. The statement points out that 'AI technologies are already changing the entire work process in science and the humanities, knowledge production and creativity'.

DFG does not rule out the use of generative tools but highlights the need to uphold certain standards to ensure good research practice. This includes aspects such as transparency and verifiability of research processes and findings, compliance with professional ethics and basic principles of research integrity, as well as disclosure of all cases where generative models are used. The statement also highlights the responsibility of the human author of any research publication to ensure that the use of AI tools does not infringe other people's intellectual property or result in scientific misconduct.

DFG also clearly states that the use of generative models in the preparation of research proposals submitted for funding has no impact on the funding decision. However, the same tools cannot be used for the preparation of reviews as this may breach the confidentiality of the process.



As the DFG statement suggests, AI tools are already used for a manner of different tasks within the research sector. Researchers at the Institute for Methods Innovation at the University of Warwick in the UK recently published an [article](#) on the way researchers may be able to utilise generative AI tools like ChatGPT to increase productivity. The list of suggestions included the creation of more accessible science communication content for different audiences and contexts, and repurposing funding applications to create impact plans or adjusting an application to fit a particular call. The tools could also help with ideas for survey design to evidence research impact or support the analysis of survey data. The researchers also highlight the tools' limitations and note that they are 'great support tools' intended as 'a starting point for content generation, editing and improvements'.

A recent [LSE Blog post](#) on the topic posits that recent developments are part of a long-term trend, stating: 'Claims to moral purity based on avoiding GenAI tools are dubious at best. Anybody who has ever accepted a suggested change from an automated spelling or grammar check in Microsoft Word already has some experience with using an AI tool to improve their work.'

However, as highlighted by DFG's statement, ethical concerns around the rapid expansion of generative AI and the need to manage risk are being raised across the research community. Recognising these concerns, the European Parliament reached a provisional agreement on the [EU AI Act](#) on 9 December 2023, which acknowledges the need to regulate AI to ensure better conditions for the development and use of this innovative technology. The Commission subsequently announced the creation of the European AI Office, which will play a key role in implementing the AI Act and foster the development and use of trustworthy AI.

As this article has illustrated, AI is increasingly embedded in the fabric of organisational and everyday life. It impacts research on many different levels. Not only is AI a leading trend across many different research disciplines, it also plays a key role in national and international research and innovation strategies. At the same time, AI technologies have a direct impact on how academics do their work. Navigating its infinite possibilities and pitfalls will increasingly become an integral part of academic life.





As part of its ongoing coverage of research funding and policy changes, the ResearchConnect team closely follows the most recent developments on artificial intelligence for and in the research sector. We offer a user-friendly database containing a global source of research opportunities, covering a broad range of funders and disciplines. Our news content features the most recent research calls and funder updates, opening a window on the latest funding opportunities and developments to researchers worldwide.

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