Lernende Systeme

GERMANY'S PLATFORM FOR ARTIFICIAL INTELLIGENCE

Bringing AI into the application

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Executive Summary

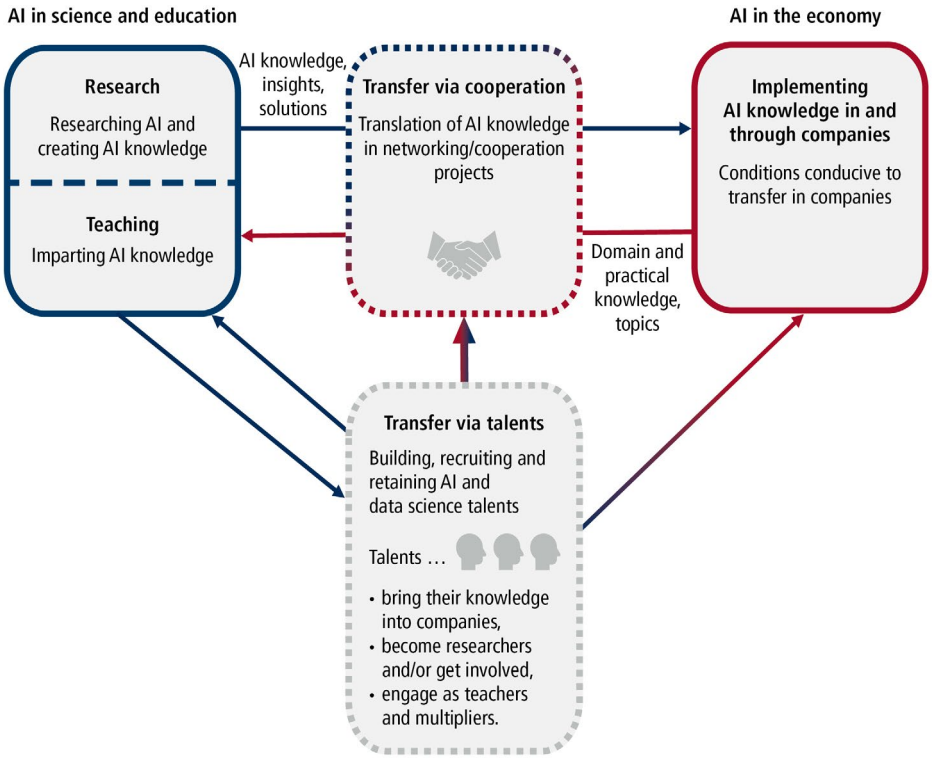
The transfer of knowledge and technology from research to application is of central importance for developing new innovative products or services and improving existing ones. Knowledge transfer is therefore also fundamental in the case of artificial intelligence (AI) to generate employment and economic growth and to strengthen Germany's international competitiveness as a business location. In AI research, Germany is well positioned in international comparison. However, in AI knowledge transfer, there is still potential for action regarding the relationship between universities and companies. In addition, companies, especially small and medium-sized enterprises (SMEs), often lack the necessary expertise and qualified specialists to implement AI knowledge and methods.

In this white paper, experts from the working group Technological Enablers and Data Science of the Plattform Lernende Systeme outline various measures on how the transfer of AI knowledge can succeed in the interest of all stakeholders involved. This means transferring interesting research results to innovative practical AI-applications with economic success.

Prerequisites for successful AI transfer

Three essential fields of action are highlighted for a successful AI transfer process: Establishing an ecosystem of AI and data science talents, improving and intensifying close cooperation between universities and companies, and creating transfer- suitable conditions for the implementation of AI knowledge in and by companies. These fields of action are essential for successfully exchanging knowledge, findings and potential solutions between scientific institutions and companies and thus for creating new products, processes, applications and services.

Figure: Overview of the transfer process of AI



Explanation: Own compilation. The figure is a simplified representation of the transfer process. It highlights the focus of the white paper and therefore does not consider other aspects of the transfer of knowledge, such as the founding of companies or companies acquiring prototypes developed in research institutions.

The experts point out various options for action:

Transfer via talents: To translate investments in education and research into growth and prosperity in the long run, it is necessary to build, recruit and retain AI and data science talents. For building AI and data science talents, there is a need for early awareness-raising already in schools to inspire and attract pupils

to AI. During their studies, students, but also doctoral candidates, should have the opportunity to become familiar with exciting AI topics with practical relevance through project work and theses (bachelor/master/doctorate) or working student activities. Graduates, in turn, should be shown concrete career prospects, for example through the career or entrepreneurship centres at the universities. For keeping AI and data science talents in Germany or to increase Germany's attractivity for international AI and data science talents the general condition in companies should be suitable and innovative and exciting AI topics from German companies should be highly visible. Since many employees have domain expertise, it is important to constantly expand this knowledge through regular training on the topic of AI and data science.

Transfer via cooperation: Excellent research, knowledge from the application domains and a sufficiently large pool of well-trained AI and data science talents are prerequisites for the transfer of knowledge and technology. The short innovation cycles of AI research and the high demand for expertise in the economy require that universities and companies cooperate in an uncomplicated and natural mutual exchange. Regular dialogue and continuous cooperation are necessary, so that the latest state of AI research and domain knowledge from companies can circulate as freely as possible and can be related to each other. This requires more openness regarding the conception of innovation on both sides – universities and companies. A conception that promotes room for manouvre and incentives for cooperation in projects and in AI-related innovation networks.

Suitable framework conditions to facilitate the transfer: Overall conditions in companies should take AI specificities into account to promote the seamless transfer of the latest findings and ideas into new and innovative AI applications. These conditions affect the organisational-structural and economic-strategic orientation of a company as well as a corporate mentality that is open to AI. With regard to the organisation, the first question is where companies should embed AI and data science talents, how to organise knowledge among employees with scientific expertise or domain knowledge for effective collaboration, and how the company's own IT and data infrastructure should be designed with value creation in mind. Furthermore, an AI-promoting corporate mentality is important. This mentality should be reflected in the strategy of a company and its self-image to ultimately develop new attractive "data-driven" business models based on AI.

In addition to these essential fields of action, the authors go on to give a brief overview of the current situation for AI transfer of knowledge in Germany and point out that the interdependencies between the conditions in this transfer must also be taken into account.

Current situation of the transfer of AI knowledge: AI research is already well positioned in Germany. It is an attractive place to work and study and has numerous networking and cooperation initiatives. However, disproportions are also evident that reveal a deficit in the transfer of AI knowledge to AI applications:

- The mismatch between the comparatively good position in AI research and the rather weak position in AI implementation in German companies.
- The gap between the demand and supply of AI and data science talents.
- The gap between the importance attached to AI in general and the actual current implementation of AI knowledge in companies.

These reasons make it clear that the transfer of AI knowledge into AI applications should be supported using the measures presented – transfer via talents, transfer via cooperation, suitable framework conditions to facilitate the transfer.

Interdependencies between the conditions for the transfer of knowledge: Furthermore, the interdependencies between different conditions for the transfer of knowledge make it obvious that good and close cooperation between universities and research institutions with companies is essential so that the latest state of AI research and domain knowledge from companies can circulate as freely as possible and be related to each other, thus making the transfer process successful.

Recommendations and outlook

A joint effort by universities and research institutions as well as companies and policy makers is necessary, to promote the transfer of AI knowledge and to overcome the aforementioned disproportions in the transfer process. For this purpose, the authors present a catalogue of possible measures for all actors involved in the process. This catalogue of measures serves as a contribution to the discussion on transfer measures and at the same time as a set of instruments for further measures based on and derived from it, which leaves room to be variably adapted to the dynamics of the transfer process. It is particularly important to continue to develop diverse options that increase the visibility of exciting topics from companies and research for the various actors in the ecosystem of talents. At the same time these options should promote awareness of the importance of and various preconditions for the transfer of knowledge among all participating shareholders – universities, companies and society.

Table: Overview of design options by actor and condition for the transfer of knowledge

Universities/ Research institutions	Companies	Government/ policy makers
Transfer via talents		
• Promote contacts between students and teachers • Offer orientation programmes for graduates • Take up exciting topics from industry, e.g. in practice-oriented teaching or through projects with companies at career and entrepreneurship centres	• Create excellent working conditions: infrastructure, organisational embedding, working hours, leadership • Promote exchange with other AI talents • Create opportunities for further training and challenging, exciting projects • Prepare and disseminate exciting topics/projects (e.g. via competitions)	• Continue to promote STEM education • Facilitate employment for international students/ graduates/professionals
Transfer via cooperation		
• Enabling matchmaking between students/companies (e.g. for internships); between AI talents/companies (e.g. via AI competence centres) • Encourage universities to rethink their approach to doctoral thesis at companies • Using universities of applied science (HAW/FH) to disseminate AI knowledge broadly and regionally (e.g. via cooperation with AI competence centres) • Create and strengthen transfer/co-innovation/ entrepreneurship centres to establish regional hubs for the ecosystem of talents • Promote public-private partnerships • Expand AI/data science continuing education programmes	• Organising competitions to solve concrete problems (thus initiating contacts between students and companies) • Promote cooperation with universities and other companies to gain and expand expertise • Enable further training for employees, managers, and decision-makers (e.g. through cooperation with universities)	• Promote cooperation/ networking projects • Facilitate the integration of associations or start-ups into the close network of AI competence centres • Promote GAIA-X for SMEs (e.g. for data cooperation)
Suitable framework conditions to facilitate the transfer		
	• Create AI-specific general condition regarding the organisational embedding of AI talents; responsibilities for AI in the company, corporate culture, (hardware and software), infrastructure, closing AI knowledge gaps through cooperation, clear AI strategy etc. • Seek and strengthen networking and cooperation in the ecosystem of talents (e.g. at regional AI centres or local universities)	

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