



# AI, Machine Learning & Big Data

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# Germany

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## Trends

German companies are heavily investing in artificial intelligence, big data and deep learning. According to a study of IDG Research Services, 57% of German companies already employ AI technology; while the services sector and consumer IT are dominated by foreign companies, especially from the US. The German industrial sector is quickly adopting and advancing these new technologies. The German economy rests mainly on the industrial sector, most prominently on its well-known automotive companies. The backbone of the German industrial sector consists of mid-sized manufacturing companies, the so-called “*Mittelstand*”. Many of these companies are acting on a global scale and are leaders in their respective business sectors. It is therefore of some concern that mainly large German companies prioritise technologies such as machine and deep learning, while the “*Mittelstand*” and smaller companies are still comparatively reluctant to invest in this trend. In order to accelerate the development and to secure Germany’s attractiveness as a business location, the German Federal Government launched its Artificial Intelligence Strategy in November 2018 and pledged to invest EUR 3 billion until 2025. Most of the technologies used in the industrial sector are likely to affect business-to-business relationships, manufacturing processes, the supply chain and final products. Machine learning and AI are still widely used as a tools to optimise existing processes; however, only one quarter of German companies intend to use these technologies to develop new products and services. Yet, many companies are currently in the process of integrating machine learning into their business activities and these figures might already change in the near future.

Germany’s automotive companies make use of artificial intelligence in order to foster innovation in the areas of autonomous driving and e-mobility. In 2019, 58% of patents related to autonomous driving originated from Germany. Nevertheless, the German car manufacturers are in fear of being pushed out of the market by companies like Google or Apple, who are also heavily investing in autonomous driving. With such new competitors on the horizon, German car manufacturers are joining forces in order to stay ahead of the curve. But these new technologies do not only boost innovation in the automotive sector. Numerous start-ups are developing new products and services, and universities are conducting comprehensive research on how artificial intelligence can be employed in innovative ways. In the European Union, Germany ranks No. 1 as the country with the highest number of AI-related start-ups.

While the business and research communities are eager to advance the process, politicians and the media are cautioning to be aware of the risks the new technologies might pose. This relates in particular to the labour forces, where people fear being replaced by artificial intelligence and robots. Workers’ unions especially remain rather sceptical towards these new technologies. Furthermore, privacy concerns arise when adopting new AI technologies;

e.g. Amazon's Alexa being a cause of heated debate. These concerns are inhibiting the widespread use of AI technology in Germany. As a result, the German Government is facing the challenge of finding a viable compromise between these conflicting interests, which leads to a rather constrained approach to artificial intelligence in Germany.

### Key legal issues

In Germany, the discussion of the legal ramifications of AI has only just begun. It is heavily driven by the underlying ethical questions. Humanity should not blindly exploit all possibilities of artificial intelligence. How and for what purposes artificial intelligence should be used, first and foremost, is a question of ethics. Ethical principles instruct human beings in their actions and decision-making, taking into account (social) values. Simultaneously, these principles define limits that people should not cross and attempt to balance the risks and the opportunities. The ethical discussion has led to five main principles: beneficence; non-maleficence; autonomy; justice; and explicability. While the legal discussion focuses on particular questions, the proposed solutions often refer to one or more of the ethical principles. The spectrum of legal questions discussed is diverse. One topic relates to whether and how the technology itself, i.e. the underlying algorithm, can be protected by intellectual property law. As the training of artificial intelligence requires large amounts of data, data protection is a highly debated topic in Germany: if the data used relates to an identified or identifiable natural person, it is considered personal data and therefore protected by the General Data Protection Regulation (GDPR). As such, its processing has to comply with the requirements of the GDPR. Similar problems arise when texts, images or videos from the internet are used to train the artificial intelligence: these works are protected by copyright law. If these works are "read" by the artificial intelligence during the training, this might lead to (partial) reproduction of the protected work. Yet, the copying of protected works requires the consent of the author. In order to answer these questions, the existing laws have to be applied to artificial intelligence.

However, artificial intelligence also raises numerous questions, which cannot be addressed by referring to existing laws. For example the problem of liability: who should be liable if the artificial intelligence causes harm to a human being. One might think of autonomous driving where the car causes a crash: the liable person could either be the manufacturer, the driver, the owner or the artificial intelligence itself, if endowed with a legal personality.

## **Ownership/protection**

### Protection of AI

The development, implementation and training of artificial intelligence systems (AI Systems) requires considerable investments. In order to protect these investments, the question arises of who the owner of the AI System is and how it can be protected against competitors using the technology to advance their own products or services.

An AI System consists of various different components: hardware; software; databases; sensors that record and transmit data; and active parts acting in accordance with output of the artificial intelligence, e.g. robot arms, car brakes or a graphical or vocal user interface. Furthermore, several companies and people are involved in the development and production of an AI System. These facts leave plenty of room for various intellectual property rights, in particular to protect each component of the AI System. Due to the various people and components involved, it is usually not possible to protect the AI System as a whole. This might only apply if the AI System is less complex and essentially developed by one company.

### *Patent protection*

Nevertheless, when we focus on the artificial intelligence itself, i.e. the software and the algorithm, particular legal issues arise to protect them. In general, it is not possible in Germany to apply for a patent if you want to protect a software solution. Patents shall only be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible to industrial application. According to the German Federal Supreme Court, an invention in the field of technology requires an instruction for the controllable use of the forces of nature to achieve a causally overseenable result.<sup>1</sup> Computer programs as such do not use the forces of nature to achieve a result. Computer programs are based on the rules of logic, but the activity of the human mind is not one of the controllable forces of nature. Therefore, programs for computers or algorithms are not patentable inventions under the German Patent Act.<sup>2</sup> However, the patentability of a computer program shall only be excluded to the extent to which protection is being sought for the subject-matter or activities referred to as such.<sup>3</sup> Therefore, it is possible to apply for a patent if the inventor wants to protect a “computer-implemented invention”. A computer-implemented invention is an invention that includes computer programs, but also other technical components, like an anti-lock braking system.<sup>4</sup>

Patent protection is possible if the computer program is embedded in the process of a technical device. The Federal Supreme Court has established a three-stage test to assess whether a computer-implemented invention is patentable. At the first stage, the court examines whether the claimed invention relates to a field of technology (*Technizität*). Therefore, the non-technical components, i.e. the software, has to be distinguished from the technical components. Only the technical components can justify patent protection. The Federal Supreme Court generally affirms the necessary technicality with regard to universal computers, i.e. not the software itself, but the software running on a universal computer. At the second stage, the court analyses whether patent protection is claimed for a program “as such”. This is the case if the invention does not contain instructions which serve to solve a concrete technical problem with technical resources. Finally, at the third stage, whether the other requirements for patent protection are fulfilled are checked: the invention has to be new; involve an inventive step; and has to be industrially applicable. Therefore, patent protection cannot be claimed for the algorithm or the software of an AI System as such, rather only in combination with hardware components.

The distinction between the virtual and the physical sphere leads to problems when we think about new forms of research using the possibilities of artificial intelligence. In the past, research was conducted through observations of the real world. The typical inventor conducts experiments in a laboratory. Nowadays, these experiments are replaced by simulations calculated with artificial intelligence: a well-known example is the folding of protein structures with Google’s deep mind engine. If such simulation results in a new invention, it is highly debated whether such results can claim patent protection as they are based on logic in the virtual space and not on the forces of nature in the physical space.

### *Copyright protection*

If we focus on the software element of an AI System, this component can be protected as a computer program under the German Copyright Act. Computer programs are programs in any form, including design material. The protection applies to all forms of expression of a computer program. However, the particular value of an AI System lies in the underlying algorithm and the “weights” of its neural network, caused through the training of the artificial intelligence. Therefore, the question arises of whether these parts of an AI System can

be protected through the Copyright Act. With regard to the algorithm, one has to keep in mind that the algorithm and the computer program are not the same. The algorithm is the abstract form of a computer program.<sup>5</sup> The software allows this algorithm to be read and processed by a CPU. Since the algorithm is the abstract concept of a computer program, the algorithm cannot be protected through the German Copyright Act. The law states that ideas and principles which underlie any element of a computer program, including the ideas and principles which underlie its interfaces, shall not be protected by copyright.<sup>6</sup> It is the common understanding in Germany that algorithms are such general ideas and thus not protected by copyright. The weights might be (a part of) a computer program, which is protected by copyright law. If a neural network is being trained and learns to process inputs to create the correct output, this learning is reflected in the weights of each neuron. The weights resemble the memory of a human brain. However, the problem with copyright protection is that the weights are not a “work” created by a human being.

The German Copyright Law is focused on the protection of the author and his relation to his work. The Copyright Law does not only protect the economic interests of the author, but also his moral rights. This understanding is the general foundation of copyright law in continental Europe, but differs from the approach in the US and the UK. Based on this approach, only works from a human being can be protected under the Copyright Act. Copyright protection is not denied if the author uses technical resources as mere tools to create his work (computer-assisted work), but it is necessary that the work is characterised by human achievement. If there is no human imprint or if it is only subordinate, copyright protection is excluded. Therefore, the weights of a neural network are not subject to copyright protection as a computer program. This might be different if the neural network is trained through monitored or reinforced training, because the development of the weights could be attributed to a human being. In the case of unattended learning, no link to a human being exists. Therefore, copyright protection for computer programs does not apply.

However, the weights could be protected as a database under the German Copyright Act.<sup>7</sup> A database is a collection of works, data or other independent elements arranged in a systematic or methodical way and individually accessible by electronic or other means and whose obtainment, verification or presentation requires a substantial qualitative or quantitative investment. With regard to the protection of the weights, the consideration of which investments have to be taken into account is particularly problematic, because the training itself (compared with the development of the AI System) does not require substantial investments. Furthermore, whether the weights can be considered as “independent elements arranged in a systematic or methodical way and individually accessible by electronic or other means” is also problematic. The value of the weights does not rest within one neuron, but in the trained neural network as a whole. Therefore, protection as a database will not apply in most cases.

### *Protection as a trade secret*

Finally, the algorithm and the weights could be protected as trade secrets. The EU Trade Secrets Directive and the German Trade Secrets Act (GeschGehG) have lately been introduced in Germany and caused some changes to the law. In particular, the requirements for the protection of a trade secret have changed. A trade secret is information which is neither generally known nor readily accessible, either in its entirety or in the precise arrangement and composition of its components, to the persons in the circles who normally handle this type of information, and is therefore of economic value and subject to the circumstances after appropriate secrecy measures by its lawful owner. In fact, it is therefore important that

the holder of the trade secret takes appropriate measures of secrecy in order to protect his trade secret. Such measures can be non-disclosure obligations, but also technical protective measures, like encryption. This becomes particularly important if the holder hands over the AI System (and thus the algorithm and the weights) to a third party for use. Furthermore, so-called “reverse engineering” is explicitly allowed by the Trade Secret Act. If the holder wishes to prevent this, he only has the option of contractually prohibiting reverse engineering.

### *Summary*

To summarise, AI Systems can be protected. Copyright protection as a computer program is only sufficient to a limited extent, since it does not include the algorithm and the weights. In this respect, only protection as a trade secret is possible, which is linked to appropriate measures for secrecy.

### Data Protection

#### *Automated decision-making*

If artificial intelligence is used to process personal data, this use has to comply with Art. 22 of the GDPR. The provision grants the data subject the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her. The legal effect of this right of a data subject is a general prohibition for the use of artificial intelligence for automated decision-making based on personal data in general. The aim of this provision is to prevent a human being from being subjected to a decision made by a machine which significantly impacts the life of this human being. A human being shall not be the object of logic without a person reviewing the decision. However, the GDPR foresees three exceptions from this general rule, if: (a) the automated processing is necessary for entering into, or performance of, a contract; (b) it is authorised by Union or Member State law; or (c) it is based on the data subject’s explicit consent. Where exceptions (a) or (c) apply, the data controller shall implement suitable measures to safeguard the data subject’s rights and freedoms and legitimate interests.

However, the general prohibition only applies if the decision is not finally reviewed by a human being. Currently, most use cases for artificial intelligence aim to support a human being. For example, a doctor is supported by an AI System to detect cancer or a driver is warned through an audio signal that he is crossing a lane. In these scenarios the artificial intelligence does not make the final decision. It is always a human being who analyses the result of the AI System and, using other sources of information, like his knowledge and experience, comes to a final conclusion. In all these cases, the prohibition set out in the GDPR does not apply. However, not every human interaction is sufficient to circumvent the prohibition. The person must be able to override the automated decision and replace it with a decision based on its own considerations. Even if the AI System does not have the authority for a final decision, we have to consider the effect an AI-proposed result has on the individual who has to reach a final conclusion. Even if the individual is entitled and able to actually deviate from the proposal of the AI System, he will not necessarily do so: if he decides against the proposal of the AI System and later on it appears that his decision was wrong and the proposal from the AI System was correct, he will be under pressure to justify his decision. This conceived pressure alone can prevent an individual from exercising his decision-making power.

#### *Duty to inform*

The data controller is obliged to inform the data subject of the existence of automated decision-making, including profiling and, at least in such cases, to provide meaningful



information to the data subject on the logic involved and the scope and intended effects of such processing. The controller must therefore first inform the data subject whether he uses automated decision-making. If this is the case, the data controller has to explain to the data subject how the logic involved works and which consequences the decision can have for the data subject. The data controller must provide the information in a precise, transparent, comprehensible and easily accessible form in clear and simple language. Thus, the data controller has to explain a complex technical process in such a way that anyone understands it. This task becomes particularly difficult if the data controller uses trained neural networks to apply automated decision-making. In the case of neural networks, even an expert is often unable to understand how the neural network reached a decision. Various methods are currently being developed to understand how artificial intelligence has achieved a specific result. However, the data subject itself will most likely not be interested in receiving a technical description of the logic involved. He is regularly interested in which parameter needs to be changed in his specific case and how, so that the automated decision turns out differently. In accordance with a ruling of the Federal Court of Justice, the logic, i.e. the algorithm itself, does not have to be shown or explained to a data subject. The German data protection authorities emphasise that not only does the result have to be explained, but also the whole process and how the decision has been reached.

#### *Data accuracy and forecasting decisions*

Personal data shall be accurate and, where necessary, kept up to date. If AI is used to make predictions about how individuals are likely to behave, there can be a conflict with the principle of data accuracy. Artificial intelligence can be used, for example, to predict whether a natural person will be able to repay a credit. The results reflect a probability of whether or not a particular event will occur. This does not guarantee that the individual will actually cause a particular event. The predicted result can therefore be wrong. However, “accurate” means that the probability value must be calculated correctly according to the method used.

#### *Data protection impact assessment*

If AI is used to process personal data, it must be checked in advance whether a data protection impact assessment is necessary. Where the processing of personal data, taking into account the nature, scope, context and purposes of the processing, is likely to result in a high risk to the rights and freedoms of a natural person, the data controller shall carry out an assessment of the impact of the envisaged processing operations on the protection of personal data, in particular if new technologies are used. A data protection impact assessment shall also be required in the case of a systematic and extensive evaluation of personal aspects relating to natural persons which is based on automated processing, including profiling, and on which decisions are based that produce legal effects concerning the natural person or similarly significantly affect the natural person. If AI is used to process personal data, a data protection impact assessment must be conducted to manage interaction with the data subject or to evaluate personal aspects of the person concerned. The data controller must deal intensively with the risks of artificial intelligence and take appropriate remedial action.

#### *Storage limitation and data minimisation*

Artificial intelligence regularly requires a multitude of training data. If the training data is personal data, it must be deleted as soon as the purpose for which it was collected has been achieved. The processing of personal data by artificial intelligence must be reduced to the necessary extent. Self-learning artificial intelligence develops itself further when information that has been processed leads to new results. If these results are based on personal data, the question arises as to whether this violates the obligation to delete personal data with the

purpose of achieving it. Artificial intelligence can regularly no longer reverse adaptations without being deleted in its entirety. However, the algorithm is adjusted without directly storing personal data in the algorithm.

### **Antitrust/competition laws**

Antitrust and competition law might be affected if companies use the same online platform to sell their products or services and the online platform is offering an AI-driven service that changes the prices of all participants to optimise the sales of their goods and services. This results in the same price for all products and services fulfilling the same needs of the customers. Under antitrust law, this constellation known as hub and spoke situation leads to an unlawful price-fixing agreement between the participants. In these cases, the companies do not communicate with each other but rather through a mediator, such as an online platform. According to the ECJ, the fact that the mediator can potentially coordinate the market behaviour and the companies' tacit acquiescence to that business model can constitute a violation of antitrust law. However, German antitrust law does not forbid collusive behaviour in general. It differentiates between explicit collusion, where the market participants directly communicate, and implicit collusion, where the actors coordinate their behaviour without direct communication. As long as the competitors only act in the same way, without any explicit agreements, this does not violate antitrust law. The line is crossed if the competitors through their parallel behaviour eliminate competitive conditions of the market. Yet, at this point, algorithms are not capable of autonomous pricing decisions and due to the complexity of the process this is not likely to change soon. Nevertheless, if and how implicit collusion through artificial intelligence should be regulated by antitrust law is already being discussed in Germany.

Similar questions arise through the increasingly wide-spread use of blockchain technology. Unlike in hub and spoke situations, at least in the public blockchain, there is no central mediator. Still, coordination occurs on an abstract level. Therefore, the principles regarding platforms can be applied here as well: If companies participate in the blockchain they simultaneously agree to the coordination and sharing of information. This, too, might result in a breach of antitrust law. Finally, a general problem in addressing collusion through AI is that it might prove impossible to attribute its behaviour to a company that could be held accountable.

### **Board of directors/governance**

Since the GDPR entered into force, data protection law is an area of law which media, authorities and the public pay special attention to. The use of personal data within an artificial intelligence or big data context should strictly comply with privacy laws in order to avoid negative publicity or fines. Compliance with data protection laws is also relevant for the board of directors as violations might lead to personal liability. Furthermore, the management has to take important business decisions with particular care. Otherwise, there is a risk that they will be personally liable for any damages incurred. Pursuant to Sect. 93 (1) German Stock Corporation Act the board of directors must "apply the diligence of a prudent and conscientious manager in the management of the company". However, the management is not liable if it acts in accordance with the Business Judgement Rule, Sect. 93 (1) German Stock Corporation Act. One requirement is that the management acts on the basis of appropriate information when taking a decision. To that end it is common practice to consult experts or consultants. However, the use of AI can also prove helpful, as AI can

conduct complex calculations and produce realistic forecasts. A legal obligation to use artificial intelligence for business decisions does not exist (yet).

### **Implementation of AI/machine learning/big data into businesses**

“AI made in Germany” is to become an international brand, synonymous with modern, secure AI applications for the common good that are based on European values.<sup>8</sup> This sentence summarises the German Federal Government’s Artificial Intelligence Strategy which it launched in November 2018. The strategy is not only focused on the promotion of Germany’s economy, but also aims to create benefits for the people and the environment. The German Government recognises artificial intelligence as a key driver of productivity and as a generator for economic growth. Although Germany is already extremely well positioned in many areas of AI, the Federal Government aims to transfer the existing strengths to areas where no or little use has been made of the potential of artificial intelligence. The strategy focuses on three key areas: (1) investments in research by creating 100 additional professorships for AI to ensure that AI has a firm place within Germany’s higher education system; (2) safeguarding a responsible development and use of artificial intelligence that serves the good of society and is based on a human-centred approach; and (3) integration of artificial intelligence in the ethical, legal and cultural sphere. One year later, the government’s enthusiasm seems to have faded: Of the initially promised EUR 3 billion, only EUR 1 billion has been budgeted, which enticed criticism from experts and the business community. It is currently being discussed whether a ministry of digitalisation should be created within the ongoing legislative period. Chancellor Merkel reacted reluctantly; it remains to be seen if these plans actually become reality.

In Germany, currently no specific law regulates AI, big data or machine learning. The first regulations that touch on these matters – for example, Art. 22 of the GDPR – are discussed above. The German Copyright Act has been amended in 2018 to adapt it to the current needs of the knowledge society. It now contains a provision allowing text and data mining and the automated analysis of a large number of works for the purpose of scientific research.<sup>9</sup> It is permissible to reproduce the source material, including automatically and systematically, in order to create, particularly by means of normalisation, structuring and categorisation, a corpus which can be analysed. The corpus can be made available to a specifically limited circle of persons for their joint scientific research, as well as to individual third persons for the purpose of monitoring the quality of scientific research. Even if the source material is protected by copyright law, e.g. pictures or texts on the internet, they may be reproduced and handed over for scientific purposes. In addition to these changes, all relevant governmental authorities have issued statements and opinions for the use of artificial intelligence and big data within their relevant area. The authorities often use these statements to clarify ongoing legal issues and present their understanding of the law. Although this opinion is not legally binding, it can serve as a guideline on how to use artificial intelligence in compliance with the law.

In 2017, Germany passed a law allowing cars to drive highly or completely automated. Although the car is driving partly autonomously, the law requires the driver to stay receptive while handing over control to the car. According to this law, the car still needs a driver, i.e. a person closely monitoring the car and the traffic and who at all times is able to retake control. It is the driver (and the owner) who will be liable if the car crashes during the use of the automated functions. The functions may only be used “within the scope of their permitted use”. For example, if the function is developed and tested for motorways, the driver shall

not be allowed to use it in city traffic. This act has already led to substantial discussions about how autonomous driving should be regulated in Germany: those in favour have argued that autonomous driving will make the roads safer and reduce the number of car crashes and persons injured or killed in traffic. Critics point out that it is irresponsible to allow drivers to use the functions because substantial questions relating to autonomous driving have not yet been solved.

In the end of 2018, the minister for traffic announced that legislation allowing fully autonomous driving, i.e. the car drives entirely without a driver, would be passed in 2019. This was mainly a result of pressure from the automotive industry that felt inhibited by the fact that legislation was lagging behind the advances in technology. So far, no such law has entered into force. Consequently, it continues to be unclear who should be liable if the artificial intelligence causes harm to another person. At the moment, the majority of commentators suggest that the manufacturer should be liable. Recently, however, the big car manufacturers have curbed the enthusiasm regarding autonomous driving and announced that it might well take another 10 years before a self-driving car might be ready for the road. Presumably the main reason being that the technology is currently too expensive for large-scale production. Nevertheless, the topic remains far up on the agenda.

\* \* \*

### Endnotes

1. BGH, Beschluss vom 27.3.1969 – X ZB 15/67, GRUR 1969, 672 – Rote Taube.
2. Sect. 1 (3) No. 3 German Patent Act (PatG).
3. Sect. 1 (4) German Patent Act (PatG).
4. Bundesgerichtshof, Urteil v. 13.05.1980, Az.: X ZB 19/78.
5. Sect. 69a German Copyright Act (UrhG).
6. § 69a (2) German Copyright Act (UrhG).
7. § 87a German Copyright Act (UrhG).
8. <https://www.bundesregierung.de/breg-en/news/ai-a-brand-for-germany-1551432>.
9. Sect. 60d German Copyright Act (UrhG).

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