

Artificial Intelligence Strategy of the Austrian Federal Government

Artificial Intelligence Mission Austria 2030
(AIM AT 2030)

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Foreword by Federal Minister

Leonore Gewessler, BA

Artificial intelligence (AI) already accompanies us in many areas of life today and will do so even more in the future. Especially when it comes to climate protection, AI opens up important new opportunities that must be exploited. With AI as an essential technological tool, it is possible to meet the major societal challenges of our time.

Specific AI fields of application are widely diversified and include numerous sectors. The majority of them are concerned with the fight against the climate crisis. The use of AI technologies offers a wide range of opportunities to help tackle environmental challenges. For example, AI-based innovations may promote the expansion of renewable energies, contribute to increasing the efficiency of freight logistics or support the transition to sustainable mobility.

Despite all the positive potential of artificial intelligence, it is also important to firmly confront possible dangers. AI must be applied fully in line with European values, in a human-centered way and must be actively designed for the common good of all. This process requires an in-depth analysis of developments on the technological as well as the societal side. For this reason, the present strategy is an agile one that needs to be constantly developed further.

The Austrian research and innovation landscape is well positioned in the field of artificial intelligence and boasts decades of diversified expertise. The Ministry of Climate Protection (BMK) has supported great research projects through its funding programmes in recent years and has thus enabled numerous innovations in the field of artificial intelligence. The focus of the next few years will be on the development of "AI for Green" technologies.

This strategy is the result of an extensive stakeholder process in which more than 160 experts from different disciplines were involved. Coordination between various disciplines, the participating ministries, companies and involving the general population will also be the centrepiece of the implementation of AIM AT 2030.

Foreword by Federal Minister Dr. Margarete Schramböck

Artificial intelligence is one of the key technologies of advancing digitisation and has the potential to make an important contribution to strengthening our economy and the positive development of our social coexistence.

With the aim of shaping artificial intelligence in the interests of society, more than 160 experts from science, economics, civil society and public administration have been actively involved in the development of this strategy from the outset.

This strategy focuses on exploiting the opportunities for our economy and society that arise from innovative applications of AI.

It is crucial that the design, development and use of AI is embedded in the framework of our democratic values and that there is a clear legal framework that provides certainty and also drives innovation.

This Austrian AI strategy also addresses the objectives of the EU AI package presented by the EU Commission in spring 2021. The proposed EU package is a combination of the world's first regulatory framework for AI and a new coordinated plan to ensure security and respect for fundamental rights while driving investment and innovation in AI across the EU. Austria supports the EU Commission's initiative and will actively participate in the negotiations on this EU legislative act.

It is essential that we promote Austrian and EU-wide competitiveness, also by creating uniform legal and technical conditions for domestic companies throughout Europe, so that they can develop and test AI solutions in a safe environment.

Furthermore, the use of AI for innovative digital services will play an increasingly important role in public administration, for example in the form of new digital administrative services. However, it is clear that administrative decisions with a direct impact on humans can only be supported by machines, but must always be made by humans.

When dealing with artificial intelligence, it is particularly important that safety and benefits for humans as well as the protection of fundamental and human rights are always at the centre of attention, while at the same time enabling innovation and thus economic growth.

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Executive Summary

Artificial intelligence (AI) is a collective term for powerful computer technologies with the potential to change many areas of society. The use of AI opens up new dimensions in the personalization of services, the optimization of processes or the management of resources across all economic and social sectors. AI can provide companies with decisive competitive advantages and, at the same time, support important socially and ecologically necessary transformation processes in a wide variety of areas. AI is a cross-cutting technology whose safe and targeted use can make a significant contribution to climate change mitigation and post-Corona pandemic economic recovery.

In addition to these opportunities, the use of AI also comes with major challenges and potential areas of concern. It is therefore essential to ensure that a secure framework for the use of AI applications is created together with our European partners that also covers the issue of fundamental rights, such as data protection, equality rights, and the prohibition of discrimination accordingly.

In order to be able to realize the opportunities of AI for Austria and to minimize the potential risks, the present AI strategy of the Austrian Federal Government was developed under the title Artificial Intelligence Mission Austria 2030 (aim AT 2030). It focuses on pursuing the following three objectives:

1. A broad deployment of AI oriented towards the common good is targeted, carried out in a responsible manner on the basis of fundamental and human rights, European fundamental values, and the upcoming European legal framework.
2. Austria should position itself as a research and innovation location for AI in key areas and fields of strength, and
3. by means of the development and use of AI, the competitiveness of the Austrian technology and business location should be secured.

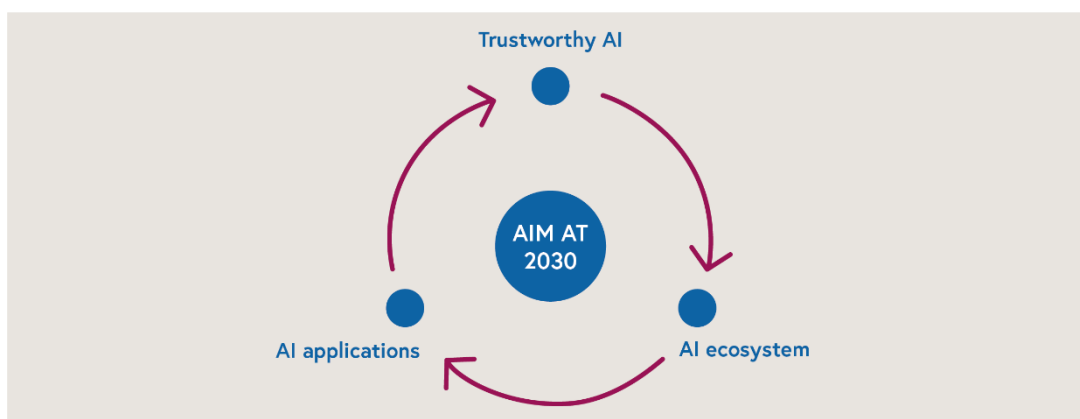


Figure 1: Topics AIM AT 2030

Based on the EU's Coordinated Action Plan on AI, the aim AT 2030 defines the necessary basic principles for trustworthy AI (Chapter 3). In order to unleash the potential of trustworthy AI, concrete measures for a functioning AI ecosystem (chapter 4) are set out. Complementing these two basic pillars, steps for realizing the potential are outlined in very specific AI application fields (Annex), which range from climate protection to applications in industry or education.

AI technologies and their applications are developing very fast. For this reason, aim AT 2030 sets the guidelines in which the use of AI in Austria can and should be develop. At the same time, aim AT 2030 focuses on agile, interdisciplinary and participatory implementation and further development.

The AI strategy of the Austrian Federal Government is defined as an agile strategy. It is not perceived to keep still for the coming years, but rather is open to changes, additions, and clarifications, learning with regard to implementations that have already taken place, and can and should therefore constantly evolve.

This strategy is interdisciplinary. AI has the potential to influence numerous fields of application. Therefore, it is imperative to take an interdisciplinary approach to shaping AI for the future. More than 160 experts from a variety of disciplines (technology, economics, natural sciences to law, social sciences or educational sciences) were involved in the development of the strategy. This broad approach is also reflected in the numerous federal ministries involved.

The federal government's AI strategy is participative. Experts and other stake holders have already been involved in drawing up the strategy. The strategy also includes broad participation of civil society organizations, intermediaries, and citizens in the implementation of the measures.

This strategy is European: The federal government attempts to formulate its target provisions in close coordination and comprehensive agreement with the fundamental values and objectives of the European Union and the Community measures. With this strategy, Austria thus also contributes to the promotion of Europe's industrial and technical performance and supports the spread of AI throughout the Union's economy.

This strategy is international: The federal government will actively participate at the international level in order to strengthen and concretise the international legal framework (especially human rights and international humanitarian law) for the digital space and to develop standards for the ethical use of AI in accordance with human rights.

The aim AT 2030 comprises clear objectives and measures pursuing these, which are divided into general fields of action, and a selection of initially relevant fields of application on the subsequent pages. The following figure shows the objectives and the individual fields of action of the two basic pillars "Trustworthy AI" and "Creating ecosystems". A detailed assignment of the measures to the three objectives is color-coded in the text.

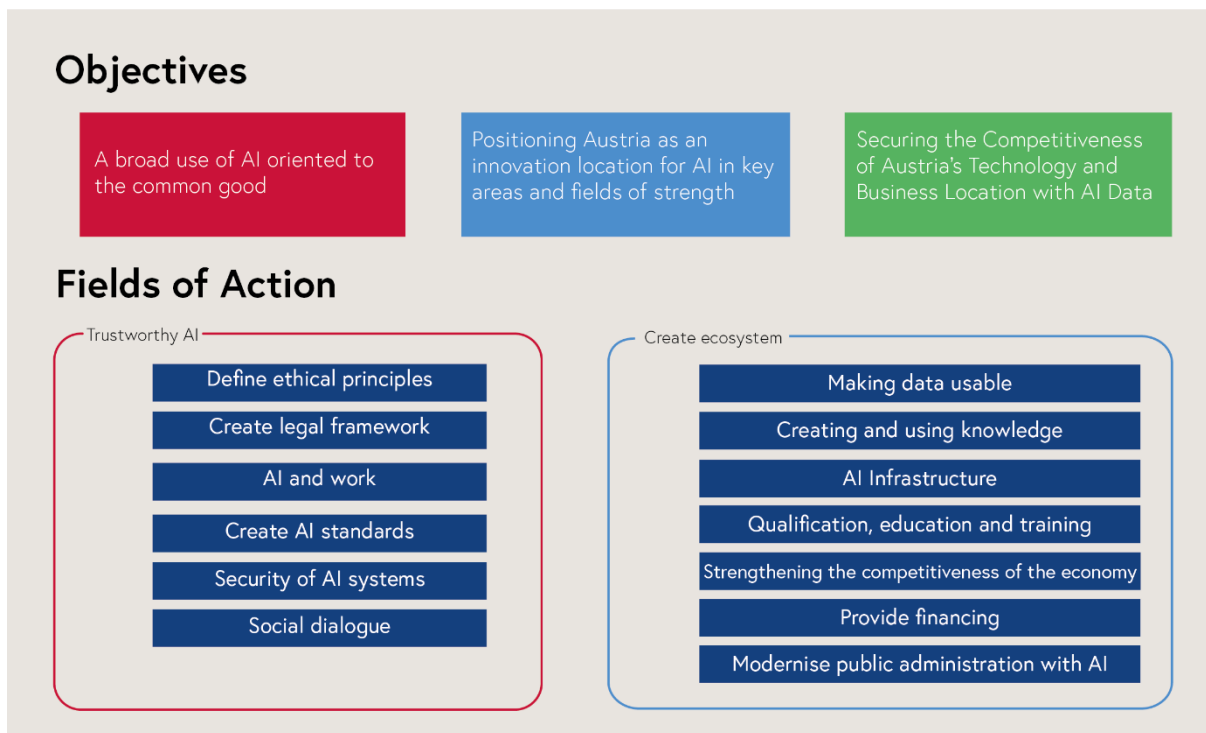


Figure 2: Objectives and Fields of Action

The fields of application listed in the annex are broadly based and cover numerous sectors, including industry, climate protection, agriculture, energy, health, education, law, and culture. They are regularly updated and supplemented depending on the topic area.

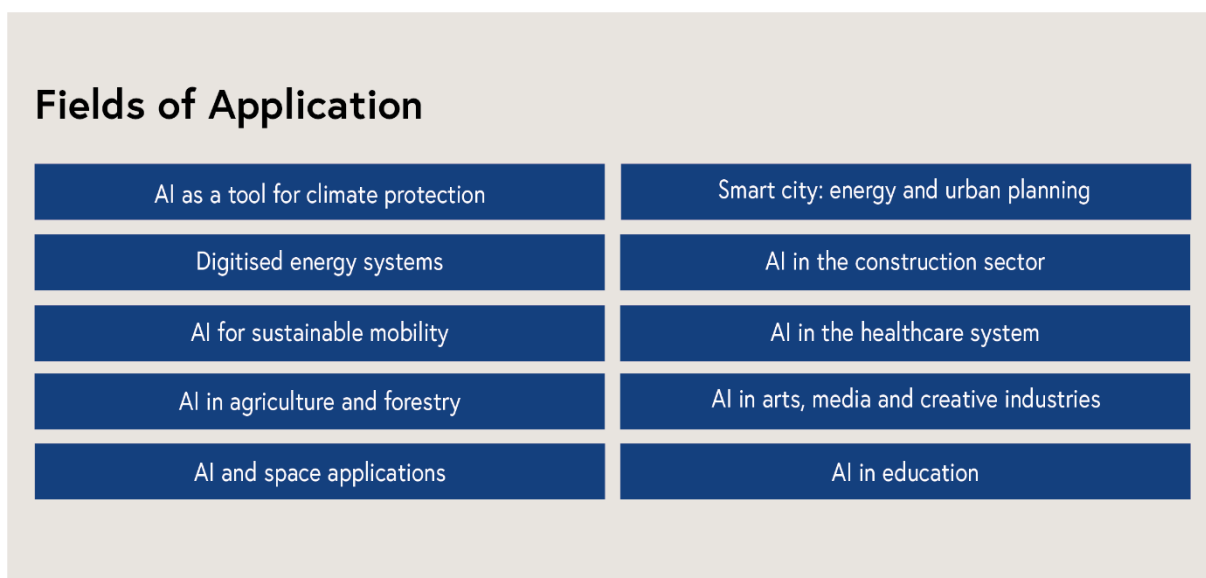


Figure 3: Fields of Application

With this strategy, the Austrian Federal Government defined ambitious goals for dealing with AI. In line with the complexity of the topic, the aim AT 2030 strategy is to be seen as the beginning of a process that will be subject to ongoing development.

1 Introduction

1.1 AI conquers the globe

Artificial intelligence is of the driving technological developments of recent years. As far as the eye can see, from Silicon Valley to the technopoles in Asia, from the most dynamic innovation regions on the globe to ministries and services of the European Commission: In just a few years AI has become the number one innovation topic, the blockbuster of global techno-economic discourses.

AI is not just a singular technology, but in its various forms it is a universal tool whose diversity is yet unknown. AI brings considerable diversity in its applications, due to which it is a new horizontal key technology that can be widely deployed to improve all of our lives. AI's potentials, their disruptive power and their risks are not only discussed by computer scientists, but also by experts in climate research, biochemistry, transport planning, jurisdiction, administration, urban planning, insurance, the media industry, the health and care sector, mechanical engineering, and the arts and culture. Already today, there are impressive outcomes such as in automatic translation, which only a few years ago were considered technically complex and unreliable. The global COVID-19 crisis in particular has shown what an important contribution AI can make to contain a pandemic.

Due to its variety of forms and applications, there is still no universally applicable definition of artificial intelligence. The Austrian AI strategy is based on the following understanding of AI:

Definition of "artificial intelligence"

Artificial intelligence (AI) within this strategy paper means computer systems that exhibit intelligent behaviour, i.e. that are able to perform tasks that have required human cognition and human decision-making skills in the past. Systems based on artificial intelligence analyse their environment and act autonomously to achieve certain goals. The Austrian Council on Robotics and Artificial Intelligence (ACRAI), for example, therefore characterises them as autonomous cognitive systems (see *Österreichischer Rat für Robotik und Künstliche Intelligenz*, 2019). They work through knowledge of rules supplied by experts or on the basis of statistical models derived from data (machine learning, e.g. deep learning). The term AI includes both pure software as well as hardware, such as in the case of autonomous robots. This definition will be used as the basis for this strategy.

The autonomy of AI systems, i.e. their ability to work mostly without help and without human interaction, is a significant difference from other innovations brought about by digitisation. This autonomy means that algorithmic decisions may take the place of human consideration and decisions, or that humans are confronted with independent actions by machines. Such machine decisions may concern both pure software systems (e.g. decisions about mortgages or in the diagnosis of diseases) and hardware that is controlled by AI (especially robots, semi-autonomous vehicles or automatic machines).

The applications of AI are versatile. They range from systems that understand human speech (e.g. voice control on a smartphone) to programmes that analyse videos (e.g. in autonomous

driving); from search engines that interpret ambiguous queries to systems that derive conclusions from data, e.g. assistance and consulting programmes. AI systems are often an integral part of other technical systems, e.g. in cars. As a key technology, AI also opens up completely new opportunities in acquiring knowledge and preparing for decisions, e.g. in medicine, in scientific and artistic research or in when searching for information in large amounts of data (e.g. industrial production data), but also in the use of robotic or cyber-physical systems.

However, the increasing use of AI also carries risks. These range from economic effects due to far-reaching transformations of the labour market, threats to democracy such as influencing public opinion through the dissemination of AI-generated content (creation of artificial images, videos, voices: "deepfakes"), impairment of fundamental and human rights guarantees, e.g. through continued discrimination based on incorrect data ("biased algorithms") or restriction of the freedom of expression due to automated and targeted disinformation campaigns, to new threats in the field of cybercrime (AI-based hacking, phishing, etc.).

It is particularly crucial for the policy design of this future AI location to clarify any ethical, public interest and value-oriented as well as socio-economic issues while advocating for digital humanism and forming framework conditions for secure AI solutions.

1.2 About this strategy

With its variety of applications and potential as a key technology, AI has brought about profound transformation processes (see European Parliament, 2020), led to high expectations of its economic and geopolitical importance ("... more AI everywhere will ensure our prosperity ..."), as well as fears about its negative effects ("...more AI will expose us to uncontrollable machines..."). Against the background of these global developments and the EU's efforts to establish an independent European value-centric framework for the application of AI (European Commission, Coordinated Plan on Artificial Intelligence (see Europäische Kommission, 2018; Europäische Kommission 2021), the Federal Government has worked with experts to develop this AI strategy for Austria.

As an open, export-driven economy with a high proportion of knowledge-intensive products and services, a high-performance innovation system with high R&D expenditures, but also high democratic standards and solid fundamental rights values, Austria has to face the question how this new key technology can be applied in the best possible way, how unintended consequences of a strong or "wrong" spread of AI can be avoided and how appropriate measures can be put into a long-term strategic framework.

How can strategies provide answers to highly dynamic developments? How to find answers for a future that already appears to change by trying to focus and plan it? How to deal with the enormous speed of technological developments and the resulting volatility?

The dynamics of digital transformation have put states under enormous change and

transformation stress in recent years. The current global wave of AI creates facts much faster than political action can be planned and implemented at all. In order to do justice to the different speed of technological development and politics, this AI Strategy of the Austrian Federal Government—Artificial Intelligence Mission Austria 2030 (AIM AT 2030)—is not to be understood as a singular and definitive "big shot" for many years to come, but rather as an agile strategy. This strategy should be open to adjustments, additions and clarifications and involve as many stakeholders as possible in its further development. The strategy is open to adjustments, additions and clarifications, learning from implementations that have already been completed. It is also participatory for all those stakeholder groups that could not previously be included in its preparation and formulation. The AIM AT 2030 strategy will therefore be monitored and evaluated regularly during its implementation.

1.3 The starting point for AI in Austria

Artificial intelligence is a key computer algorithmic technology that has become increasingly important in recent years. AI not only plays an important role in healthcare, for example recently in the search for treatments against the coronavirus and the containment of the Covid-19 pandemic; its importance for the economy, society, science, research, art and public administration will increase massively in upcoming decades and will have far-reaching effects on our daily lives, the opportunities and risks of which must be well assessed. The potential of AI is an important driver for economic development. It is estimated that through the extensive use of AI, the growth rate of the Austrian economy may double by 2035 (see Accenture, 2019). However, AI also brings about a wide range of potential impacts for our society; in particular, it will bring new requirements to the world of work.

Austrian companies have recognised the importance and potential of AI. Engineer-driven companies in particular have already started to look into possible AI applications, while other sectors, especially in the service industry, are still lagging far behind when it comes to taking advantage of these opportunities.

Although numerous Austrian companies are active in the field of AI, only a small part of them are specifically concerned with its development (see BMVIT, 2019). Most companies in the AI environment come from the field of software development or offer data processing, followed by business and market consultancies that use their own software to analyse company data, stock market data, etc. Start-ups are also perceived as technology leaders and carriers of AI expertise who can offer tailor-made solutions using specific knowledge.

Austria has a large number of research institutions that deal with AI and are spread throughout the country (see BMVIT, 2019a). Especially in essential AI sub-fields, such as machine learning, symbolic processes, robotics and autonomous systems, Austrian universities and research institutions possess great expertise and enjoy a good reputation worldwide. New focal points have emerged in the field of production and Industry 4.0, e.g. for predictive maintenance. Between 2012 and 2020, Austria supported these research activities with a total of 910 million euros in funding distributed through the Austrian research promotion agency FFG.

Austria thus possesses a solid basis for the successful development and innovative use of AI. Austria is already one of the world leaders in some priority fields of research and application, such as automotive or mechanical engineering, as well as in the field of embedded systems.

1.4 The European framework

In April 2018, the European Commission presented a European strategy for artificial intelligence with a focus on human-centric AI (see Europäische Kommission, 2018a). Based on this umbrella strategy, a coordinated action plan for AI (see Europäische Kommission, 2021) was developed together with the member states, which aims to make Europe the world's leading region in the development and use of innovative, ethical and secure AI: the goal is an

AI "made in Europe". This action plan also provides a strategic framework for national AI strategies and calls on Member States to implement the measures it contains at national level.

At the beginning of 2020, the European Commission also presented a White Paper on Artificial Intelligence (see Europäische Kommission 2020), which builds on previous initiatives and consists of two pillars: One is a strategic framework that promotes science and research on AI topics, fosters international exchange, increases investment in AI and promotes Europe-wide infrastructure expansion. The second pillar describes key elements for a future legal framework that is supposed to strengthen confidence in AI and its use and provide companies, citizens and public authorities with legal certainty for AI-based innovations.

In April 2021, the European Commission presented another AI package, which, in addition to an updated version of the Coordinated Action Plan on AI (see Europäische Kommission, 2021), mainly contains the world's first draft regulation for AI, which will significantly shape the development of AI in Europe and the implementation of the AIM AT 2030 strategy (see Europäische Kommission, 2021a). The recast of the coordinated EU Action Plan includes measures in line with the objectives of the White Paper on AI. These include six new fields of action, such as environment and health, to better coordinate joint AI projects with the Green Deal and to combat the coronavirus pandemic. The proposed legal framework provides, among other things, a risk-based approach with four levels from unacceptable to minimal risks for the regulation of AI systems: The former ones include AI systems that are "considered to be a clear threat to security, livelihoods and human rights" and are generally to be banned. High-risk AI applications and services for government agencies, individuals and companies should be subject to strict mandatory requirements to minimize potential risks.

The Austrian strategy is strongly based on the two cornerstones of the European AI strategy (ecosystems of excellence and trust) and applies them to the future application of AI in Austria. Austria thus not only fosters enhanced cooperation at European level, as proposed in the White Paper and the latest AI package, but also shapes its national AI ecosystems in line with European goals. Only in this way can AI be promoted and further developed on the basis of European values, and Europe will be able to succeed in the tough global competition in the field of AI.

2 Vision and goals for human-centric AI

A realistic assessment of the opportunities and possible risks of AI requires constant discussion on the basis of in-depth knowledge of the technology and its possible social impact.

In order to use and shape the possibilities of AI for the benefit of the Austrian population, above all, a common vision, clear objectives and active co-design are required.

2.1 Vision for human-centric AI

AI in Austria should be used on the basis of fundamental European values, while respecting and guaranteeing fundamental and human rights, such as privacy and the principle of equality, for the greatest possible benefit of all. AI will contribute to positioning Austria as a research and innovation location as well as a competitive location for technology and industry. Various forms of AI are already being used by Austrian small and medium-sized enterprises. It is important that this deployment is as sovereign as possible, i.e. independent of global monopolies and in close cooperation with our partners in Europe. Risks and undesirable developments of AI should be avoided, detected at an early stage and reduced and eliminated where they occur.

To this end, the Federal Government will encourage and promote a social dialogue that ensures that citizens are being involved, and on the basis of which AI technology can be used and further developed in a safe and socially desirable manner.

2.2 Objectives

For the present AI strategy, this vision results in a strategic direction, which is characterised by three essential strategic goals.

Objective 1: The Federal Government is striving for Austria to use AI for the common good.

AI should be used where it benefits people and is used exclusively in a responsible manner and on the basis of European fundamental values and fundamental rights.

- In Austria, AI is to be developed and applied while maintaining the greatest possible sovereignty. Dependence on global monopolies is to be reduced or avoided.
- The specific application of AI technology is to be developed in a broad social dialogue. This means involving science, research, business, politics, arts and civil society with the aim of social participation, the freedom of action of citizens and their self-determination.
- The design, development and application of AI should take place in a transparent, trustworthy and legally protected manner. To this end, framework conditions are to be created that will ensure human rights compliance and the security of the AI throughout its entire "technology life cycle" for society.

- The Federal Government will create and continuously evaluate the legal framework for the safe use of AI in accordance with European and international requirements and in close coordination with European and international partners.
- The intention is to identify, cushion and prevent possible risks and undesirable developments in the use of AI in a timely manner.

Objective 2: Austria is to become an internationally recognised research and innovation location for AI.

- To this end, AI-relevant ecosystems are to be created that comprehensively connect domestic actors with each other and, in particular, focus on the provision of marketable products through the application of AI.
- Targeted measures are intended to raise Austria as an innovation location in the field of AI to a global top level.
- Training and further education as well as the promotion of science, research and the arts in the field of AI will contribute to strengthening Austria's role as a centre of innovation.

Objective 3: AI will ensure the competitiveness of Austria as a location for technology and business.

- The conditions for companies, in particular for small and medium-sized enterprises (SMEs) and start-ups, are to be improved in order to give both economic impetus and impetus for employment.
- The transfer of AI applications to Austrian small and medium-sized enterprises needs to be further promoted in order to generate new added value from the application of AI.
- Education and training measures for the general population to gain knowledge and skills on AI and its applications should be further expanded.
- The secure use of AI applications as support for administrative processes should be examined to allow for a modern and efficient public administration.

The Federal Government endeavours to formulate the targets in close coordination and in full accordance with the foundations and objectives of the European Union (see Europäische Kommission, 2020) and its common measures as well as in accordance with international human rights standards. With this strategy, Austria also contributes to the promotion of Europe's industrial and technical performance and supports the spread of AI in Europe as a business location. Austria will thus also support the preparation for socio-economic changes in Europe associated with AI and contribute to ensuring an appropriate ethical and legal

European framework. Only in this way can AI be promoted and further developed on the basis of European values, and Europe will be able to succeed in the tough global competition in the field of AI.

In order to achieve the above-mentioned strategic goals, fields of action for a trustworthy AI and an AI ecosystem will be described in the next chapters. The above-mentioned cross-sectoral (horizontal) measures help Austria to create optimal and agile conditions for a human-centred use of AI oriented towards the common good.

3 Trustworthy AI

The use of artificial intelligence will fundamentally change many areas of everyday life. In the future, AI will support people in their work, help them gain new insights and, in many cases, be able to make decisions and take appropriate actions autonomously. All these opportunities raise ethical, legal, social and technical questions about how and where AI should be developed and used. In order to establish trust in AI, AI applications must be designed to be technically secure and reliable, embedded in a trustworthy ethical and legal framework and geared towards the well-being of humans. This includes, above all, that they support human action and decision-making and ensure human supervision through control mechanisms. In the future, important decisions should still be made by humans.

The measures presented in this strategy create the necessary framework conditions. The Austrian Federal Government is guided by international and regional human rights instruments and in particular by the EU Ethics Guidelines, according to which a trustworthy AI must guarantee compliance with ethical principles and values, comply with all applicable laws and regulations and be technically and socially robust. Other important aspects are transparency, explainability, traceability, data protection, protection of fundamental rights, priority of human action and human supervision as well as the verifiability of AI systems. Policies in the field of AI must place humans and their rights at the centre of technological developments, in the sense of advocating for digital humanism.

3.1 Defining ethical principles

AI technologies have the potential to significantly influence many areas of society. Therefore, their use requires comprehensive ethical reflection as well as informed and conscious social decisions. The relevance of the topic becomes apparent in the scope of current discussions held at the European and international level (EU, UN, UNESCO, OECD, Council of Europe, G7) in national AI strategies, in standardisation bodies (IEEE, ISO, ITU), at company level (see inventory.algorithmwatch.org), in science and in non-governmental organisations (NGOs). AI is also an important topic of the transatlantic digital agenda. Ethical principles for AI are currently being developed intensively everywhere. In Austria, the Council on Robotics and Artificial Intelligence (ACRAI) (see Österreichischer Rat für Robotik und Künstliche Intelligenz) has laid the foundations for a national discussion.

The current state of discussion shows great similarities with regard to the responsible use of AI for the benefit of society. At the same time, the implementation of ethical principles for AI applications in administration, business or research is in many cases only in its infancy. In order to anchor the use of fundamental ethical principles in practice, a European High-Level Expert Group of the European Commission, with the participation of Austria, has developed ethics guidelines for the application of trustworthy AI (see High-Level Expert Group on Artificial Intelligence, 2018). According to these guidelines, AI systems must comply with three basic principles in order to be considered trustworthy.

They need to:

- be lawful by respecting all existing laws and regulations;
- respect ethical principles and values such as equality and fairness and
- be robust, both in a technical sense and from a social perspective.

In order to exploit the opportunities of AI for the Austrian society and the country as a business location, it is necessary to develop a set of rules at the level of the European Union (see Europäische Kommission, 2021a); to actively co-design ethical regulations at the international level in accordance with existing international law standards (human rights, international humanitarian law); to implement them in Austria, and to have a broad social discourse.

Austria will participate at the international level in the development of guidelines and regulations for the ethical use of AI. Their cornerstones will be the European AI ethics guidelines, Ethics by Design and Ethics in the Loop, a human-centered approach as well as the protection of human rights and human dignity. The rule of law, especially compliance with international law and preventing its erosion is another basic principle.

To this end, it is also important to develop future visions of the desired application of AI and to observe any social transformation processes initiated by AI by means of technology impact assessment. Some main topics in this regard are the definition of limits for the application of AI by the state, businesses and science, or its effects on the labour market. Ethical and social reflection is an essential part of technology development. In the course of implementing the AI strategy, a wide range of participatory measures and open dialogue formats are required, such as specialist events, open spaces, citizen forums, publications, exhibitions and, above all, open dialogue formats.

The Austrian Federal Government will encourage and promote a broad, continuous and open public dialogue on the use of artificial intelligence.

3.2 Creating the legal framework for AI

Ethical questions about AI must be discussed comprehensively and embedded in a suitable legal framework. It must take into account socio-political, scientific, economic and technical interests, as well as the protection of individual interests and the fundamental rights and freedoms of citizens.

The aim is a human-centered use of AI for the public benefit, while fostering competitiveness and innovation. To this end, a clear legal framework must be created that optimally drives innovation in Austria's science and industry, reduces uncertainties and at the same time guarantees legal certainty for all.

The European Union and international organisations such as the United Nations, OECD and the Council of Europe have been engaged in a global dialogue on the responsible development

and use of AI for several years. They recommend reviewing and putting into concrete terms the legal and regulatory framework (cf. European Coordinated Plan on AI (see Europäische Kommission, 2018), Policy and Investment Recommendations for Trustworthy AI (see High-Level Expert Group on Artificial Intelligence, 2019). OECD Principles on AI (see OECD Principles on AI [oecd.org/going-digital/ai/principles/](https://www.oecd.org/going-digital/ai/principles/)), the Council of Europe's Ad hoc Committee on AI (CAHAI) (see <https://www.coe.int/en/web/artificial-intelligence/cahai>). The White Paper on AI presented by the European Commission in February 2020 already contains key elements for a future legal framework for AI in Europe, which should help to create an "ecosystem for trust".

Building on this, the Commission presented a regulatory proposal for AI in April 2021 (see Europäische Kommission, 2021a). It aims to establish harmonised rules for placing on the market, launching and using AI systems in the Union and to ensure the fundamental values and rights of the EU as well as the safety of users. The basic condition is that legal interventions are only made where they are necessary. In this risk-based approach, certain AI systems must meet mandatory requirements regarding their trustworthiness and ensure that human oversight is guaranteed at all times.

The Austrian Federal Government supports the creation of a Europe-wide legal framework for AI applications in order to avoid isolated national solutions. It has already participated in public consultations for the preparation of the regulatory proposal and will continue to actively participate in the design of the regulation.

Austria will actively participate at the international level in the development of legal standards for the design, development and application of AI. Their basis will be existing standards in international law, in particular in the field of human rights and international humanitarian law.

Internationally and nationally, there is great demand from industry, science and civil society for a legal and regulatory framework for the operation of test facilities for trial and examination under real conditions. A suitable instrument for this are "living labs" (regulatory sandboxes). Part of this strategy evaluates the extent to which such sandboxes can be used to test innovative AI-based technologies or AI applications under real and legally secure conditions within a limited geographical area, period or user group. Through the extensive use of AI in regulatory sandboxes, conclusions can also be drawn as to how the legal framework should be designed outside of these labs. This saves time in legislation and makes AI-related legislative amendments more practice-oriented and accurate. They allow companies to responsibly test innovative technologies and applications, even if they cannot (yet) be used according to the general legal framework. Since AI applications are subject to different regulations depending on their purpose, features and area of application, it is also necessary to evaluate what general legal bases would have to be created for regulatory sandboxes in order to enable their establishment in strategic areas (e.g. healthcare). These applications must be accompanied by a technology impact assessment and by ethical considerations.

The Federal Government will examine the possibility of enabling regulatory sandboxes in strategic areas within the framework of interdepartmental cooperation.

Use cases from business, research and development should be incorporated into this process in a structured manner so that the sandboxes to be established reflect the actual needs of companies and administration as well as those of applied research. At the international, European and national level, in addition to assigning responsibilities for AI systems (such as product liability and black box issues (see “Black Box”), it must be clarified how a safe and appropriate use of data can be ensured. The question arises whether the current legal framework for product liability, product safety, data protection and consumer protection for products with embedded AI is sufficient or whether new regulations are needed, especially with regard to learning AI systems.

The Federal Government will review the existing legal framework with view to any gaps or obstacles for the development and application of trustworthy AI systems and, if necessary, adapt the framework to promote innovation while ensuring a high level of security and protection of rights.

Any legal framework must ensure that the technical implementation prevents discrimination or systematic disadvantages (such as social scoring, gender-specific discrimination) and that personal rights and data protection are safeguarded.

Likewise, possible manipulation or misuse of algorithms is one of the risks that the legislator has to deal with. The Federal Government will actively participate in the design of the EU draft AI regulation with regard to the uniform certification and approval of AI systems proposed therein. The use of AI systems in business and public administration also poses new challenges for consumer protection. Since AI technologies are rapidly evolving, the necessary legal framework and standards to protect consumers must also be examined.

In order to protect consumers in the development and use of AI, the Federal Government places a special focus on protecting privacy and personal rights and ensuring legal enforcement, especially in the areas of data protection, fundamental rights protection and product liability. Furthermore, the establishment of an AI ombudsman office is being considered.

In order to strengthen the trust of society in the use of AI systems and to expand consumer protection, it must be clear at all times whether AI systems are being used. Such labelling should build on the basic principles of trustworthy AI and ensure transparency, control and traceability (see Arbeiterkammer Wien, 2020).

The Federal Government will promote the labelling obligation of AI systems at European and national level.

It is also particularly important to clarify questions about data protection and data use for AI applications in the public sector.

The Federal Government will examine the prerequisites for the secure use of AI-supported services in the public sector and the associated data protection issues.

3.3 AI in the world of work

AI applications have already found their way into the world of work and have in some cases profoundly changed processes that had previously developed over decades. Even where complex cognitive skills are required, AI-supported automation systems already accompany everyday work as "intelligent tools".

The associated pressure on restructuring, reorganisation and re-qualification will potentially have a strong impact on the world of work. This entails substantial changes in work organisation and forms of work.

In the course of this change process, it is central to actively shape the long-term retraining, requalification or re-skilling of people. Companies that want to test the use of AI tools in their value chains for reasons of efficiency and resource conservation, as well as employees who use these tools, must be offered opportunities to be able to specialise at an early stage.

The development and use of human-centered AI systems in work contexts has a high potential to enhance existing work processes and perform certain tasks through AI-based automation systems. The focus must be on social and human-centred design, social security, the rights of workers and their quality of life and health. At the same time, it is important to prevent discrimination, support disadvantaged groups and ensure diversity. Any discussion must take place in coordination with international standards in order to achieve a uniform approach and to prevent a weakening of important employee rights.

Together with the social partners, the Federal Government will strengthen the dialogue between companies and employees for a human-centred design of future AI-supported workplaces.

To remain a highly developed industrial and service location with a high employment rate and low unemployment rate, it is essential to identify effects on employment rates of the use of AI in business and administration as early as possible. It is also necessary to critically reflect on unwanted developments and to implement necessary labour market policies (training and further education programmes, retraining, sector-specific regulations). As the Policy and Investment Recommendations for Trustworthy AI of the High-Level Expert Group on Artificial Intelligence (see [oecd.org/going-digital/ai/principles/](https://www.oecd.org/going-digital/ai/principles/)) have already pointed out, human-centered AI applications can create new job opportunities, especially for people who are tied to less qualified jobs due to restrictions such as disabilities.

AI-based automation can also be used by people with natural limitations to actively shape their lives.

The Federal Government will examine the establishment of a socio-economic observatory for artificial intelligence, the tasks of which are to continually observe and methodically describe AI-induced changes in working environments and labour markets; to develop positive future scenarios for an AI-supported economy and society; and to submit proposals for politics.

The Federal Government supports the establishment and expansion of European and international AI observatories, which offer national organisations the opportunity for exchange and networking.

This corresponds to internationally established initiatives, such as the OECD AI Policy Observatory and the EU AI Watch.

Issues of gender equality are also of particular importance: Gender-specific distortions can be particularly common in algorithmic decisions, for example in automated recruitment procedures or evaluation tools for services.

Within the AI ecosystem, the proportion of female talents (especially in Austria) must be greatly increased through sustainable, committed and substantial funding programmes and attractive scholarships in order to ultimately increase the proportion of women in programming teams that are still strongly male-dominated.

The Federal Government will pursue equality policy in all AI fields of action, in particular through funding programmes that promote an increased share of female AI developers in the talent pool, and through promoting initiatives for networking and coaching for women in AI (for example through mentoring programmes).

3.4 Setting standards

Technical standards and norms for AI systems are the basis for the development and application of human-centered and trustworthy AI, as these make ethical basic principles and legal requirements applicable. Technical standards are an important prerequisite for robust, transparent and secure AI processes. Setting standards supports technology companies in their work and guarantees the quality and safety of products. Technical standards of AI increase interoperability, reduce implementation costs for IT solutions, increase sales markets for domestic companies, simplify the formulation of laws and enable the systematic training and teaching of new technologies.

Technical norms and standards will play an essential role in the marketing of AI applications and products in Europe. The Commission's draft AI regulation relies on harmonised European standards to technically specify the requirements it formulates for AI systems. These are developed as EU legal acts on the basis of a standardisation request by the European Commission. It is therefore crucial to establish a framework where as many interested groups as possible can contribute their knowledge to the formulation of technical standards in order to be able to negotiate them as best as possible for Austria in the international environment.

The Federal Government will promote the technical standardisation of AI at national, European and international level.

As coordinator at the state level, the Federal Government supports the development of standards and will promote the creation of suitable framework conditions. Companies and

research institutions should be supported in the best possible way to incorporate their know-how into the preparation of international standards and to cooperate in anchoring Austrian and European interests in technical standards. Especially with regard to the future regulation of AI systems, Standards for AI should be defined according to the criteria for trustworthy AI and in particular according to the principles "Ethics by Design", "Privacy by Design" and "Security by Design", which are also in line with the proposed regulation for a European AI legal framework (see Europäische Kommission, 2021a).

"Ethics by Design" calls for unbiased design of AI applications. In all AI applications, a principle of equality must be observed and discrimination based on gender, place of origin, religion or other affiliations must be prevented. If necessary, targeted measures must be taken to ensure effective equality. "Ethics by Design" includes special care in handling sensitive data and a clear requirement for data transparency, even in the case of indirect personal data that allow conclusions to be drawn about sensitive data and influence AI applications.

AI applications that process personal information must comply with the GDPR. When processing data, the principle of "Privacy by Design" must be taken into account. To increase the acceptance of security solutions and frameworks, opportunities for the involvement of relevant stakeholders will be evaluated.

Together with European and international partners, the Federal Government will promote the standardisation of AI applications in relevant forums, so that a secure framework can be created for the development, operation and use of trustworthy AI applications.

3.5 Safety and security

With the increasing spread of AI in application systems, the need to ensure a correspondingly high level of security at all levels of these systems increases. Safety and security must therefore be an essential part of the AI process. Protecting AI systems, data, and communication channels is critical to user security and privacy, as well as protecting business investments.

Due to the close cooperation between man and machine, trust must be built through strong security standards and frameworks. These standards should follow the principle of "Safety and Security by Design", in particular also provide resistance to attacks and security breaches and ensure the reliability and reproducibility of AI results.

One main objective is to ensure security in the sense of protection against attacks (referred to as "security") and protection against threats emanating from the AI application itself (referred to as "safety"). Only the integration of the two aspects (safety and security) within AI applications and their environment enables the development of a robust and safe system. Such standards are to be embedded both in the development and the operating process as well as in the underlying data models and training data.

The draft on the regulation of AI systems presented by the Commission in April 2021 therefore lays down strict requirements for high-risk AI systems in order to ensure safety and fundamental rights. These requirements are supplemented by an adaptation of the safety regulations for machines that contain AI components (see Europäische Kommission, 2021).

Safe and trustworthy AI applications offer significant advantages for the economy and business location. To this end, IT security in the area of AI product and operational security must be guaranteed, among other things. In contrast to classic AI algorithms, the traceability of individual learning steps is particularly challenging for humans in some more recent AI applications. In many cases, this traceability is necessary to make AI uncertainties measurable and to design corresponding dynamic security mechanisms. Comprehensive analysis and validation of AI will result in comparable quality features that can be used to certify the safety of AI-based systems.

The Federal Government supports the development of models and methods for the safety of AI systems and, in this context, evaluates the creation of special RTI priorities in applied research.

The use of AI systems can lead to a significant increase in efficiency.

Nevertheless, AI must, as far as possible, be subject to human monitoring of results and plausibility checks. Regular checks will play a special role in correcting errors at an early stage. It is particularly relevant when using machine learning in critical infrastructures to include checks for traceability (how the AI system was created) and interpretability/ auditability (why such a decision was made) in the development and learning process as well as the operation of the AI system.

Together with experts at the national and European level, the Federal Government will examine concepts for auditing AI systems.

Application security is a relevant prerequisite for the security of systems and infrastructures when using AI, especially in socially sensitive areas. It is therefore important to ensure the methodological verifiability, traceability and transparency of AI systems to protect against manipulation and discrimination. When developing and using AI systems, there is a risk of errors and deliberate manipulation, which must be minimised and prevented. For this reason, the EU draft AI regulation also called for obligatory transparency for certain AI systems with specific manipulation risks, such as e.g. "deepfakes".

The Federal Government will raise awareness regarding safety and possible (intentional or unintentional) manipulation by AI systems.

AI systems must be protected against attacks on IT systems. At the same time, AI systems can be used to improve IT security, e.g. in public institutions. It is therefore necessary to strengthen protection against data loss and data manipulation as well as to prevent the misuse of AI security technology for criminal purposes.

Together with experts, the Federal Government will examine the extent to which AI can be used

to improve cybersecurity and enhance the fight against cybercrime.

3.6 Public dialogue on AI

Like hardly any other technology, AI is shaped in its perception by narratives that do not always make its social impact appear positive. Many of these ideas distributed by media paint a bleak picture of the future. This is opposed by many current application scenarios: The majority of existing AI systems work in very narrow application niches with specialised functionality. They are used for areas where they provide a clear benefit, with no discernible negative side effects.

Images and ideas of technical systems often influence which innovations are being worked on and which technical issues are being researched. That is why it is important to make realistic and future-oriented considerations about the AI of the future and to make them accessible to public discourse, including technology impact assessments. This helps to improve the understanding of AI systems, stimulates public discussion and contributes to demystification. Such a dialogue should be based on both scientific and technical knowledge (including social sciences) and should be conducted with a view to desirable future visions, taking into account any fears the general population might have.

Such a discussion includes topics such as methodological verifiability, traceability, transparency and protection against manipulation and discrimination through AI-based decisions. With a view to increasing acceptance, opportunities for involving various stakeholders should be evaluated.

The Federal Government will raise awareness of the advantages and disadvantages of AI systems. To this end, a scientifically sound discourse should be supported as it contributes to demystifying AI and realistically assessing its possibilities and dangers.

The Federal Government will provide comprehensive information and provide the Austrian population with scientifically sound information on AI and its applications via all available effective information channels, including social media and video platforms.

The Federal Government will systematically survey international best-practice examples of AI information campaigns and derive precise objectives for national measures from this survey.

4 AI ecosystem

4.1 Making data usable

In the course of advancing digitisation in science, research, the arts, the economy, society and administration, the use of data plays a central role. Data is the raw material of the information society and the basis for technological innovations in areas such as big data and artificial intelligence. The availability of data, especially in conjunction with AI methods, can help to address major societal challenges, as was already seen in containing the COVID-19 pandemic.

Due to the high priority of the cross-sectional issue of "data", the Digital Action Plan for Austria places a special emphasis on it (see Bundesministerium für Digitalisierung und Wirtschaftsstandort, 2020).

Only the availability of suitable data can advance the research and development of AI in Austria and thus also contribute to the competitiveness of Austria and Europe.

In February 2020, the European Commission presented a European data strategy (see Europäische Kommission, 2020a). The aim of this strategy is to create a European data space that enables a free and cross-sectoral flow of data within the EU for the benefit of business, research and administration. Its top priority is to ensure that European rules and values (e.g. in the area of data protection, competition and consumer protection) are observed and maintained. In its data strategy, the Commission also emphasises that the availability of data is an essential prerequisite for training AI systems. However, there is currently not enough data available for innovative re-use. The creation of a European data space facilitates the emergence of new business models and strengthens both Europe and Austria as a business location.

The Federal Government welcomes the initiative for a common European data space, which is intended to improve the cross-border availability and reuse of data, and will actively participate in its implementation.

AI systems need comprehensive, targeted, and quality-assured data to learn and evolve, and to deliver important new insights. Without enough high-quality data, the development of AI and other digital technologies is hardly possible.

Therefore, it is necessary to create a suitable framework compliant with data protection regulations for the availability and accessibility of high-quality data that supports the development of data-driven innovations. This also includes the mutual exchange between companies, science and administration in the form of data partnerships.

Data should be made available in a central and quality-assured manner so that it can be used for research and development, especially in the field of AI. Developers of AI applications should be provided with quality-assured data for research and development via a single point of contact, which is user-friendly and complies with data protection regulations. In any case, personal data sovereignty must be guaranteed.

The Federal Government will support and promote the development of a secure data ecosystem where data for the further development of AI systems can be exchanged responsibly, based on ethical principles and legal foundations.

The Federal Ministries aim to develop department-specific data strategies that specify which data can be made available under which conditions.

The Federal Government will promote the establishment of a common data space that establishes standards for merging data into a data infrastructure.

In addition, it is essential that the exchange of data between non-state actors is also intensified in order to promote Austria's attractiveness as an economic and data location. Data exchange in the form of data partnerships between companies (business-to-business, B2B) and between companies and science (business-to-science, B2S) plays a special role.

Many companies possess enormous amounts of data that are useful for other companies (SMEs, start-ups, etc.) for the further development of AI systems. The sharing of data between companies is not yet sufficiently established despite the economic potential for all parties involved. Many companies are still sceptical about data sharing because they fear the disclosure of trade secrets. The development of a uniform architecture for trading and exchanging complex and large data is an issue yet unsolved. Austria has already been able to gain initial experience with a data services ecosystem within the Data Market Austria pilot project (see Data Market Austria, n.d.) and the Data Intelligence Offensive (see dataintelligence.at/), a national multi-stakeholder platform that supports data cooperation between different actors in the data ecosystem. This ecosystem has been created through a significantly improved technology basis for secure data markets, cloud interoperability and the establishment of a data innovation environment.

The Federal Government will examine the creation of a legal and technical framework for data partnerships between companies, research, science and public administration in order to promote Austria's attractiveness as an economic and data location.

In addition, it should be noted that the public sector may need access to certain data generated by companies that are not yet available to it in sufficient form and scope in order to fulfil its tasks. This is especially true for the various data spaces, e.g. on topics such as industrial production, the Green Deal, mobility or health, which the EU requires in its data strategy. This data could, for example, improve public services in the field of mobility, make the fight against climate change more efficient or better provide official statistics.

What makes AI attractive for the further development of science and research, especially at Austria's universities, is available, interchangeable and reproducible data (on a large scale) as well as powerful software and hardware.

The Federal Government supports science and research in the introduction of new and existing guidelines for the protection of public research data as well as in the compliance with ethical

principles and legal framework conditions (data protection, Open Data, human rights).

The European Open Science Cloud (EOSC) (see eosc-portal.eu/) enables researchers to store, manage, analyse and reuse large amounts of research data and digital objects in a trusted environment across technologies, disciplines and borders. The EOSC will make data actionable by providing world-class computing power, high-speed connectivity, and leading data and software services for academia including algorithms for artificial intelligence, business, and the public sector.

Austria is actively involved in the process of the European Open Science Cloud and the world wide web of FAIR (findable, accessible, interoperable, reusable) data and services.

The topic of data exchange by and with European research institutions plays a central role. Enabling the free flow of data and implementing policies for data collection and copying rights are the focus of attention. In the future, research data and data generated by the public and private sectors should be grouped together and be openly available, usable and largely free of charge within the framework of Open Science. Companies, governments and research institutions should be able to use this data jointly to find solutions to societal challenges. The aim is to ensure that high-quality data sets are accessible and machine-readable for everyone throughout the EU – this includes geographical, meteorological and statistical data as well as company registers.

All efforts to make data as usable as possible in accordance with the objectives of AIM AT 2030 must be made taking into account privacy and data protection. The existing rights under the General Data Protection Regulation (GDPR) to information, correction and deletion, data portability, guarantee of IT security as well as liability and compensation in the event of a data breach must be guaranteed.

4.2 Creating and using knowledge: AI in research, technology and innovation

The rapid development of AI technologies illustrates the importance of investments in research and development. Despite recent successes, AI remains an extremely dynamic and interdisciplinary field of research that is only just beginning to develop. It touches on the technical sciences as well as the natural and social sciences and humanities.

AI research has been an integral part of the Austrian innovation system for decades. Research is not only the starting point for all further developments, but also a prerequisite for remaining competitive through technological leadership; this applies in particular to the field of AI. In addition to research at Austria's universities, there are a number of strong non-university AI research institutes, some of which can look back on a 50-year history. AI research is concentrated at universities, universities of applied sciences and research institutions in almost all federal provinces. These institutions work on knowledge-based systems, machine learning, autonomous robots, automatic image recognition and speech processing systems,

among other things. Austria thus boasts a fertile, historically grown AI research ecosystem.

At the European level, AI is also an integral part of Horizon Europe, the European framework programme for research and innovation. In particular, the sub-programme "AI and Robotics" is directly concerned with the further development of AI-specific research, as well as with its application in the field of industrial production (robotics). It is important to make the best possible use of any synergies between national programmes and their counterparts at European level in order to make the best possible contribution to competitiveness in Austria.

Equally important at the European level is the relationship between research funding (Horizon Europe) on the one hand, and the application and diffusion component that takes place within the "Digital Europe" programme on the other hand. Especially the topics of AI and high-performance computing (an important prerequisite for AI applications) are important components of both programmes.

The Federal Government aims for a successful participation of Austria in AI activities in the European Framework Programme for Research and Innovation (Horizon Europe) as well as in the application and diffusion activities of "Digital Europe". It recognises the close connection between national and European activities.

The momentum in international AI research (see "AI research") is driven by massive public and private investments in R&I. This leads to a global competition for the best minds, which can be seen as part of a global competition for technological leadership and further development of AI (see Kai-Fu Lee, 2019). It is therefore central to keep top executives in the country, to secure highly qualified scientific staff and to achieve a critical size of research groups. This is especially important based on the strengths of the Austrian industry and science, e.g. in the field of embedded systems. Embedded AI technologies, i.e. specialised computing units integrated into other technical systems combined with other edge technologies, can set important Austrian accents in the industrial environment, e.g. short latencies in autonomous driving or speech recognition while preserving privacy.

The Federal Government aims to create and ensure a suitable framework for AI research, technology and innovation at the highest level. This requires sufficient funding, excellent AI research staff and close cooperation within AI research as well as across disciplines.

The Federal Government will examine the establishment of endowed professorships for artificial intelligence. AI research should be carried out with a thematic focus on established AI expertise with regard to excellence.

In order to increase visibility, cooperation at European level is important (Österreichische Universitätskonferenz, 2019).

The Federal Government will increasingly support and promote European and international cooperation with leading initiatives in the field of AI (e.g. European Excellence Initiatives ELLIS or CLAIRE). In addition, it will examine the formation and funding of research networks and an

orientation towards European clusters of excellence, as well as collaboration between AI researchers within the country.

AI is an interdisciplinary field of research. It is therefore of utmost importance that scientists are offered opportunities to work together across disciplines and to continuously be measured against international standards.

The Federal Government aims to specifically promote young scientists in the field of AI by creating a critical number of pre- and post-doc positions in AI research and AI development.

Public funding of AI technologies and AI research has been part of the ministries' programme portfolio for many years. From 2012 to 2020, around 910 million euros of federal funding was awarded in this area through funding programmes of the Austrian Research Promotion Agency (FFG). Building on previous experience, the aim is to expand RTI funding and focus on the field of AI.

The Federal Government will strengthen AI in existing funding programmes, from basic research to business growth, and consider establishing its own thematic AI funding programme.

New research funding programmes might focus on AI areas such as machine learning, expert systems, autonomous robotics, autonomous systems or computer vision, but also areas at the borders of different disciplines, e.g. mathematics, law, economics and arts. This also includes research into AI methods for the responsible handling of personal rights (e.g. ethical AI, explainable AI, responsible AI).

The cooperation between science, research, arts and business will enable an early use of current research results, strategically align research and development with the needs of the Austrian population and competitive requirements of the economy, occupy strategic niches and secure technological focus areas in Austria.

The Federal Government will support and promote socially relevant, interdisciplinary AI research that guarantees the protection of privacy.

This is done through projects aimed at strengthening technologies in the field of Privacy Preserving Machine Learning and other technologies for the responsible handling of personal data (Privacy by Design). This also includes research into secure AI systems, systems that make comprehensible decisions, but also research into embedded AI.

In addition to scientific excellence at an international level, AI research in Austria is intended to help promote socially relevant, economically viable and artistic-cultural innovations. This can only be achieved through close and low-threshold networking and cooperation between businesses, education and science, arts and culture in Austria and within Europe.

The Federal Government strives to support the transfer of innovative AI technology between Austrian universities, universities of applied sciences, research institutions and companies.

This could be achieved through transfer laboratories that help realise innovative solutions in close cooperation with research, science, arts, culture and companies. The Federal Government is striving to actively join European projects in this context (such as the European Digital Innovation Hubs for AI). Research institutions and companies should be supported in sharing their knowledge, e.g. by facilitating the provision of training data, trained or rule-based AI models for pre-competitive use by several actors. The fact that AI technologies are about to affect all areas of the economy and life increases the need for a broad social discourse. The focus of examining the effects of AI technologies and societal objectives should be on a creative, i.e. productive dialogue involving the technical and economic disciplines, taking into account the relevant technology impact assessments. This makes interdisciplinary projects particularly important for integrating humanities and social science issues into technical contexts. This also means developing inter- and transdisciplinary skills for the cooperation of technology, science and arts in the field of AI.

The Federal Government aims to promote inter- and transdisciplinary research and active social discourse, including in the field of AI.

4.3 AI infrastructure

Austria already has a solid infrastructure in many areas to develop AI systems (e.g. research infrastructure) or to apply them (e.g. telecommunications infrastructure). Where there are gaps, they ought to be closed. It must be ensured that existing infrastructure can be used for AI research and that it is expanded where it is necessary for AI research. Important infrastructure will have to be developed and expanded together with European partners. The Digital Europe programme is also intended to ensure the establishment of reference and test facilities for AI, e.g. for selected sectors such as health, smart cities, smart mining, agriculture, mobility or production.

The Federal Government will actively participate in the implementation of the EU's Coordinated Plan on Artificial Intelligence.

The aim is to assess whether the establishment of a local, highly energy-efficient, GPU cluster linked to universities is a suitable means of strengthening AI development in Austria.

The Federal Government will evaluate the participation in AI reference Testing and Experimentation Facilities (TEFs) within the Digital Europe programme and examine whether and how testing facilities can be set up in specific areas of application (e.g. automotive or agriculture) in Austria. The Federal Government is also striving to continue its active participation in the Euro-HPC programme and to promote the strategic expansion of HPC infrastructure in Austria.

Connecting to European cloud services (e.g. Trusted Cloud) and ensuring high-quality telecommunications networks are also important foundations for a widespread use of AI applications and for the development and thus the design of the technology. This must be

done in a way that also connects as many rural areas as possible.

The Federal Government will continue to promote the expansion of broadband communication infrastructure (including 5G networks).

In addition to physical infrastructure, a good institutional AI infrastructure is important to improve coordination and interaction between different actors. The aim is therefore to pool these resources in Austria and to create particularly low-threshold information services so that, for example, companies with low RTI resources can access AI skills and technologies.

The Federal Government is striving to establish an interdisciplinary AI platform that connects all relevant actors. This platform should involve all groups and people relevant to the topic of AI. In addition to business and science, this also applies to arts and public administration.

4.4 Qualification, education and training

The rapid development of artificial intelligence also places new demands on the education and science system. It changes teaching and learning processes and learning behaviour. An education and science system that proactively takes up, anchors and further develops current technological developments and creates space for the development of individual interests and talents is an essential key to being successful in the digital transformation.

Strengthening the basic skills required for the use and development of AI in STEM (science, technology, engineering, mathematics) is of great importance throughout education, in particular the development and expansion of AI in general education and secondary vocational schools. It is necessary to consolidate and further develop measures that promote interest in STEM topics among children and adolescents at an early stage and to identify their gifts and talents early on. By anchoring a separate compulsory subject "Digital Basic Education" instead of a mandatory exercise, STEM including AI is not only visibly strengthened, but this approach also offers new opportunities for implementing this important topic area.

The Federal Government strives to ensure that the compulsory exercise "Digital Basic Education" is converted into a compulsory subject and to increase its extent (at least 4 hours in the timetable) in order to anchor this important topic accordingly. As a result, AI topics as well as related ethical questions are specifically strengthened and included in pedagogical concepts. Furthermore, a focus is placed on this topic in vocational training and general education in upper secondary education in order to promote its potential for innovation.

A special focus is placed on the promotion of women and girls in STEM areas throughout the education system. The integration of aspects of data protection and ethics must be fully taken into account in the training offered.

Throughout the education system, the Federal Government will continue to place and enforce a special focus on the promotion of girls and women in STEM, especially against the background of societal changes as a whole in the context of digitisation.

In addition to the subject "Digital Basic Education" in lower secondary education, this also applies to AI-preparatory content (mathematical basics, algorithms, big data, pattern recognition and machine learning). Educational institutions should be accompanied and supported in setting appropriate focal points within the framework of their autonomy. At the upper secondary level, STEM and AI are increasingly being focused on so that the need for these skills can be met. The framework of school autonomy allows vocational schools to set additional priorities.

The Federal Government will continue to quantitatively and qualitatively expand STEM and AI training places and focal points at vocational secondary schools (BHS) with regard to regional demand. At the upper secondary level, as part of the revision of the curricula, an increased focus will be placed on STEM topics, and in particular on AI topics. Furthermore, with regard to any STEM and AI competence gaps between school and the requirements of work and study, measures are to be developed which contribute to closing these gaps and facilitate permeability.

In addition to a supply-side perspective, the widespread opportunities offered by digitisation in general and AI in particular must also be taken into account.

For this, it is essential that the entire population acquires digital skills and continuously develops them. Based on the Digital Competence Framework for Austria (DigComp 2.2 AT (see Bundesministerium für Digitalisierung und Wirtschaftsstandort, 2018)), it is necessary to pursue a holistic approach for implementation consisting of instruments for assessing digital competences (see fit4internet.at), the assignment of training formats to this model as well as the visibility of digital competences, especially in a professional context.

On the basis of the Digital Competence Framework for the field of (vocational and private) adult education, the Federal Government is striving to develop assessment tools with a focus on artificial intelligence. Such "self-assessments" and "quizzes" on the subject of AI are intended, on the one hand, to self-assess existing knowledge in the field of AI and, on the other hand, to show in which areas of competence further learning is recommended. If necessary, specific further training opportunities are recommended, or it is shown in which areas of (vocational) training there may be a need for adaptation.

In the medium term, in addition to "self-assessments", a certification system should also be available. In addition to formal qualifications, it will demonstrate non-formally and informally acquired skills related to the Digital Competence Framework for Austria.

Universities, universities of applied sciences and universities of teacher education also play a central role in education, training and further education in relation to digital skills and AI. Digital skills and topics related to AI should also be comprehensively anchored in the curricula of teacher training at the universities of teacher education.

The Federal Government will further increase media and digital skills in the field of teacher education by integrating AI topics specifically into existing education, training and further

education. Methodological competence also needs to be expanded so that AI can be used in a useful didactic manner to support teaching and learning processes. In the area of STEM and AI, career changes by people from business and industry with AI experience are to be encouraged.

AI should be used by teachers and learners for individualisation and didactic innovation throughout the entire education system. This requires developing AI-based tools that are linked to specific learning methods, as well as proving their effectiveness through accompanying research.

The Federal Government will promote the development of an information platform for the presentation of AI products currently on the market, methodological opportunities and research projects. It will pursue the goal of integrating AI tools into teaching and learning processes.

The development of AI-based tools (e.g. intelligent tutorial systems) and proof of their effectiveness through accompanying research will enable and ensure the use of AI by teachers and learners throughout the education system. Important steps in this regard are to create links to concrete teaching methods and to create incentives for further development. Furthermore, AI should be actively used to support individual lifelong learning. The development of AI-based tools that are linked to specific learning methods, as well as attempts to prove their effectiveness (keyword: accompanying research), should also be promoted.

The Federal Government will initiate a reflection on AI development through accompanying research, taking into account societal issues, including technology impact assessment. An emphasis should be placed on accompanying research on the benefits and risks of AI-based tools in teaching.

The use of artificial intelligence also has great potential in the area of individual support for lifelong learning. In order to exploit this potential, comprehensive digitisation of lifelong learning services is also required. The focus is also on the development of (digitised, as far as possible) processes and procedures to validate prior learning as well as the recognition of relevant education, further education and training or qualifications in the field of AI.

The promotion of AI teaching and research at universities and colleges is an important parameter for strengthening the state of science and innovation. It is important to enable students to apply, design and develop trustworthy AI. To this end, AI is to be more firmly anchored in curricula and AI research is to be strengthened. In particular, this involves the interdisciplinary connection of issues from the humanities, social and cultural studies, as well as ethical issues, with technical contexts and vice versa.

The Federal Government aims to increase the AI skills of students and graduates. To achieve this: AI skills must increasingly find their way into the curricula of universities and AI research is to be strengthened.

Degree programmes of the future are to be enriched in such a way that the use of digital technologies and new cultural techniques such as "computational thinking" will be integrated

as mandatory elements in non-technical training courses, and knowledge and ways of thinking from the humanities and arts will be even more strongly incorporated into technical education.

Together with universities and universities of applied sciences, the Federal Government will promote the integration of issue from the humanities, social and cultural sciences into technical contexts and, by the same token, the use of digital technologies and cultural techniques in non-technical education.

In addition, the Federal Government is taking targeted measures to reduce drop-out rates in order to increase the number of graduates in STEM or AI.

In addition to supporting young scientists, existing AI expertise and fields of (excellence) competence in teaching and research are to be further developed in a targeted manner.

AI should be used by teachers and learners for individualisation and didactic innovation throughout the entire education system. This requires developing AI-based tools that are linked to specific learning methods, as well as proving their effectiveness through accompanying research.

To this end, the Federal Government will promote the development of AI-based tools that are linked to specific learning methods, as well as proving their effectiveness (keyword: accompanying research).

In order to be able to develop and implement the above measures in a meaningful way, it is essential for relevant actors in research, education, science, arts, business and society to connect and to cooperate across the entire education system.

The Federal Government supports the expansion of AI education and training offers at universities and in cooperation with other (further) education and training institutions.

Depending on the profession, skills regarding the use of AI applications must also be included in the respective training profiles in the dual training of specialists (apprenticeships). While basic knowledge about AI and its specific application can be taught during an apprenticeship, AI might be a possible topic for specialisations after completing an apprenticeship within the framework of "higher vocational education" (German: HBB) in suitable professions.

The Federal Government will continue to promote both the teaching of basic AI knowledge and possible specialisations in the field of AI in job-related education and training.

A central challenge for Austrian companies are the necessary user skills in each respective industry. There are already initiatives (such as the Digital pro Bootcamps) that contribute to counteracting the current shortage of skilled workers in the IT sector. Intra-occupational training courses are intended to impart sound IT knowledge and skills in AI-relevant subject areas quickly, in a practical and dialogue-oriented manner. The resulting networks with other companies and universities are intended to promote ideas for new business models.

The Federal Government intends to further promote training and further education measures for companies on relevant AI future technologies, taking into account industry-specific peculiarities.

4.5 Strengthening the competitiveness of the economy

In Austria, according to a study by the European Commission in 2020, 51 percent of companies use at least one type of AI application and another 20 percent plan to use AI by 2022 (European Commission, Directorate-General of Communications Networks, Content & Technology, 2020).

The use of AI applications in business is central to expanding Austria's competitiveness, generating tangible social and entrepreneurial progress and improving resource efficiency in business processes. However, adoption costs can be a major challenge when using AI, especially for smaller companies.

Therefore, it is important to create a framework that also enables and facilitates the use of AI for SMEs and start-ups. For this reason, the Federal Government has set up a digital marketplace for AI solutions that brings together providers and potential users of AI applications and thus promotes the pooling of capacities.

The Federal Government will continue to promote the best possible networking between providers of AI solutions and Austrian companies.

While some companies are already advanced developers or users of AI, smaller companies in particular still lack the necessary AI expertise. Awareness measures in the field of digitisation are particularly important for getting started with this topic. Finally, in order to bring skills about the application of AI to a wide range of Austrian SMEs and start-ups, a cooperation and interaction between education, science and business is essential. Universities should be encouraged to deal even more intensively with AI topics and challenges from entrepreneurial practice in teaching and research. One opportunity for AI transfer are university spin-offs (start-ups by universities), which are founded on the basis of new scientific procedures or the use of research results of the respective university.

The Federal Government will examine the creation of financial incentives to encourage companies to participate in spin-offs of universities and colleges in the field of AI and thus exchange know-how.

Austria consists of a cluster landscape of fields of technological and economic strength, which strengthen the national and international competitiveness of its cluster companies, especially SMEs, through innovation and cooperation. In order to increase entrepreneurship in the field of AI, it is important to use these clusters and networks and to stimulate a dialogue between relevant cluster actors.

The Federal Government will evaluate existing framework conditions for digital innovation and technology transfer in the economy and, if necessary, create new instruments that facilitate the

conversion of innovations into marketable products.

4.6 Providing funding

In order to establish a successful location for AI-based innovative services and product solutions, appropriate framework conditions are required that enable and ensure investments in innovation and development.

With 3.2 billion euros invested in R&D from private and public funds (2016), Europe has so far lagged far behind the USA (12.1 billion euros) or Asia (6.5 billion euros) (Europäische Kommission, 2020). China in particular has massively increased its spending on AI research (see The Conversation, 2019). It is therefore essential for Europe as a technology location that the EU, and thus also Austria, positions itself more strongly as a provider of trustworthy AI in an internationally highly competitive environment and that the appropriate framework conditions for this are created. The key pillars are targeted public investment and the mobilisation of private financing (such as European public-private partnerships). For this reason, the EU plans to stimulate annual total investments in AI of 20 billion euros in the coming decade through specific incentives. In addition to joint efforts at the EU level, it is also necessary to enable private investments in the key technology of artificial intelligence at the national level and to further expand public funding.

According to the so-called twofold transformation (see, for example, the EU Commission's communication on shaping the digital future of Europe (see Europäische Kommission, 2020b), in addition to the digital transformation, the reduction of greenhouse gas emissions and thus the protection of the environment, climate, resources and the preservation of biodiversity are central challenges of the coming years and decades of the Union. The use of AI will be of particular importance to both.

Against this background, a call entitled "Artificial Intelligence (AI) for Green" was opened in 2021 with a funding budget of 7 million euros. The use of technologies and methods from the field of artificial intelligence offers a wide range of opportunities to help meet any environmental challenges in achieving climate goals. For example, AI-based innovations may promote the expansion of renewable energies, contribute to increasing the efficiency of freight logistics, support the transition to sustainable mobility, decrease the use of pesticides in agriculture, or promote sustainable tourism and consumerism.

The "AI for Green" program invites to submit R&D projects that lead to a new and further development of artificial intelligence technologies, promote networking and interdisciplinarity, contribute to solving ecological challenges and are exemplary for environmentally, climate and nature-friendly digitisation.

In order to support Austrian companies in the implementation of AI projects, AWS (Austria Wirtschaftsservice) has already awarded targeted grants amounting to 4 million euros in 2020 and 2021 to increase the number of trustworthy, innovative AI projects in Austria. Individual

projects can be supported with up to 200,000 euros.

In addition to public subsidies and investments, financing by private investors and companies is of considerable importance. They often have extensive knowledge about technologies and the market and can also develop AI portfolios with higher risk and greater strategic influence than the public sector. Private investors are therefore of central importance for the development of AI. At the same time, Austrian companies and their know-how must be protected against sell-outs and emigration. This is guaranteed by investment control, which, **among other things, allows to examine the seriousness and trustworthiness of the investor.**

The Federal Government intends to create the best possible framework for private investment in trustworthy AI projects, which protects Austrian companies against sell-offs and emigration abroad. At the same time, targeted public funding in this area is to be continued and further expanded. Public funding for trustworthy AI must cover the entire innovation cycle, from the idea to international expansion.

The public sector can set an example in the use of trustworthy AI applications and become a reference customer for trustworthy AI. With the innovation-promoting public procurement (German: IÖB), an important strategic instrument is available that can be used to accelerate and transfer innovations to the market. For example, the state can act as a consumer for ethical and trustworthy AI, thereby defining markets, setting standards and increasing its efficiency. At the same time, innovative solutions by start-ups, new companies and small businesses will benefit from this.

In the public procurement of AI products and services, the Federal Government will require compliance with the criteria of trustworthy AI.

4.7 Modernising public administration with AI

Many areas of public administration could use secure AI applications to offer to citizens even more efficient and economical administrative services. For example, intelligent digital assistants can handle questions and thus facilitate administrative procedures. Within the administration, AI could support employees in their tasks, contribute to quality assurance and relieve the entire management system. Above all, simple and repetitive tasks are suitable for being carried out by AI applications, which contributes to increased efficiency. Trustworthy AI also guarantees the highest standards in terms of robustness, reliability and security of the methods used.

It is clear that the use of AI in administration is intended to support human activities while respecting fundamental rights. To do this, public officials must be able to handle these applications and exercise a control function. Human oversight ensures that important decisions in public administration continue to be made by humans for humans.

Public administration can and should also be a role model for the safe handling of trustworthy

AI solutions. However, any implementation in the public sector should not only be geared to the technological possibilities, but above all to the needs of citizens, and digital administrative processes should be geared to user-friendliness and data security.

The tasks of the public administration as well as the use of funds result from the legal basis and responsibilities. New digital processes in administration may require a new legal framework. In order to harness the existing AI potential, legal framework conditions must therefore be examined first and adjusted if necessary.

In order to enable the safe use of AI in public administration, the corresponding foundations in administrative law are evaluated, taking into account the traceability and transparency of AI-based decisions.

At the same time, the state must also take into account possible risks of AI, e.g. lack of transparency of algorithms, lack of traceability of decisions, or inadequate databases (e.g. biased data). The use of AI systems in the public sector must therefore be examined with particular care and rules and control mechanisms for the use of data and for the use of AI must be defined. This also includes the definition of red lines in the application of AI by the Austrian state.

The Federal Government is creating structures and processes to define guidelines for the use of AI in administration in accordance with fundamental rights.

AI can also release its potential in the reform of administrative processes, in which it relieves staff permanently. Reviews of documents and other routine tasks are already being carried out by AI-based systems in pilot projects. However, the extensive use of AI in many cases requires process innovation. Since there is a wide range of tasks in the public sector, the use of AI must be differentiated into internal administrative processes, sovereign processes and services of general interest. The necessary framework conditions for this must be created.

The Federal Government aims to evaluate administrative processes with regard to their AI suitability with the aim of increasing the efficiency, quality and accuracy of its services for citizens.

The public administration owns large non-personal databases, the potential of which is insufficiently exploited due to lack of accessibility and re-usability. This includes meteorological data, digital maps, statistics or environmental information. This open data could be made available to research and industry for the development of innovative applications that can then also be used within the public administration. The new version of the EU's Open Data and PSI Directive takes into account this availability of frequently changing data, which forms the basis for research, development and innovative business models (e.g. in the field of AI). Taking into account data protection principles, an implementation strategy for the access and further use of non-personal administrative data should be developed in accordance with the principle of open by default.

The Federal Government will further expand the provision and further use of open and non-personal administrative data. This includes rapid and efficient implementation of the European Union's Open Data and PSI Directive at the national level, which will also increase the availability of dynamic data, which will lay the foundation for developments in areas such as big data or AI.

AI can only unleash its full potential if people can use it safely and fully. In order to be able to successfully use AI in the public sector, it is therefore important to develop and expand AI skills at the various levels of public administration. Training will be designed to help public officials gain a basic knowledge of AI. One basic prerequisite is a positive, innovative and future-oriented administrative culture that puts citizens at the centre of administrative action.

The Federal Government is striving to expand the training and further education models of public officials in the field of digital competence. Training programmes adapted to specific target groups, which increasingly also include IT skills, are intended to provide public officials with the necessary AI skills.

A broader understanding of the functionalities and areas of application of AI also helps to increase the acceptance of AI-based processes within the administration. For a comprehensive use of AI applications, in addition to the aforementioned requisite legal basis, financial resources and adapted processes, what is also necessary is an acceptance of these solutions within the public administration.

5 Epilogue

This AI strategy of the Austrian Federal Government forms the strategic framework for a human-centered use of AI geared towards the common good. The measures outlined in the previous sections concern fields of action that, by their nature, must be dealt with independently of sectoral issues and have a cross-sectional character. The following overview lists these measures again in a clear form and shows which of the three main objectives of the strategy these measures will contribute to.

In the annex, several AI fields of application are listed, which have already been explained in more detail as part of the strategy creation and now form the basis for the implementation of the strategy at the sectoral policy level.

As already stated in the introduction, the AI strategy of the Austrian Federal Government sees itself as an agile strategy that seeks to do justice to the dynamic transformation processes of this technology and its interactions with economy and society. For example, it is to be expected that current discussions on the draft of the European AI legal framework, or its entry into force, will have an impact on the present national strategy and must be incorporated. At the same time, the cornerstones and goals of this strategy also guide the Austrian position in consultations at EU level. This strategy should be open to adjustments, additions and clarifications and involve as many stakeholders as possible in its further development. It will therefore be republished in updated versions regularly, accompanying its implementation.

An interministerial working group chaired by the BMK and BMDW will be set up to monitor the cross-departmental implementation of the strategy and to promote regular updating. In addition, the ongoing involvement of relevant stakeholders and the general public is ensured.

Overview of measures

- Chapter 3.1: Austria will participate at the international level in the development of guidelines and regulations for the ethical use of AI. Their cornerstones will be the European AI ethics guidelines, Ethics by Design and Ethics in the Loop, a human-centered approach as well as the protection of human dignity. The rule of law, in particular compliance with international law and preventing its erosion, is another fundamental principle. → contributes to Objective 1
- Chapter 3.1: The Federal Government will encourage and promote a broad, continuous and open social dialogue on the use of artificial intelligence. → contributes to Objective 1
- Chapter 3.2: Austria will actively participate at the international level in the development of legal standards for the design, development and application of AI. Their basis will be existing standards in international law, in particular in the field of human rights and international humanitarian law. → contributes to Objective 1
- Chapter 3.2: The Federal Government will examine the possibility of enabling regulatory sandboxes in strategic areas within the framework of interdepartmental cooperation → contributes to Objectives 2, 3
- Chapter 3.2: The Federal Government will review the existing legal framework with view to any gaps or obstacles for the development and application of trustworthy AI systems and, if necessary, adapt the framework to promote innovation while ensuring a high level of security and protection of rights. → contributes to Objectives 1, 2
- Chapter 3.2: In order to protect consumers in the development and use of AI, the Federal Government places a special focus on protecting privacy and personal rights and ensuring legal enforcement, especially in the areas of data protection, fundamental rights protection and product liability. Furthermore, the establishment of an AI ombudsman office is being considered. → contributes to Objective 1
- Chapter 3.2: The Federal Government will promote the labelling obligation of AI systems at European and national level. → contributes to Objectives 1, 3
- Chapter 3.2: The Federal Government will examine the prerequisites for the secure use of AI-supported services in the public sector and the associated data protection issues. → contributes to Objective 1, 2
- Chapter 3.3: Together with the social partners, the Federal Government will strengthen the dialogue between companies and employees for a human-centred design of future AI-supported workplaces. → contributes to Objective 1, 3

- Chapter 3.3: The Federal Government will examine the establishment of a socio-economic observatory for artificial intelligence, the tasks of which are to continually observe and methodically describe AI-induced changes in working environments and labour markets; to develop positive future scenarios for an AI-supported economy and society; and to submit proposals for politics → contributes to Objectives 1, 2
- Chapter 3.3: The Federal Government supports the establishment and expansion of European and international AI observatories, which offer national organisations the opportunity for exchange and networking. → contributes to Objectives 1,2
- Chapter 3.3: The Federal Government will pursue equality policy in all AI fields of action, in particular through funding programmes that promote an increased share of female AI developers in the talent pool, and through promoting initiatives for networking and coaching for women in AI (for example through mentoring programmes). → contributes to Objectives 1, 2
- Chapter 3.4: The Federal Government will promote the technical standardisation of AI at national, European and international level. → contributes to Objectives 1, 3
- Chapter 3.4: Together with European and international partners, the Federal Government will promote the standardisation of AI applications in relevant forums, so that a secure framework can be created for the development, operation and use of trustworthy AI applications. → contributes to Objectives 1, 3
- Chapter 3.5: The Federal Government supports the development of models and methods for the safety of AI systems and, in this context, evaluates the creation of special RTI priorities in applied research. → contributes to Objectives 1, 2
- Chapter 3.5: Together with experts at the national and European level, the Federal Government will examine concepts for auditing AI systems. → contributes to Objective 1
- Chapter 3.5: The Federal Government will raise awareness regarding safety and possible (intentional or unintentional) manipulation by AI systems. → contributes to Objective 1
- Chapter 3.5: Together with experts, the Federal Government will examine the extent to which AI can be used to improve cybersecurity and enhance the fight against cybercrime. → contributes to Objective 1
- Chapter 3.6: The Federal Government will raise awareness of the advantages and disadvantages of AI systems. To this end, a scientifically sound discourse should be supported as it contributes to demystifying AI and realistically assessing its

possibilities and dangers. → contributes to Objective 1

- Chapter 3.6: The Federal Government will provide comprehensive information and provide the Austrian population with scientifically sound information on AI and its applications via all available effective information channels, including social media and video platforms. → contributes to Objective 1
- Chapter 3.6: The Federal Government will systematically survey international best-practice examples of AI information campaigns and derive precise objectives for national measures from this survey. → contributes to Objective 1
- Chapter 4.1: The Federal Government will support and promote the development of a secure data ecosystem where data for the further development of AI systems can be exchanged responsibly, based on ethical principles and legal foundations. → contributes to Objectives 1, 2, 3
- Chapter 4.1: The Federal Ministries aim to develop department-specific data strategies that specify which data can be made available under which conditions. → contributes to Objectives 1, 2
- Chapter 4.1: The Federal Government will promote the establishment of a common data space that establishes standards for merging data into a data infrastructure → contributes to Objectives 2, 3
- Chapter 4.1: The Federal Government will examine the creation of a legal and technical framework for data partnerships between companies, research, science and public administration in order to promote Austria's attractiveness as an economic and data location. → contributes to Objectives 2, 3
- Chapter 4.1: The Federal Government supports science and research in the introduction of new and existing guidelines for the protection of public research data as well as in the compliance with ethical principles and legal framework conditions (data protection, Open Data, human rights). → contributes to Objectives 1, 2
- Chapter 4.1: Austria is actively involved in the process of the European Open Science Cloud and the world wide web of FAIR (findable, accessible, interoperable, reusable) data and services. → contributes to Objectives 1, 2, 3
- Chapter 4.2: The Federal Government aims for the successful participation of Austria in AI activities in the European Framework Programme for Research and Innovation (Horizon Europe) as well as in the application and diffusion activities of "Digital Europe". It recognises the close connection between national and European activities → contributes to Objective 2

- Chapter 4.2: The Federal Government aims to create and ensure a suitable framework for AI research, technology and innovation at the highest level. This requires sufficient funding, excellent AI research staff and close cooperation within AI research as well as across disciplines. → contributes to Objective 2
- Chapter 4.2: The Federal Government will examine the establishment of endowed professorships for artificial intelligence. AI research should be carried out with a thematic focus on established AI expertise with regard to excellence. → contributes to Objective 2
- Chapter 4.2: The Federal Government will increasingly support and promote European and international cooperation with leading initiatives in the field of AI (e.g. European Excellence Initiatives ELLIS or CLAIRE). In addition, it will examine the formation and funding of research networks and an orientation towards European clusters of excellence, as well as collaboration between AI researchers within the country. → contributes to Objective 2
- Chapter 4.2: The Federal Government aims to specifically promote young scientists in the field of AI by creating a critical number of pre- and post-doc positions in AI research and AI development. → contributes to Objective 2
- Chapter 4.2: The Federal Government will strengthen AI in existing funding programmes, from basic research to business growth, and consider establishing its own thematic AI funding programme. → contributes to Objectives 2, 3
- Chapter 4.2: The Federal Government will support and promote socially relevant, interdisciplinary AI research that guarantees the protection of privacy. → contributes to Objectives 1, 2
- Chapter 4.2: The Federal Government strives to support the transfer of innovative AI technology between Austrian universities, universities of applied sciences, research institutions and companies. → contributes to Objectives 2, 3
- Chapter 4.2: The Federal Government aims to promote inter- and transdisciplinary research and active social discourse, including in the field of AI. → contributes to Objective 2
- Chapter 4.3: The Federal Government will actively participate in the implementation of the EU's Coordinated Plan on Artificial Intelligence. → contributes to Objectives 1, 2, 3
- Chapter 4.3: The Federal Government will evaluate the participation in AI reference Testing and Experimentation Facilities (TEFs) within the Digital Europe programme and examine whether and how testing facilities can be set up in specific areas of application

(e.g. automotive or agriculture) in Austria. The Federal Government is also striving to continue its active participation in the Euro-HPC programme and to promote the strategic expansion of HPC infrastructure in Austria. → contributes to Objectives 2, 3

- Chapter 4.3: The Federal Government will continue to promote the expansion of broadband communication infrastructure (including 5G networks) → contributes to Objective
- Chapter 4.3: The Federal Government is striving to establish an interdisciplinary AI platform that connects all relevant actors. This platform should involve all groups and people relevant to the topic of AI. In addition to business and science, this also applies to arts and public administration. → contributes to Objectives 2, 3
- Chapter 4.4: The Federal Government strives to convert the compulsory exercise "Digital Basic Education" at secondary level 1 into a compulsory subject and to increase its extent (at least 4 hours in the timetable) in order to anchor this important topic accordingly. As a result, AI topics as well as related ethical questions are specifically strengthened and included in pedagogical concepts. Furthermore, a focus is placed on this topic in vocational training and general education in upper secondary education in order to promote its potential for innovation. → contributes to Objectives 2, 3
- Chapter 4.4: Throughout the education system, the Federal Government will continue to place and enforce a special focus on the promotion of girls and women in STEM, especially against the background of societal changes as a whole in the context of digitisation. → contributes to Objectives 2, 3
- Chapter 4.4: The Federal Government will continue to quantitatively and qualitatively expand STEM and AI training places and focal points at vocational secondary schools (BHS) with regard to regional demand. At the upper secondary level, as part of the revision of the curricula, an increased focus will be placed on STEM topics, and in particular on AI topics. The framework of school autonomy allows vocational schools to set additional priorities. Furthermore, with regard to any STEM and AI competence gaps between school and the requirements of work and study, measures are to be developed which contribute to closing these gaps and facilitate permeability. → contributes to Objectives 2, 3
- Chapter 4.4: On the basis of the Digital Competence Framework for the field of (vocational and private) adult education, the Federal Government is striving to develop assessment tools with a focus on artificial intelligence. Such "self-assessments" and "quizzes" on the subject of AI are intended, on the one hand, to self-assess existing knowledge in the field of AI and, on the other hand, to show in which areas of competence further learning is recommended. If necessary, specific further training opportunities are recommended. → contributes to Objectives 2, 3

- Chapter 4.4: The Federal Government will further increase media and digital skills in the field of teacher education by integrating AI topics specifically into existing education, training and further education. Methodological competence also needs to be expanded so that AI can be used in a useful didactic manner to support teaching and learning processes. In the area of STEM and AI, career changes by people from business and industry with AI experience are to be encouraged. → contributes to Objective 3
- Chapter 4.4: The Federal Government will promote the development of an information platform for the presentation of AI products currently on the market, methodological opportunities and research projects. It will pursue the goal of integrating AI tools into teaching and learning processes. → contributes to Objectives 2, 3
- Chapter 4.4: The Federal Government will initiate a reflection on AI development through accompanying research, taking into account societal issues, including technology impact assessment. An emphasis should be placed on accompanying research on the benefits and risks of AI-based tools in teaching. → contributes to Objectives 2, 3
- Chapter 4.4: The Federal Government aims to increase the AI skills of students and graduates. To this end, AI skills must increasingly find their way into the curricula of universities and AI research is to be strengthened. → contributes to Objectives 2, 3
- Chapter 4.4: Together with universities and universities of applied sciences, the Federal Government will promote the integration of issue from the humanities, social and cultural sciences into technical contexts and, by the same token, the use of digital technologies and cultural techniques in non-technical education. → contributes to Objectives 2, 3
- Chapter 4.4: In addition, the Federal Government is taking targeted measures to reduce drop-out rates in order to increase the number of graduates in STEM or AI. → contributes to Objectives 2, 3
- Chapter 4.4: To this end, the Federal Government will promote the development of AI-based tools that are linked to specific learning methods, as well as proving their effectiveness (keyword: accompanying research) → contributes to Objectives 2, 3
- Chapter 4.4: The Federal Government supports the expansion of AI education and training offers at universities and in cooperation with other (further) education and training institutions. → contributes to Objectives 2, 3
- Chapter 4.4: The Federal Government will continue to promote both the teaching of basic AI knowledge and possible specialisations in the field of AI in job-related

education and training → contributes to Objective 3

- Chapter 4.4: The Federal Government intends to further promote training and further education measures for companies on relevant AI future technologies, taking into account industry-specific peculiarities. → contributes to Objective 3
- Chapter 4.5: The Federal Government will continue to promote the best possible networking between providers of AI solutions and Austrian companies. → contributes to Objective 3
- Chapter 4.5: The Federal Government will examine the creation of financial incentives to encourage companies to participate in spin-offs of universities and colleges in the field of AI and thus exchange know-how. → contributes to Objective 3
- Chapter 4.5: The Federal Government will evaluate existing framework conditions for digital innovation and technology transfer in the economy and, if necessary, create new instruments that facilitate the conversion of innovations into marketable products. → contributes to Objectives 2, 3
- Chapter 4.6: The Federal Government intends to create the best possible framework for private investment in trustworthy AI projects, which protects Austrian companies against sell-offs and emigration abroad. At the same time, targeted public funding in this area is to be continued and further expanded. Public funding for trustworthy AI must cover the entire innovation cycle, from the idea to international expansion. → contributes to Objectives 1, 3
- Chapter 4.6: In the public procurement of AI products and services, the Federal Government will require compliance with the criteria of trustworthy AI. → contributes to Objectives 1, 3
- Chapter 4.7: In order to enable the safe use of AI in public administration, the corresponding foundations in administrative law are evaluated, taking into account the traceability and transparency of AI-based decisions. → contributes to Objective 1
- Chapter 4.7: The Federal Government is creating structures and processes to define guidelines for the use of AI in administration in accordance with fundamental rights. → contributes to Objective 1
- Chapter 4.7: The Federal Government aims to evaluate administrative processes with regard to their AI suitability with the aim of increasing the efficiency, quality and accuracy of its services for citizens. → contributes to Objectives 2, 3
- Chapter 4.7: The Federal Government will further expand the provision and further use

of open and non-personal administrative data. This includes rapid and efficient implementation of the European Union's Open Data and PSI Directive at the national level, which will also increase the availability of dynamic data, which will lay the foundation for developments in areas such as big data or AI → contributes to Objectives 2, 3

- Chapter 4.7: The Federal Government is striving to expand the training and further education models of public officials in the field of digital competence. Training programmes adapted to specific target groups, which increasingly also include IT skills, are intended to provide public officials with the necessary AI skills. → contributes to Objectives 1, 2, 3

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Annex

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AI fields of application

The potential application of AI in various fields might seem limitless; however, the specific solutions will differ. Application schemes cannot be the same everywhere; the conditions of training data (quality, confidentiality or availability of data) are not similar everywhere; possible solutions might not find acceptance everywhere. Fields of application that are based on highly sensitive data pools under data protection law (such as in the healthcare sector or in financial services) must be designed differently from those that do not process personal data or only process personal data to a very limited extent (such as in the field of manufacturing). Security-sensitive or high-risk applications must be viewed independently from those in which other features (such as real-time capability or latency) are the main focus. In all application scenarios, only human-centred solutions that respect the fundamental rights of those affected are to be considered.

The effective design of AI in fields of application therefore requires profound domain-specific knowledge in order to be able to take into account the specific challenges and framework conditions of the sector. Due to its scope, this version of the AI strategy cannot provide individual strategies for each sector, but it can illustrate essential building blocks and open up design perspectives. The focus must be on climate protection, which is most strongly represented here with the sections energy, mobility, (primary) production, agriculture, space, urban and energy planning and the construction sector.

AI as a tool for climate protection


Without a doubt, the climate crisis poses one of the greatest challenges humanity has had to face so far. The consequences and effects of this challenge form the reference point and framework for almost all European policies and have recently been translated into sophisticated multi-billion-euro programmes (see European Commission priorities: Ein Europäischer Green Deal, n.d). As recently as December 2020, the EU decided to tighten climate targets and reduce greenhouse gas emissions by 55% by 2030 (compared to 1990). Far-reaching and sustainable transformation measures are therefore necessary in order to achieve the 2030 climate targets and Austria's climate neutrality by 2040.

Great expectations are rightly placed on technological solutions for tackling climate change, whether through mitigation or adaptation strategies, or through progress in understanding the basics and system behaviour of climate change. On the one hand, these include environmental technologies, the main purpose of which is to protect against environmental damage (Green Tech, such as renewable energy generation, circular economy technologies, wastewater or exhaust gas treatment, energy or heat recovery systems in industry, etc.). On the other hand, there are technologies whose features make it possible to achieve climate goals directly or indirectly (Tech for Green: technologies such as specialised instrumentation and control engineering for optimising energy-intensive processes, highly efficient logistics systems for reducing transport costs and thus emissions, modelling and simulation to avoid complex physical test runs, predictive maintenance, etc.). AI and machine learning are a powerful tech-for-green tool that has only become the focus of climate discussions in recent years. Although this large field of application is only just beginning to develop, its importance for the greening or decarbonisation of the globalised industry is increasingly recognised (see AI for the earth).

Potential impact dimensions of AI-based solutions for climate change can be broken down as follows: industry, energy systems, buildings and urban planning, transport systems, agriculture and forestry, climate forecasts, water management, social impacts, geoengineering, individual action, collective decisions, education and financing (see Rolnick et al, 2019).

Due to Austria's high environmental standards, its well-developed environmental technology industry (see Schneider et al., 2017), the associated considerable potential to differentiate by location and to develop locations as well as its high level of know-how in tech-for-green applications, Austria strives to be one of the first countries in the world to explore the potential of AI-based applications for tackling climate change in all their range, to develop functional prototypes and finally to convert them into market-ready products or solutions.

The Federal Government will develop a master plan for the most promising applications of AI to combat climate change and present it in the next version of the AI strategy AIM AT 2030



However, as part of this first version of the AI strategy, already some first measures from the areas of energy, mobility, production, agriculture, space, smart city and construction are being presented. These measures can already be implemented now.

Digitised energy systems

Converting our energy systems to renewable energy sources means a fundamental transformation, as many more actors and technical systems will have to be organised in an increasingly dynamic environment. Some factors are becoming major drivers in this process, in addition to the already visible effects of liberalised energy markets: decentralisation, fluctuating solar and wind power, the necessary small-scale interconnection of various infrastructures and sectors (e.g. energy and mobility, electricity and heating/cooling, etc.) as well as social changes (the desire to participate in the energy system, new concepts in the sharing economy, etc.). These structural changes might create new challenges, for instance when it comes to efficiency or reliability, security and resilience of energy systems.

According to the report “Digitalisation & Energy” (see the International Energy Agency, 2018) by the International Energy Agency (IEA), digital technologies have the potential to make future energy systems all over the world smarter and thus more efficient, reliable, resilient and sustainable. AI will be able to play a central role in this development. Methods from statistics and data management allow for independent recognition of the physical environment by combining machine learning algorithms with patterning and clustering from AI research. The analysis of large amounts of data results in patterns that are converted into independent reactions by AI. Thus, the analysis of energy consumption data will accelerate our profound understanding of efficient energy systems. A completely new, dynamic and cellular self-organisation of resilient energy networks and energy systems might therefore become possible.

When tapping into the potential of the digital transformation for the energy transition, AI offers the opportunity to transform future energy systems in the areas of technical operation (such as in terms of grid, buildings, industrial plants, consumer generation plants, storage), business processes (infrastructure operators, utilities, aggregators, community operators, etc.), organisation of markets (platforms and transaction mechanisms to trade and exchange values at different levels such as energy, performance, flexibility, etc.) or communication (connecting actors in the energy system, such as consumers, producers, infrastructure operators, etc.) to make them efficient, resilient and sustainable.

The Federal Government will address AI-specific priorities in existing energy research programmes and relevant thematic programmes in the Austrian RTI system (see Austrian RTI system), in which the innovation potential of AI-based solutions will be researched and implemented. This also includes extensive validation initiatives, such as innovation laboratories or the Energy Model Regions.

The Federal Government will continue and expand its current active and leading participation in transnational cooperations within the framework of the European Strategic Energy

Technology Plan (EU-SET Plan), the International Energy Agency (IEA) and Mission Innovation (such as the Joint Programming Platform Smart Energy), in particular elaborating the opportunities of AI.

AI for sustainable mobility

Artificial intelligence has the potential to greatly increase efficiency in the mobility system and thus significantly contribute to reducing pollutant emissions and initiating new solutions for sustainable mobility. Ecological and digital transformation represent the central challenges of the various sectors in the mobility industry. Essential pillars are competitiveness and advantages through circular technologies, security of supply through sustainable transport chains and comprehensive services through climate-friendly mobility innovations. In the diverse fields of mobility, such as traffic management and control, transport logistics processes or in the value chains of the mobility industries, there is often a high volume of structured and unstructured data available. Targeted measures ranging from basic research projects to field trials are supposed to support the increasing use of AI in future mobility. When using personal movement or geodata, special attention must be paid to data protection regulations.

AI is a key technology that first needs to be increasingly tested and used as a central element in individual modes of transport. On this basis, multimodal concepts can be developed. The targeted use of AI may lead to capacity improvements, increased flexibility and experiments with new, more fuel-efficient forms of mobility (e.g. light pods on rails) by individual transport companies and thereby make a significant contribution to meeting climate protection goals. In addition, through the increased use of AI-based systems, Austria will be able to provide higher levels of safety in the future and thus create greater confidence in the mobility system.

The use of AI technology in mobility aims to achieve multimodal control. The basis for this is a holistic view of the three levels of system, vehicle and usage in order to provide comprehensive mobility services. Among other things, in this scenario AI acts as a technological enabler for real-time analysis and dynamic on-demand solutions. For instance, it is able to analyse how many people board at different stops and which recommendations for which vehicle are best suited to meet individual travel needs. A variety of different data sources are required to achieve this, such as vehicle-specific data (OBD) or mobile phone data of passengers, while maintaining privacy and taking into account the guidelines of data protection, but also combining them at the vehicle level or combining data from vehicles and infrastructure. Merging and analysing of different data sources requires a high degree of care.

Austria aims to apply AI in the mobility industries in such a way that the technology clearly provides added value for humans while respecting the GDPR. This targeted application leads to further increase in efficiency and thus serves climate protection. Shorter design loops thanks to the use of AI and thus shorter development periods make it easier to handle the demand for efficiency in the mobility industries. Minimal use of resources as well as maximum economic and ecological efficiency are essential drivers for the development of sustainable transport technologies and require an integrated and consistent view on data—from

generative design to predictive maintenance and servicing. Austria is already very well positioned in the integration of data and services from different actors, but sometimes lacks the necessary AI application competence in the field of mobility to draw insights from it and to act with foresight. In order to leverage this potential, an in-depth, RTI-policy focused discussion of the topic in the area of mobility is required.

Against this background, the Federal Government will analyse the relevance of AI within the four mission fields of the R&I Mobility Strategy and, based on the results, include the technology in the focus of the national R&I programme Mobility of the Future. Moreover, it is planned to include the topic in the tender objectives of the RTI programme Take Off for aviation-specific applications.

The importance of AI for the manufacturing industry

Among the numerous fields of application of AI, in which Europe has to compete with Asia and the USA, it is best positioned in the manufacturing industry. European strengths in key industries such as mechanical engineering, automotive, robotics and automation or energy production form the backbone of a globally successful manufacturing industry and must be well prepared for the challenges of digitisation and artificial intelligence (see manufacturing industry). As an export nation, Austria contributes to this European industrial base with a very high share of the manufacturing industry in its GDP and employment and a high export ratio. It also boasts very high levels of specialisation and large shares of the world market in numerous, especially knowledge-intensive industrial sectors. AI in manufacturing companies: In the vast majority of cases,

AI applications in the manufacturing industry help to increase resource and energy efficiency. In other cases, they help companies make better decisions in complex situations; they increase flexibility and create stable and highly efficient value chains.

AI can have a value-adding effect in various areas of a business organisation. Its greatest benefit is unfolded when AI applications are implemented across different areas of a company. A holistic approach that also includes the value chains of the manufacturing sector may prove beneficial in the context of AI.

The following figure gives an overview of opportunities for AI application in companies based on a product development process. Production is closely interlinked with other areas within a company.

Use of new AI-based technologies in value added processes

The use of AI increasingly connects complex and heterogeneous systems and ensures better integration along the value chain in the long term.

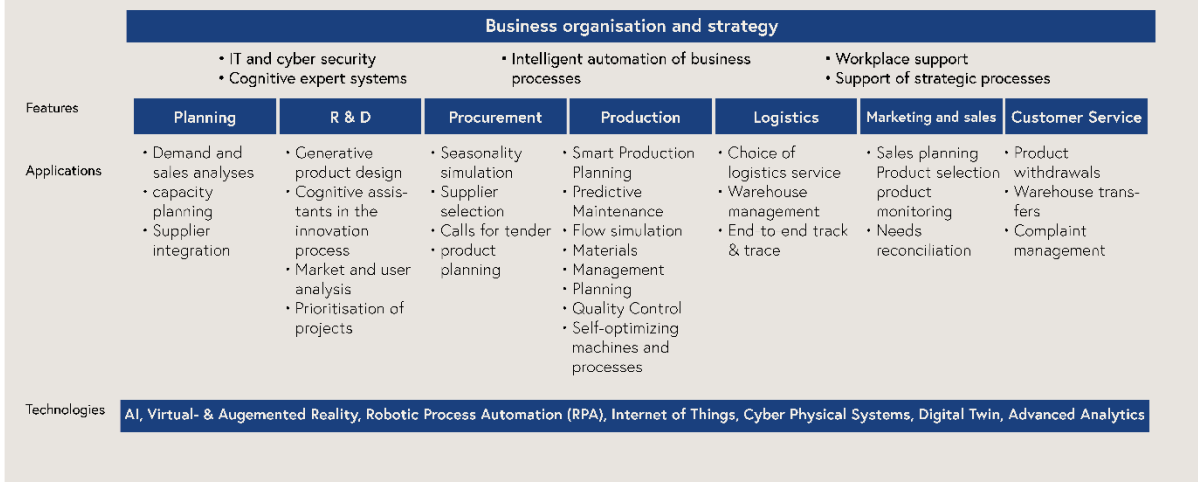


Figure 1 AI technologies in value added processes in the manufacturing industry

AI measures for the manufacturing industry: In the next few years, industrial skills in the field of AI are to be developed and expanded in Austria. Technology transfer must be intensified, in particular for SMEs, and increased data exchange within Austria must be pursued. Furthermore, Austria will increasingly contribute to relevant European flagship projects and take on a leading role there. The following measures will be implemented in the short term:

The Federal Government will promote the development and establishment of a use case database in which examples of successfully implemented AI projects are collected and, in particular, made accessible to SMEs. Additionally, it will seek cooperation with other actors in the DACH region.

The Federal Government will work on improving access to AI technologies by authorising existing institutions such as pilot factories and smart factory labs to integrate AI solutions for medium-sized enterprises. Likewise, the European Digital Innovation Hubs for AI (EDIH) planned by the EU as part of the Digital Europe programme are to scout locations in Austria and provide transfer services for AI applications.

The Federal Government will focus on increased availability of data in the industry. The exchange of data between companies and research institutions will be intensified within sectoral data circles (see data circles). Incentive systems and better conditions for the voluntary and data protection-compliant sharing of data (also from publicly funded research projects) will be created (see eosc-portal.eu).

The use of data and data platforms as well as the sharing of training data on a voluntary basis will be made possible and the use of pre-trained networks will be promoted.

The Federal Government will noticeably increase its involvement in European initiatives and

participate in strategic initiatives at European level, such as GAIA-X, the testing and experimentation facilities (TEF) of the Digital Europe programme or the Cybersecurity Centre.

In the medium term, the focus will be on exploiting synergies and optimal promotion of joint projects.

The Federal Government will promote the creation of an AI roadmap for the Austrian manufacturing industry including annual adaptations, taking into account the principles of a trustworthy AI (for example: protection of personal data, rights of employees and sensitive company data).

The Federal Government will establish its own visible AI research funding track for the production sector within the framework of an AI programme, which will enable faster translation of research into specific AI applications through testing areas, living labs, model experiments, regional clusters and novel funding formats.

AI in agriculture and forestry

Decisions on the use of technical means in agricultural and forestry production are traditionally based on cross-generational experience-based assessments. Although the agricultural sector was rather reluctant to embrace information innovations until recently, in recent years there has been a growing awareness that intelligent digital tools are a necessary basis for sustainable management in an era of highly volatile weather and high input prices. In particular, satellite and weather data, data from soil sensors and from sensor-guided agricultural machinery may form a valuable basis for models that optimise agricultural production and sustainability using AI methodology.

In the field of forestry, data from forest monitoring schemes, data about soil conditions and also about pest infestation are essential for the sustainable management of forests. An active forest management adapted to climate change requires targeted measures, which can be selected even more accurately for certain forest locations by AI-based methods. Climate models based on AI, which predict the future development of forest sites, enable long-term management planning, especially with regard to a robust choice of tree species.

The climate crisis, digitisation and globalisation require an innovative supply-chain management for socially, environmentally and economically sustainable and resilient timber transport solutions. The development of AI-based workflow and planning tools for timber supply chains will contribute significantly to increasing planning and supply security in the Austrian forestry and timber industry.

In fact, the agricultural and forestry sector has experienced an enormous boost in digitisation in recent years, both globally and in Austria, which is the prerequisite for the use of data-driven and AI-based applications. Some of the most important applications in the agricultural sector concern the field of precision farming, i.e. the targeted management of areas with a view to optimal use of fertilisers and plant protection products, which requires new intelligent approaches. For example, it is to be expected that robots will increasingly be able to carry out mechanical instead of chemical weed and pest control. Leading applications in the field of precision agriculture include, among others:

- Creating vegetation and yield maps to develop fertilisation strategies
- Distinction between plants and fruit through AI-based image processing
- Automated determination of pest infestation
- Field robotics: development of autonomous tractors and self-driving machines, use of robots for sowing, crop maintenance and harvesting

- Documentation of damages (storms, erosion, flooding, droughts, bark beetles, pests) by drone or satellite
- Use of innovative sensor technology in animal husbandry to determine animal welfare (GPS tracking, activity monitoring, heat detection, etc.)
- Automation and air conditioning of greenhouses

In addition, AI technologies may contribute to species and environmental protection, e.g. through pinpoint crop protection applications.

In order to promote AI projects in the field of agriculture, forestry and nutrition, it is important to combine the necessary skills. This includes, on the one hand, systemic knowledge about applying and providing the necessary data in typical applications and, on the other hand, methodological knowledge about artificial intelligence itself.

The Federal Government will promote projects with a critical minimum size and obligatory cooperation between competence centres.

The Federal Government will expand the funding of necessary infrastructure at universities and non-university research institutions in the field of AI and agriculture.

The Federal Government will consider participation in AI testing and experimentation facilities (TEFs) within the framework of the Digital Europe programme for agriculture.

AI and space applications for climate protection

Space infrastructures (Copernicus and Galileo/EGNOS) provide long-term and sustainable data and information for a knowledge-based European and national policy and are a strategic tool for tackling global and European challenges, such as the effects of the climate crisis. Copernicus, the European Earth observation program, provides more than 12 terabytes of data every day that allow us to have a digital image of the Earth. Analysing such amounts of data is only possible with the help of automated processes; AI-supported pattern recognition and video analysis make it possible to process these large amounts of satellite data.

AI applications are particularly relevant in the areas of Earth observation, navigation and satellite-based telecommunications. Other areas of application of AI in space include the analysis of payload data on board spacecraft, the analysis of test data on space missions, the resilience of software, systems and processes to AI-activated attacks and threats to the ground segment, as well as data analysis in the field of space sciences.

For a fruitful use of AI applications in the context of space applications, the following measures are planned:

As an ESA and EU member state, Austria will promote the development of the "Digital Twin Earth": The data and services of the Copernicus program will be linked to the Common European Data Spaces with the aim of determining the current state of the planet and predicting future developments with high-precision simulations. Some areas of application are, in particular: climate, environmental, and civil protection as well as urban development.

AI-supported space applications are to be anchored in the BMK's Space Strategy 2030.

Climate protection and topics of AI in the application of satellite data and signals will be given a visible role in the upcoming call for tenders for the national space programme ASAP.

Smart City: energy and urban planning

Cities play an essential role in the decarbonisation of our energy system as energy consumers and energy storage. Digitisation makes it possible to synergistically connect the electricity, heating and mobility sectors with living, working and leisure in a smart city. AI can be used in this environment to find, predict and control patterns and regularities in production and consumption data.

A transparent and valid flow of information between all parties involved and via all software types in an urban system supports the development of solutions that help interpret the data generated in a meaningful way. AI methods based on progressive learning algorithms are intended to support all stakeholders in finding hidden insights into the decarbonisation of cities (living, working, mobility, consumption and leisure) in resource flow data. Through real-time monitoring of measures in energy and urban planning, AI-based tools can help us better understand and predict the use of the city and its infrastructure and thus provide important decision support.

In the RTI initiative City of the Future and the JPI Urban Europe, the Federal Government will call for tenders for demand-oriented research topics relating to smart and carbon-neutral cities.

This offers municipalities and infrastructure operators in particular the opportunity to develop and implement research questions on AI-based solutions for the decarbonisation of cities and urban agglomerations.

The Federal Government will address AI projects in its urbanity programmes, in particular in the planning of infrastructures and in operational optimisation.

Projects in the AI sector may range from the creation of building materials to decision-making in energy planning to intelligent buildings that continuously optimise their own resource flow.

AI in the construction sector: digital planning, construction and operation

In the future, the planning, construction and operation of buildings will be largely determined by the digital transformation, which offers immense potential for improving energy and resource efficiency. Digital technologies and applications allow for an optimised construction life cycle in terms of costs, deadlines, quality and planning security and thus minimise risks. An important building block here is the concept of Building Information Modelling (BIM) in all its dimensions, which allows for an integral overall view of all phases of the life cycle and digitally records and manages all relevant information – from planning to execution, operation and dismantling. BIM, combined with automation, robotics or artificial intelligence, will permanently change the workflows and processes of the construction industry and offers the potential for greater occupational safety.

Especially in planning and construction software, it is to be expected that existing products and software packages will be supplemented by AI features, e.g. for image recognition and dialogue systems that describe data, create captions and headings or point out interesting patterns or findings in data. AI creates virtual decision support that provides planners and customers with personalised recommendations and interactively helps to make a selection from a variety of options. Inventory management and surface layout may also be improved with the help of AI. For example, AI might analyse IoT data transmitted from networked devices in factories to predict capacity and demand using recurrent networks, which are special deep learning networks that use sequential data. Opportunities of using AI range from optimising planning and infrastructure to improving resource efficiency.

In the R&I programme City of the Future, the Federal Government will increasingly address the topic of digitisation in the construction industry, including digital planning, construction and operation under aspects of AI. In calls for cooperative RTI research projects and studies, it will provide impetus for AI in the areas of digital planning, the construction process and operational management, digital (construction) data management and data acquisition, intelligent technologies and application scenarios, and 3D printing and prefabrication in construction.

AI in the healthcare system

Artificial intelligence in general and machine learning in particular play a role in many areas of the healthcare sector. The potential fields of application cover the entire spectrum: from health promotion, prevention, prognosis, diagnosis, treatment and aftercare to systemic tasks such as public health and pandemic management. Key approaches include:

- creating individual or population-wide risk profiles for diagnosis and prognosis (see, for example, the multitude of models for Covid-19 diagnosis and disease progression),
- AI-based data aggregation (e.g. for epidemiological monitoring),
- using artificial neural networks in the diagnostic evaluation of medical image and audio data,
- AI-assisted drug development and personalised medicine,
- therapeutic intervention using data supplied by novel sensors (e.g. wearables) or
- the use of AI algorithms for patient interaction (e.g. chatbots, decision support systems, recruitment for studies, etc.).

The latter area in particular makes it clear that machine learning not only improves existing processes, but can also fuel disruptive changes in processes in traditional healthcare professions.

The application of machine learning in the healthcare sector may contribute to improving the quality of care and patient safety under certain conditions. Care processes might become more patient-centred. The development of treatments might benefit from the integration of new types of data. In addition, improved planning and the sensible use of resources can also contribute to security of healthcare supply. Any purely economic considerations regarding efficiency must be made transparent, but must never be in the foreground. Medium- and long-term consequences of the increased use of AI must be considered and evaluated. One of the major challenges of applying AI in the healthcare sector, beyond technical and medical issues, is to clarify the necessary conditions, such as:

- privacy and data availability,
- socio-economic issues, such as the impact of AI on healthcare professions and forms of interaction in healthcare,
- ethical aspects (algorithm and data ethics, transparency and explainable AI) and

- legal requirements (market approval/medical device legislation, liability issues).

The current degree of maturity of AI and machine learning applications in the healthcare sector varies greatly. While large studies on the effectiveness of image analysis approaches are already available, the areas of individual risk profiles, therapeutical support and prognosis are still at an early stage of development. The Austrian AI community in the healthcare sector is characterised by research at universities and individual non-university institutions, by start-ups in the healthcare sector and by the activities of the pharmaceutical industry. There are also isolated initiatives on behalf of public actors in the healthcare system. In this context and in view of the role of the federal level in healthcare policies, the following measures can be derived:

Digitisation in general and the use of artificial intelligence in particular are becoming increasingly important in applied healthcare professions. For example, decision support systems will play a stronger role in diagnosis and treatment. Medical and other healthcare professionals must be able to help shape these systems and evaluate the quality of applied algorithms and the resulting recommended actions. This requires knowledge of statistics and data sciences as well as inputs from ethics and the social sciences. These aspects are currently underrepresented in the training of healthcare professionals.

Taking into consideration developments in the field of AI, the Federal Government will analyse the training regulations of healthcare professions and discuss the need to adapt current regulations/curricula with stakeholders (including students).

Healthcare is becoming increasingly data-intensive, not least in the inpatient environment. AI learning offers tools to improve the quality of care based on the available data. Various actors are testing the use of AI and machine learning in their environment (for example, for image diagnostics or predictive analysis of risk profiles within a hospital network).

The Federal Government will take stock of AI algorithms used in the clinical environment and hospital management in Austria and, based on its findings, initiate an exchange of experience, identify possible synergies and support transfer as part of the Health Targets (eHealth specialist group).

Machine learning algorithms can support planning in the healthcare system with the help of predictive models, for example in the field of planning and provision (pharmaceuticals, protective equipment, etc.) or in the modelling or creation of risk profiles.

The Federal Government will promote the identification and critical discussion of relevant approaches to AI in the healthcare system in an international environment, an exchange of experience and networking, and the piloting of selected AI algorithms.

In addition to these algorithms, corresponding databases, which need to be built, adapted

and/or merged, are also an important basis for various areas of application of AI.

For the trustworthy use of AI in the healthcare system, the Federal Government will identify the type and scope of application-related source data and implement their combination for statistical and research purposes, taking into account data protection and data security requirements.

AI in arts, culture, media and creative industries


Due to their creative potential, actors in the arts and cultural sectors are important sources of inspiration for ideas and perspectives on how AI as a key technology can be used to the greatest possible social benefit. Numerous internationally renowned festivals, above all Ars Electronica and the “Steirischer Herbst” festival, explore the social implications of technological innovations. By way of example, they illustrate how art and culture provide an impetus for translating and mediating the design of AI. They also make it clear that like all technologies, AI technologies can and should be co-designed.

In order to make the best possible use of its creative potential, Austria is strengthening interdisciplinary cooperation between the cultural and tech scene, start-ups as well as universities. Existing (economic) development programmes will be made more accessible to actors in the arts and cultural sectors, thus extending their participation in these programmes.

AI technologies offer a variety of new and challenging testing grounds and possible applications in the arts, culture and media sector. With its diverse and rich art and cultural landscape, Austria offers excellent conditions to be able to apply AI comprehensively in this field. First of all, this concerns its application for creative processes in artistic production: For artists and designers, AI applications offer a wide range of new opportunities to implement creative concepts and ideas. The future role of AI may be in particular to create conditions for innovative formats of presentation. In addition, AI allows for more effective approaches in the digitisation and transfer of knowledge regarding cultural heritage. Routine activities also exist in the arts, culture and media sectors. These can be automated, thus freeing resources for human creative processes. These activities are often industry-specific, such as cataloguing museum objects, generating a weather report based on data, or material or surface renderings in the architectural process or in product design.

Especially in the media sector, there are major upheavals due to the digital transformation of classic media, and it is especially required to provide funding and support. To this end, the “Fund for the Promotion of Digital Transformation” set up by the Federal Government is currently undergoing a notification procedure by the EU Commission. Subject to approval by the National Council and notification by the EU Commission, this digitisation fund will be one of the largest media subsidies in Austria, accounting for 20 million euros in funding per year. Thus, digital AI applications that help to save time and resources and make processes more efficient can also receive funding in the context of the digital transformation of classic media.

Austria will increasingly promote aspects of arts, culture, media and creative industries that will facilitate the development and use of AI.



AI applications in the arts, culture, media and creative industries are highly subject to industry-specific requirements. It is therefore all the more important to network and exchange experiences, as this provides impetus for AI applications that go beyond currently known technological innovations.

Industry-specific dialogue and conference formats are to be established in cooperation between journalists, members of the creative industries and arts, developers from the ICT industry and research institutes. This exchange is also intended to promote cooperation between artists and engineers in order to exploit their potential for new AI applications and AI experiments.

AI in education

AI-based tools offer potential for personal and individual support of lifelong learning at all levels of education. The aim is to use AI-based tools in a responsible and pedagogically/didactically meaningful way as support for teachers and learners, while always critically reflecting on its conditions and possible effects, for instance with regard to data protection (personal data). This is always accompanied by attempts to prove the effectiveness of the aforementioned AI-based tools (accompanying research).

Currently available applications can be roughly divided into four categories:

- **Smart content:** Use of AI for the automated processing of learning content: AI can help to process existing teaching content automatically in a variety of ways, for example by creating chapter summaries, quizzes or visualisations. Intelligent feedback systems also provide learners with personalised feedback, so that, for example, solutions to a gap-fill exercise are no longer only right or wrong, but their correctness—for example in foreign language lessons—is automatically evaluated on the basis of semantic criteria.
- **Intelligent tutoring systems** automatically provide personalised learning content and real-time feedback, tailored to different learning styles and needs: Learning resources as well as individual instructions and real-time feedback that match a learner's individual learning path are provided automatically. The basis for these recommendations is the evaluation of learning data (learning analytics) and the knowledge which content has helped other learners in the same situation. This opens up more opportunities for the development of individual interests and talents of students.
- **Virtual learning companions:** Automated communication systems for standardised scenarios in virtual learning environments: By using interactive AI systems (e.g. chatbots) in virtual learning environments, the teacher is supported in creating an interactive space for learners. For example, learners can be encouraged by a chatbot sending them reminders and notifications, or materials and tasks can be contextualised and presented to them in the style of a conversation. It is also worth mentioning that chatbots are able to respond to standardised questions.
- **Evaluation of learning data (learning analytics, predictive analytics):** AI-based tools may support teachers in their work, for example by providing detailed information about learners' strengths or their development potential based on learning data. Evaluation of learning data carried out in an appropriately abstract and aggregated form may also provide insights into the education system and thus support the further

development of the system.

The Federal Government will continue to pursue the aspects of smart content, intelligent tutoring systems, virtual learning companions or the evaluation of learning data in the context of piloting software, the support of development work as well as addressing the topic in education, training and further education.

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