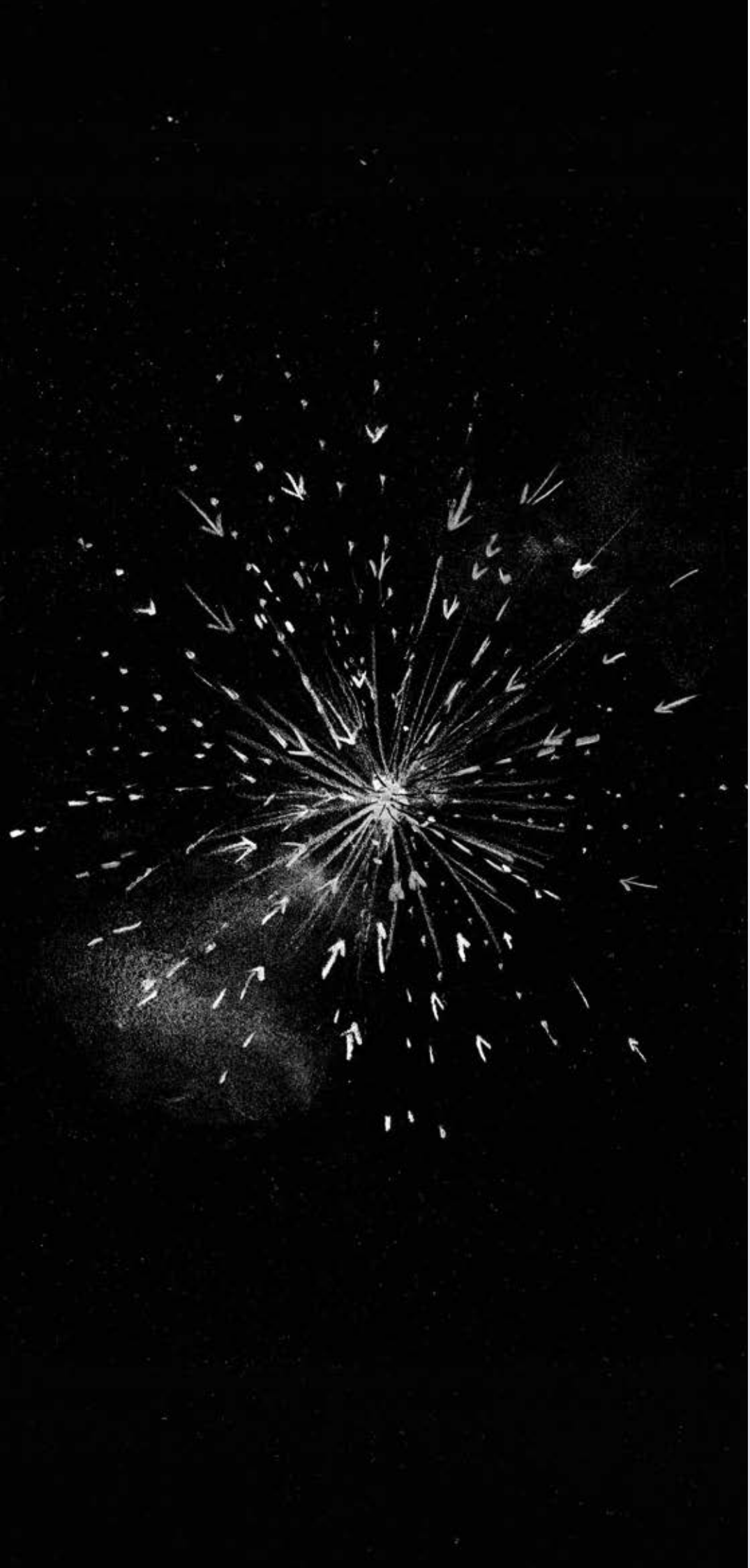

IMPACT REPORT

Solutions for Industry and Society

English Edition 2026

AUSTRIAN INSTITUTE OF TECHNOLOGY

The art in this issue:
Nikolaus Gansterer, Objects Yet To Become

The AIT art programme artloop aims to embed artistic forms and methods more systematically within the institute. This is also reflected in this year's Impact Report, for which Klaus Speidel, art theorist and head of artloop, invited an internationally recognised figure in contemporary drawing and artistic research to collaborate: Nikolaus Gansterer. As a result, artistic research is present in the Impact Report as an independent form of inquiry and knowledge acquisition.

The selected drawings from the series *Objects Yet To Become* (since 2016) are reminiscent of technical or scientific diagrams, which Gansterer has been exploring for many years: "Diagrams are something like a universal language of science, but without text they almost become a Rorschach test. They are interpreted in very different ways. This openness interests me greatly and I seek it out quite deliberately in my practice," explains Gansterer.

Based on this consideration, the instructions for action, which in the *Objects Yet To Become* series normally appear directly within the drawing, are printed here as captions. This allows the images to be read autonomously and associatively, either in the context of the report's text or, with the aid of the captions, as poetic instructions for action and imagination (see also an interview with Gansterer – QR code on page 78).

The Impact Report is thus expanded to include an artistic form of inquiry and provides a first impression of the relevance of art at AIT.

Image description for the cover image:

OBJECTS YET TO BECOME #4

Nikolaus Gansterer

Focus all your attention on one point. Start compressing time there till there's an abrupt implosion. Collect all the swirling dust and keep it warm.

AIT IMPACT REPORT

Solutions for Industry and Society

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WE MAKE INNOVATION
A DRIVING FORCE
IN EUROPE.

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Editorial

Dear readers,

The AIT Austrian Institute of Technology is driven by the vision that innovation will become the driving force behind Europe. Against the backdrop of global developments, it is clear just how crucial technological sovereignty, competitiveness and resilience are for Europe's future. Geopolitical shifts, new industrial dynamics and increasing competition for key technologies are fundamentally changing the operating environment. What is crucial, therefore, is not merely the development of new technologies, but their effective integration into industrial and societal systems. This is precisely where AIT comes in.

Our mission is clear: to translate scientific excellence into measurable impact. This Impact Report demonstrates how our research and development activities make concrete contributions to the economy, the environment and society.

Research at AIT is closely aligned with the needs of industry and current societal challenges. The implementation of the Austrian Industrial Strategy 2035 also requires strong applied research as a connecting element between science and industrial value creation. AIT applies this strength in a targeted manner across key future-oriented fields – from the digital transformation of production and sustainable energy systems to resilient infrastructure and safety-critical technologies. Our partners benefit both from technological excellence and from our ability to combine individual technologies into integrated, scalable solutions. This ability to take an idea through to application is a key driver for the competitiveness of industry, as well as for Austria and Europe as centres of innovation.

To further expand our sphere of influence, we have set ourselves ambitious goals. Digital technologies, particularly artificial intelligence, form a central foundation for this. We do not view them as isolated applications, but as a strategic capability that makes industrial and societal systems more efficient, robust and scalable. With AI Factory Austria, we are working with strong partners to create a high-performance infrastructure for their development and application in Austria.

Furthermore, we are shaping the next generation of industrial value creation with the aim of sustainably strengthening competitiveness. The focus is on the intelligent integration of energy and resource efficiency, the circular economy and the end-to-end digitalisation of industrial processes. On this basis, we are increasing efficiency, flexibility and productivity and developing industrial systems that are both economically successful and sustainable.

At the same time, we are developing new approaches to significantly accelerate research and development processes. A consistent data strategy, clear governance structures and the use of modern digital methods enable highly automated engineering processes and shorten innovation cycles. In this way, we demonstrate how industrial innovation processes can be made more efficient and scalable.

Another key focus is on expanding our technological expertise in quantum communication. Europe plays a leading role in this field of the future. Here, AIT makes a concrete contribution to technological sovereignty in security-critical areas.

We are convinced that excellent research only realises its full value when it is translated into economic strength, societal benefits and sustainable systems. That is why we are working consistently to further increase our innovative strength and develop solutions that make a real difference. This is made possible by our highly qualified and dedicated staff, to whom we extend our heartfelt thanks.

We would also like to thank our partners from business, industry and academia, our funding bodies, and our owners – the Federal Ministry of Innovation, Mobility and Infrastructure and the Federation of Austrian Industries – for their reliable support.

Together, we are laying the foundations for a sustainable, resilient and competitive future for Europe.

Brigitte Bach, Andreas Kugi, Alexander Svejkovsky
Managing Directors of the AIT Austrian Institute of Technology

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Introduction

AIT as a key driver of implementation within the innovation system

The AIT Austrian Institute of Technology, with its seven centers (Energy, Transport Technologies, Health & Bioresources, Digital Safety & Security, Vision, Automation & Control, Technology Experience, Innovation Systems & Policy), combines scientific excellence with technological implementation expertise.

As a key player in the innovation chain, AIT fulfils a clear systemic role: It bridges the gap between basic research and application, accelerating the transfer of knowledge into marketable solutions and effective applications for industry, public administration and operators of critical infrastructure.

In an environment of increasing technological and geopolitical dynamism, AIT makes a significant contribution to securing the competitiveness, technological sovereignty and resilience of Austria and Europe as a business location.

Focus on two key research priorities

Our research focuses on two closely interlinked strategic priorities:

- Resilient and sustainable infrastructures in the fields of energy, transport and health
- Digital transformation of industry and society

These two priorities address key levers for the transformation of the economy and society. They make measurable contributions to strengthening competitiveness and productivity, ensuring security of supply and technological sovereignty, as well as increasing the resilience of critical infrastructures and improving energy and resource efficiency in the context of changing climate and economic conditions.

Through our systemic perspective, interdisciplinary approach and excellent research infrastructure, we develop solutions that are technologically innovative, function robustly under real-world conditions and are scalable.

Close integration with industry, the public sector and academia ensures that research is conducted in a targeted manner to address specific needs and is efficiently translated into application. AIT thus acts as an innovation platform that links new technologies with concrete implementation processes and enables them to have an impact within the system.

Excellence as a standard – technological leadership as a goal

AIT is committed to excellence and strives for technological leadership in selected areas. What is decisive here is not merely scientific quality, but a consistent focus on implementation and scaling.

For instance, the "MEDUSA" project, which develops megawatt charging stations for the rapid charging of large electric vehicles, was awarded the Houska Prize in 2025. Further Houska Prizes followed in 2026 for the "Voltera" project, which combines artificial intelligence with physical modelling for the real-time control of power grids, and for the XR-based training solution "Green Manikin".

Further awards underscore the breadth of AIT's activities, including the ÖGUT Environmental Award for the "RecAL" project on circular economy in the aluminium industry, as well as for the City of Lienz's climate neutrality roadmap. The projects "BuildSaVR" and the "PeaceTech Alliance" initiative were also honoured with eAwards.

These awards exemplify AIT's commitment to transforming technological innovations into scalable solutions, thereby making measurable contributions to competitiveness, the further development of infrastructure and the tackling of key societal challenges.

Award-winning researchers

AIT's scientific excellence is also reflected in numerous individual awards. AIT researchers in various disciplines have received national and international honours, including the "EREA Best Paper Award" for James Page, the "Grete Rehor Prize" for Anna Hudits, the "Austrian Microbiome Research Award" for Daniela Wöber, and the "Mariella Schurz Prize" for Ivan Barisic and Johannes Peham.

Furthermore, Andreas Kugi was awarded the "Kardinal-Innitzer-Preis", Thomas Strasser was appointed Honorary Professor at Óbuda University, and Bernhard Bürger was honoured with the "CAMILO Award 2025".

Successful spin-offs

AIT's effectiveness is also evident in the successful spin-off of innovative companies. One example is the spin-off ENSEMO, which

significantly reduces the use of synthetic fertilisers and plant protection products by employing a novel method of seed treatment using natural microorganisms. Following its award of the "PHOENIX" start-up prize, the company secured a "Blended Finance Grant" worth millions from the EIC Accelerator Programme – the only Austrian company to do so in the current call for proposals. This example demonstrates how research at AIT gives rise to marketable solutions that are internationally competitive and make concrete contributions to sustainable industrial and bioeconomic applications.

Strong position in the European Research Area

With 159 projects under Horizon Europe and funding totalling over 93 million euros (as of February 2026), AIT ranks among Austria's leading research institutions and is one of the most prominent players in the European Research Area. This strong position enables AIT to actively shape European innovation agendas and position key technological issues for Austria and Europe.

The special role of AIT is evident in its close integration with industry, the public sector and infrastructure operators: 47 percent of the total of 685 scientific publications are produced in collaboration with these partners, and 56 percent of PhD students are involved in collaborative projects. The high number of invited talks – 342 in total, 177 of which were for these partners – also underscores AIT's strong networking and relevance.

This combination of international visibility, scientific excellence and consistent focus on practical application is a key factor in AIT's impact within the European innovation system.

Extensive expertise for international bodies

The high relevance of AIT is also evident in its strong presence in international bodies, standardisation processes and strategic platforms. AIT researchers hold a total of 371 positions in national and international bodies and associations. In addition, they hold 238 positions on certification and standardisation committees, in 21 cases in a leading role as Chair or Co-Chair.

Examples include the European Automotive Research Partners Association (EARPA), the European Heat Pump Association, EU-REC, Public Safety Communication in Europe, and various EARTO working groups. In this way, AIT not only makes an impact through research but also actively helps shape the technological and regulatory framework that enables innovation in Europe.

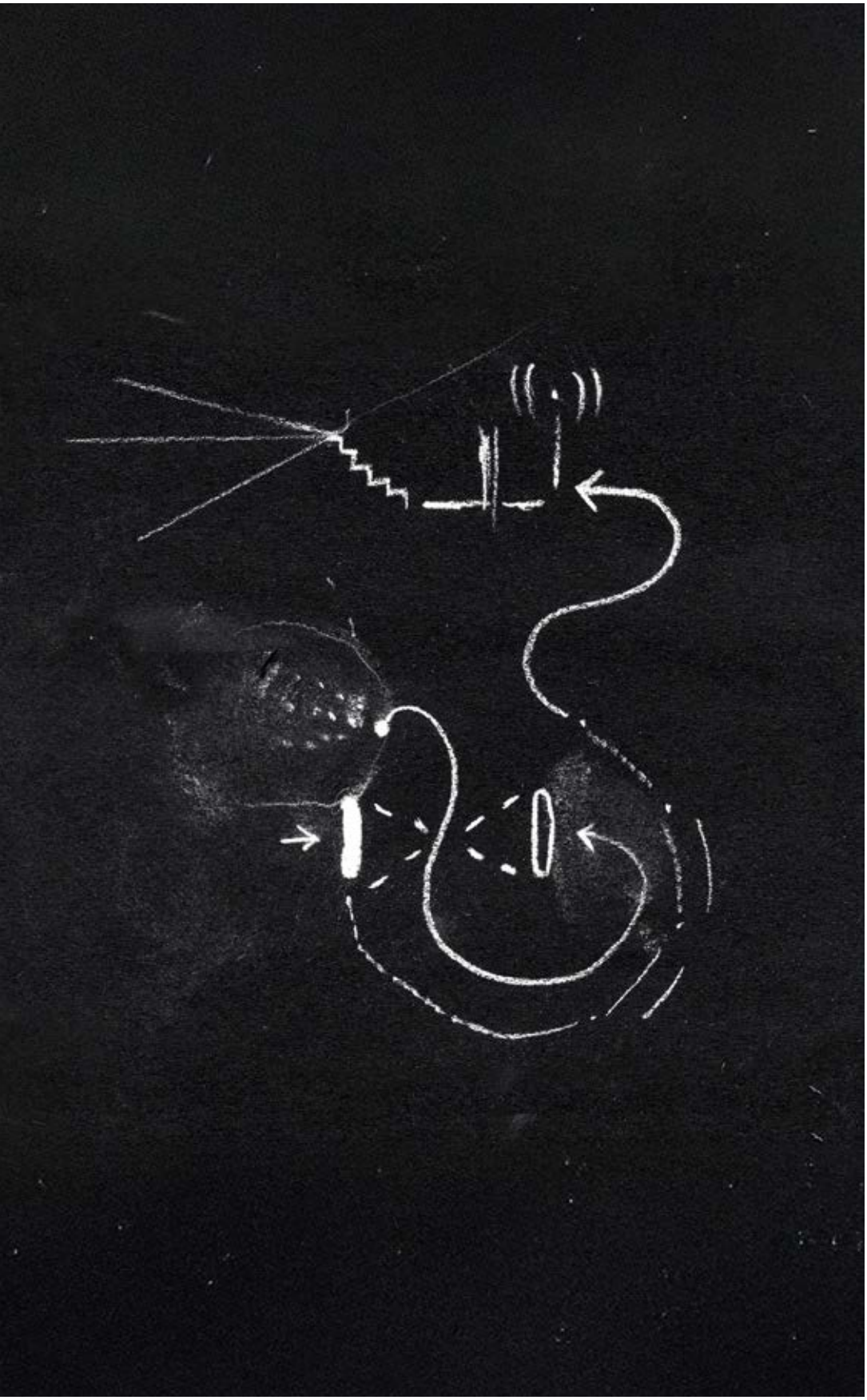
Technology, responsibility and impact

AIT develops solutions that integrate environmental, economic and societal requirements and deliver results under real-world conditions. The focus is on the transformation of energy and infrastructure systems, increasing the productivity and efficiency of industrial processes, and the targeted use of digital technologies.

Artificial intelligence plays a central role in this. AIT does not view it as an isolated technology, but as a strategic capability that is deployed effectively and responsibly through appropriate infrastructure, clear governance structures and targeted skills development. In this way, data-intensive applications – for example in energy or healthcare systems – are implemented on a scalable basis and translated into real-world applications with measurable impact.

At the same time, AIT pursues a consistently human-centred approach that builds trust in new technologies and ensures their benefits for the economy and society. We have a clear ambition: impact through science, technology and innovation – with solutions that have a systemic effect and contribute to competitiveness, resilience and sustainable development in the long term. In this way, AIT makes a significant contribution to shaping Europe's technological future.

Our ambition is clear: impact through science, technology and innovation – with solutions that have a systemic effect and contribute to competitiveness, resilience and sustainable development in the long term. In this way, AIT makes a significant contribution to shaping Europe's technological future.



OBJECTS YET TO BECOME #10

Nikolaus Gansterer

Take a deep breath. What is the backside of the opposite? What is the foreside of the contrary? Enter the backstage of unknowing to silent applause.

Impact of AIT

In this Impact Report, we use concrete examples to demonstrate how AIT's research and development activities are making a difference to the economy, society and the environment. The effects achieved vary depending on the field of application, but follow clearly identifiable areas of impact.

They range from efficiency gains and resource savings, through direct effects on competitiveness, to improvements in health, safety and the resilience of critical infrastructure.

Impact Categories

Labels indicate the assignment to the respective impact categories in the individual impact stories

Resources, Energy & Environment:

AIT develops solutions for sustainable infrastructure, energy supply and energy storage, efficient industrial processes and the responsible use of energy and resources. This reduces costs, minimises environmental impact and supports the circular economy as well as the better utilisation of materials.

Productivity & Competitiveness:

AIT develops and integrates methods, technologies and processes that boost productivity and strengthen the competitiveness of companies and organisations. These include efficiency gains, quality improvements and the accelerated translation of innovations into marketable applications.

Security & Resilience:

AIT develops technologies and solutions to enhance the security and resilience of systems, infrastructures and organisations. This reduces risks, makes failures more manageable and strengthens the capacity for action of the economy, the public sector and society.

People & Society:

AIT develops technologies and solutions that contribute directly to improving quality of life, health and safety. At the same time, AIT addresses societal requirements regarding the deployment of technologies, particularly with regard to usage, trust and responsible handling.

Scaling, Market & System Impact:

AIT bridges the gap from research to application, developing technologies so that they can be deployed in real-world environments and integrated into markets, infrastructures and societal systems. This results in market-effective solutions and evidence-based foundations for regulatory, political and strategic decisions.

THE DIGITAL TRANSFORMATION OF INDUSTRY AND SOCIETY

Digital systems as enablers of transformation

Digital transformation is fundamentally changing how industrial value is created, how public services are delivered and how social systems function. However, sustainable economic success can only be achieved where digital systems are secure, trustworthy and scalable.

AIT views digital technologies not as isolated applications, but as systemic enablers of competitiveness, resilience and technological sovereignty – key objectives of the Austrian Industrial Strategy 2035. Across industry, public administration, healthcare and society, AIT develops digital systems that facilitate the transition from pilot projects to widespread implementation. The focus is on measurable outcomes: increased productivity, risk reduction, efficiency gains and the strengthening of industrial and governmental capacity to act.

OBJECTS YET TO BECOME #2

Nikolaus Gansterer

Choose two things you wish to connect with. Reach out until you get in touch. Feel their materiality. Mediate between them for a while till they coalesce. Then swallow them.

AI-powered Industrial Systems

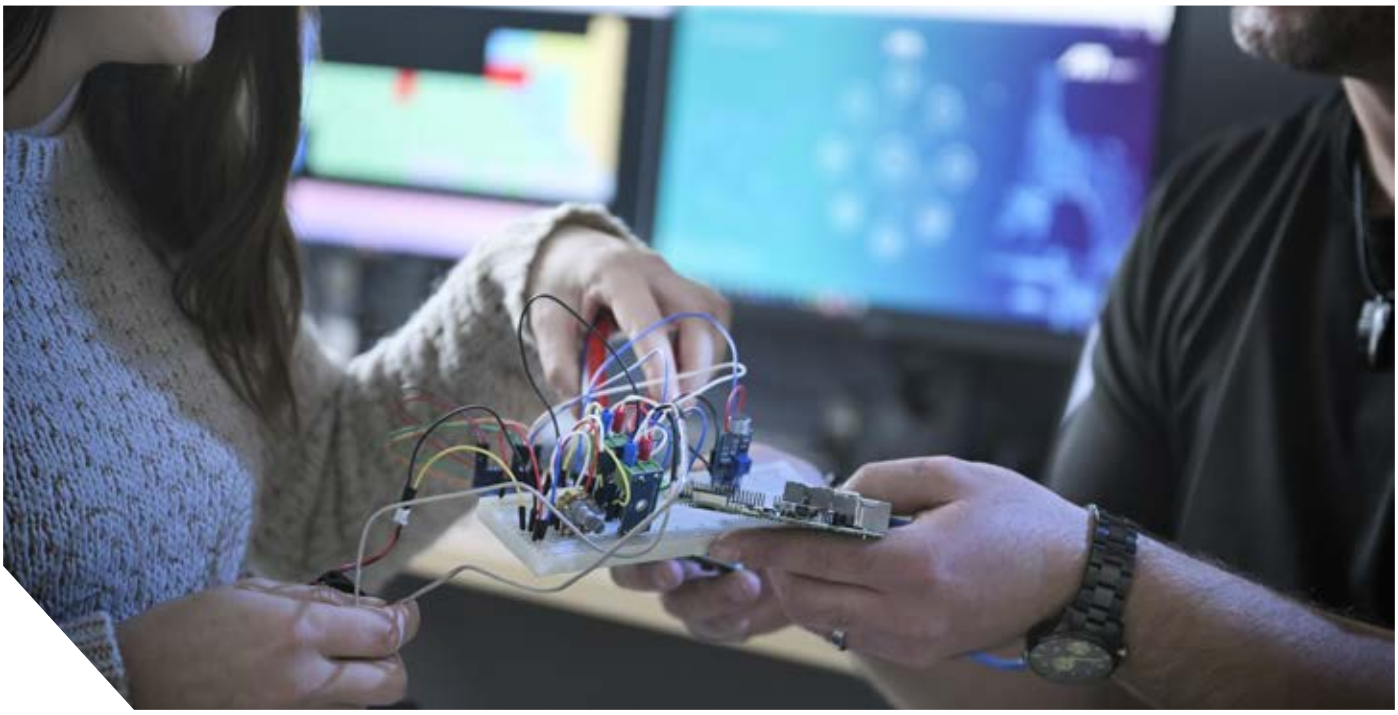
Strengthening industrial performance and innovation is a key objective of the Industry Strategy 2035. Artificial intelligence, automation technology and data-driven models are crucial drivers of productivity, energy efficiency and quality assurance. The AIT combines AI with in-depth process and system understanding to make industrial systems more robust, precise and efficient.
The focus is on explainable, reproducible solutions that function reliably under real-world conditions and can be integrated into existing production environments. In this way, AIT supports industrial companies in scaling up innovations and securing their international competitiveness.

DATA BRATA Identifies Quality Issues at an Early Stage

- Productivity
- Scaling

The mobile, adaptive and scalable system can be integrated into existing production environments

A key objective in many industrial processes is to detect quality deviations as early as possible, thereby minimising waste and using resources more efficiently. With DATA BRATA, AIT's LKR Leichtmetallkompetenzzentrum Ranshofen (Light Metals Technologies Ranshofen), has developed a modular technology framework that integrates data analysis and machine learning directly into industrial processes. The name follows the clear system principle: Boxed, Reconfigurable, Adaptive, Transportable, Analysis – DATA BRATA is a mobile data and AI platform that connects directly to machines, aggregates signals in real time and derives concrete recommendations for action from them. The aim is to detect process deviations and tool wear at an early stage, before they affect the quality of the end products.



The system builds on empirical knowledge from production and translates this into digital patterns: sensors record forces, displacements, vibrations, acoustics and temperature. The data is transmitted in real time, and at the Edge, AI aggregates the signals to make decisions. The sequence is crucial: first domain knowledge, then sensor technology and data architecture, and only then AI – to achieve reliable results without excessive overhead.

In a practical test at the Ranshofen site, the system has already been trialled on a 250-tonne hydraulic deep-drawing press. Several thousand components were recorded and analysed in real time; deliberately introduced deviations (such as micro-cracks or differences in the raw material) served as a training basis for time-series analyses and machine learning models. Following successful trials and an industrial deployment that has already been implemented – including at MARK Metallwarenfabrik – DATA BRATA is being gradually further developed and applied to additional use cases. Sectors such as metalworking, the automotive industry and aerospace technology are being targeted.

The system is currently in pilot operation and is intended as a Function-as-a-Service (FaaS) and Research-as-a-Service (RaaS) – with the aim of enabling companies to achieve data-driven improvements in quality and efficiency in real time without significant implementation effort. This is of particular interest to Austrian companies in these sectors, which are typically highly specialised SMEs, and can provide them with a significant competitive advantage.

> The results show clear early indicators of process deviations and tool wear – even before these reach the quality gate. This allows material and energy consumption to be significantly reduced.

Carina Schlögl
researcher

Find out more:

- Resources
- Productivity
- Scaling

Anode Analyser

Systematic condition assessment of rotating anodes for X-ray systems

Plansee and AIT are developing a globally unique inspection system.

Rotating anodes are at the heart of modern X-ray imaging systems. X-rays are generated by bombarding the anode surface with high-energy electrons. During operation, so-called focal tracks develop on the anode surface, where localized melting, cracking, and material loss can adversely affect tube performance and image quality. Rotating anodes are typically replaced not only at the end of an X-ray system's service life but also whenever the X-ray tube fails and is exchanged during maintenance. After removal, the anodes are often reused only to a limited extent, and in many cases they are ultimately scrapped.

Together with Plansee, the market leader in highly specialised refractory metal products, AIT has now developed an innovative solution for more efficient use: the 'Anode Analyser', which for the first time enables systematic recording and assessment of the anode's condition, combines high-precision imaging techniques that scan the surface of the rotating X-ray anode. The 2D and 3D data obtained is analysed using AI, with wear characteristics being automatically classified.

This new analysis method enables Plansee to accurately assess the operational suitability of used X-ray rotating anodes and, on this sound basis, decide on their further use. This not only saves considerable production costs and energy but also makes an important contribution to sustainability in the operation of X-ray equipment.

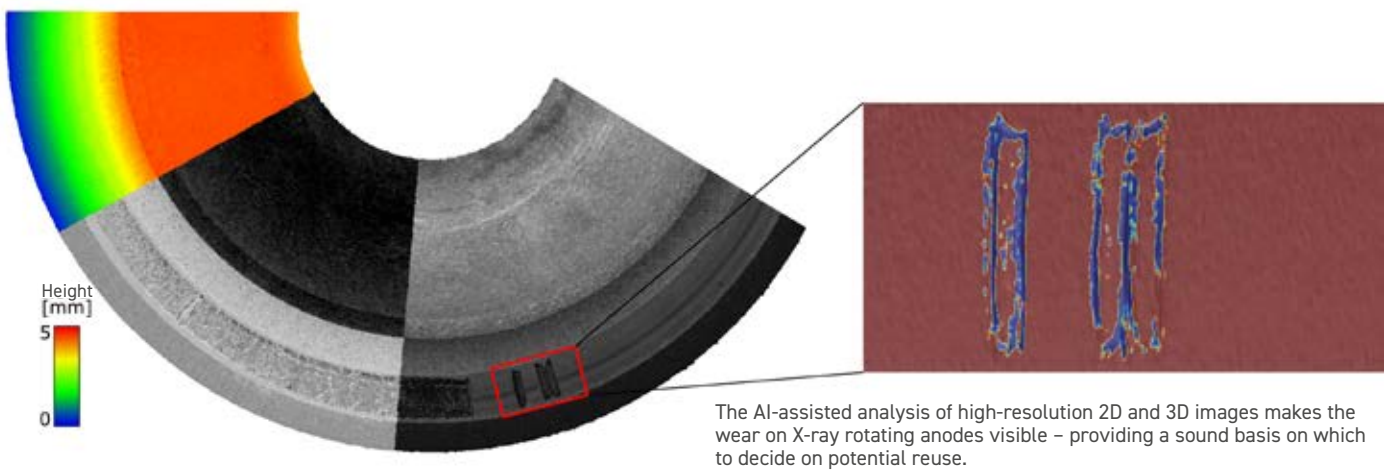
For the AIT research team, which specialises in high-performance inspection solutions, the project marks a significant technological milestone: for the first time, the proven Inline Computational Imaging (ICI) technology for fast and precise two- and three-dimensional surface inspection has been successfully applied to rotating metallic objects. Furthermore, an inspection method has been implemented for the first time that captures and combines images at different scales. A machine-learning algorithm automatically displays the detected anomalies in a clear graph as a defect map of the component under examination. Through additional calculations based on the acquired data, specific wear patterns can also be automatically quantified.

To date, there is no comparable solution worldwide for the fully automated analysis of rotating anodes. A system has already been installed at the Plansee plant in Reutte and is being used for further development and testing.

This success opens new opportunities. High-resolution inspection of rotating objects can also be applied in other industrial sectors, such as medical technology or in-line quality inspection, where microscopic defects need to be detected and quantified over large areas.

> This new dimension of quality assurance allows us to reduce costs, significantly extend the service life of our products and, at the same time, save resources.

Michael Mark
Head of Product Development at Plansee.



The AI-assisted analysis of high-resolution 2D and 3D images makes the wear on X-ray rotating anodes visible – providing a sound basis on which to decide on potential reuse.

- Resources
- Productivity
- Scaling

Precise Process Control for the Highest Steel Quality

Model-based quality control in industrial practice

Steel is a key material for European industry – from the automotive and mechanical engineering sectors to the energy and construction industries. Its performance depends crucially on its microstructure, which is precisely controlled during heat treatment. Even slight temperature deviations can lead to quality variations, scrap or increased energy consumption.

In a continuous strip processing line, the steel strip is first heated so that a phase transformation to austenite takes place. In the subsequent cooling zone, the strip is specifically cooled to achieve the desired microstructure (phase composition) through what is known as austenite decomposition. As the microstructure is crucial for the mechanical properties of the steel strip, cooling represents a critical process step for the quality and performance of steel products.

© voestalpine (2)

Innovative algorithms have significantly improved steel quality in heat treatment plants.

As part of a successful collaboration, experts from AIT, TU Wien and voestalpine have implemented a modern nonlinear model predictive control (NMPC) concept for the strip temperature in the cooling zone. This concept enables a significant increase in temperature control accuracy compared to the state of the art. The basis for this is a real-time mathematical model that takes into account both the temperature evolution and the phase transformations in the steel strip. Using a tailored algorithm, the controller calculates optimal control variables in real time, such as the fan speeds for cooling, in order to precisely control the temperature of the steel strip along specified setpoints.

The industrial implementation on a strip processing line at voestalpine's Linz site demonstrates clear improvements in temperature distribution and significantly increased process stability, leading to reduced variation in mechanical properties, a lower scrap rate and more efficient use of resources. Furthermore, the results provide a solid basis for further research towards the direct control of microstructure and steel quality.

The system is already in permanent industrial operation and has been fully accepted by plant operators – a clear sign of industrial maturity and robustness. The control concept developed is not limited to a single production line. It is essentially transferable to different steel grades and other metallurgical heat treatment processes.

The results were also published under the title "Nonlinear model predictive temperature control of a cooling process for steel strips undergoing phase transformations" in the renowned journal "Control Engineering Practice".

The new process control system combines in-depth process knowledge with state-of-the-art control engineering algorithms.

Find out more:

- Resources
- Productivity
- Scaling

Titanium Forming at Moderate Temperatures

A resource-efficient process has been developed in collaboration with industry partners.

Experts at the LKR Leichtmetallkompetenzzentrum Ranshofen are implementing an innovative process for deep drawing titanium sheets.

Titanium, a lightweight yet extremely strong metal, is indispensable in the aerospace industry. However, the forming of the commonly used α-β-titanium alloy Ti-6Al-4V is considered particularly challenging. Conventional processes are energy-intensive and complex – so-called 'superplastic forming' (SPF) requires very high temperatures (e.g. 840–930 °C for Ti-6Al-4V) and low forming speeds. Furthermore, prolonged exposure to high temperatures in air can lead to the formation of a brittle, oxygen-rich 'α-case' layer, which must subsequently be laboriously removed.

A novel hot deep-drawing process has now been developed at the AIT's LKR Leichtmetallkompetenzzentrum Ranshofen (Light Metal Technologies Ranshofen), demonstrating that α-β-titanium sheets exhibit excellent deep-drawing properties at temperatures below 500 °C. This is a decisive advantage in practice: at these temperatures, conventional hot-work steels can be used as forming tools – instead of the expensive nickel-based alloys that would otherwise be required for significantly higher process temperatures.

As isothermal forming at 500 °C or below is not successful, the process relies on preheating the sheet (below the SPF temperature) and subsequent forming in the press. The key advantage over established processes lies in the dramatically reduced forming times, which enable significantly faster cycle times and thus substantially higher productivity.

The performance of this process has been demonstrated by concrete forming results: as early as 2022, a test component with a depth of 44 mm was successfully formed. Through further optimisations, a drawing depth of 68.5 mm was achieved. At the same time, preheating time, preheating temperature and deep-drawing temperature were further reduced. Tests with Ti-6Al-4V sheets of varying surface finishes – supplied by the industrial partner voestalpine BÖHLER Bleche GmbH & Co KG – demonstrated excellent reproducibility. It is particularly relevant that the process also works with rougher surfaces, thereby reducing the need for grinding.

The component properties also underscore the technological leap: an elongation at break of over 10 % was achieved without additional heat treatment following the deep-drawing process. Furthermore, the results suggest that multi-stage forming processes will be possible in future without intermediate heat treatment – initial two-stage trials have already been successful. Another advantage: no brittle α-case layer is visible on the component surface. This is attributed to the comparatively short exposure to high temperatures.

An Austrian patent has already been granted for the process, and an international patent application is pending. This also provides strategic protection for the innovation – serving as a foundation for further establishing titanium forming at moderate temperatures in a resource-efficient manner for industrial applications.

Conventional processes are energy-intensive and complex.

Find out more:

Trustworthy Digital Systems & Cyber Resilience

Digital sovereignty and cyber resilience are key industrial policy priorities for Austria and Europe. Digital transformation can only succeed if risks are manageable and trust is systematically built up.

AIT develops security, identity and governance solutions that make digital systems controllable, resilient and compliant with regulations. This is not about isolated security solutions, but rather systemic approaches that secure critical infrastructure, industrial applications and public systems in the long term.

- Productivity
- Security
- Scaling

Biometrics

Contactless fingerprint identification

An innovative, reliable and user-friendly technology for digital identities.

Traditional biometric systems, such as contact-based fingerprint sensors, are increasingly reaching their limits, particularly in security-critical areas such as airports, border controls and public institutions. This is because contact-based systems are susceptible to tampering, are unhygienic and often not user-friendly. At the same time, there is a growing need for contactless, secure and data protection-compliant solutions that meet both user requirements and strict security standards. Both the EU and international organisations such as the United Nations (UN) support the establishment of secure system solutions and the responsible handling of sensitive biometric data.

In recent years, AIT has established state-of-the-art biometric sensor technology for the contactless verification of digital identities. For example, BioCapture technology was developed and brought to market in collaboration with the Austrian start-up T3K. This enables police officers to scan the fingerprints of individuals contactlessly using their service smartphone, and to cross-reference them against various databases. This allows wanted criminals and individuals residing illegally to be clearly identified on the spot. There is no longer any need for additional devices or – as has been the norm until now – for detainees to be transported to police stations. Decisions on further police action can be taken immediately on the spot – quickly, efficiently and in compliance with the law. The roll-out across Austria, so that the application can be used by all police officers on their service mobile phones, is planned for completion by the end of 2026.

This international technological leadership is evidenced by several licence agreements with solution providers, including an international global provider of airport security systems. AIT has thus played a key role in the global market launch of this new technology. Furthermore, AIT provides certification expertise and tools to the German Federal Office for Information Security (BSI) and, through the global information platform www.responsible-biometrics.org, cooperates with the United Nations Office on Counter-Terrorism (UNOCT). AIT holds around 15 patents in the fields of sensor fusion and next-generation sensor technology.

In AIT's laboratories, researchers are working on innovative methods for contactless registration of biometric features, such as fingerprints.

Through this 'Made in Austria' technological development, AIT is making a significant contribution to the EU's digital sovereignty and to the global security infrastructure.

A key aspect of the development is strict compliance with data protection regulations and legal requirements.

Find out more:

- Productivity
- Security
- Scaling

Cyber Security for Digital Systems

Security by Design: The ‘ThreatGet’ development tool enables vulnerabilities to be identified as early as the design phase of new IT systems.

© GettyImages

With the increasing digitalisation of industrial processes, there is a growing need for secure development approaches to minimise vulnerabilities right from the inception of IT systems (Security by Design). Traditional security measures usually only come into play after IT systems have been developed, meaning that potential vulnerabilities remain undetected and the risk of cyberattacks increases. Industrial companies in particular need effective methods to identify and close security gaps at an early stage. At the same time, international standards must be adhered to in order to ensure competitiveness in the global market.

Experts at the AIT Center for Digital Safety & Security have developed ThreatGet, a Security-by-Design development tool, which is a leading international innovative technology for sectors such as the automotive market and for shaping international standardisation for model-driven system development. To this end, successful collaborations have been established with Austrian industry partners such as LieberLieber, msg Plaut, and AVL, which makes a significant contribution to enhancing the global competitiveness of Austrian companies. The development was funded by EU funding programmes – primarily the EU’s Key Digital Technologies (KDT) programme and the European Defence Fund (EDF) – as well as nationally through the KIRAS and K-Pass security research programmes and via licensing agreements with industry partners.

“This partnership with AIT enables us to carry out Threat Analysis & Risk Assessment (TARA) analyses systematically and automatically. Combining AVL ThreatGet with our cyber security compliance management and testing solutions allows us to take a holistic approach to the entire process,” says Harald Petschnik, Business Innovation Manager at AVL. By integrating effective measures, the consequences of cyber-attacks on the privacy and health of road users can be drastically mitigated. “High levels of automation and seamless integration into our customers’ IT landscape are important to us, as this process may need to be run multiple times for many variants and throughout the entire vehicle lifecycle,” says Petschnik.

As a result, the Model-Driven Safety & Security by Design approach is now being further developed for additional market segments, ncluding those outside the automotive sector. The offering is also being expanded to meet new requirements arising from the forthcoming EU Cyber Resilience Act and the EU Space Act. In parallel, AIT experts, in cooperation with the Austrian Federal Chancellery (BKA), are leading the “Cyber Resilience Act” working group within the CSP Cyber Security Platform Austria. In total, AIT holds around 50 patents in the field of cyber security.

> This partnership with AIT enables us to generate Threat Analysis & Risk Assessment (TARA) analyses systematically and automatically.
>
> **Harald Petschnik**
> Business Innovation Manager at AVL.

A new system can drastically mitigate the consequences of cyber attacks on the privacy and health of road users.

Find out more:

- Productivity
- Security
- People
- Scaling

AIT Cyber Range for Securing Critical Infrastructure

An innovative training environment for dealing with cyber attacks.

With growing dependence on digital systems, the risk of cyber attacks on critical infrastructure such as energy supply, healthcare, transport networks or government departments is increasing. These attacks can not only cause economic damage, but also jeopardise public safety and trust in state institutions. Therefore, there is an urgent need for practical and innovative training methods to prepare IT security experts and critical infrastructure operators for current and future threat scenarios.

The AIT Cyber Range is an innovative simulation environment that realistically replicates IT networks in security-critical settings. This multi-award-winning system is used worldwide for training personnel to defend critical infrastructure against cyberattacks. It enables tailor-made training programmes to be provided to operators of critical infrastructure around the globe. AIT has also been the world's only 'IAEA Collaborating Centre' of the International Atomic Energy Agency (IAEA) for several years, responsible for IT security training in member states.

"AIT's expertise and state-of-the-art facilities enable high-quality training and demonstrations on computer security, which can make a significant contribution to capacity building as well as research and development activities," emphasised Lydie Evrard, IAEA Deputy Director General and Head of the Department of Nuclear Safety and Security, at the signing of the cooperation agreement. Furthermore, training courses are organised in collaboration with various partners, including the United Nations Office of Counter-Terrorism (UNOCT) and the European Union Advisory Mission (EUAM) in Ukraine. In Austria, AIT's clients include the IT and energy networks of Vienna, as well as operators such as Verbund, EVN and Salzburg AG. Training programmes are conducted internationally in many European countries, such as the UK, Slovenia and Romania; in the Middle East, including Oman and the United Arab Emirates; in Asia, including Korea, Thailand, the Philippines and Vietnam; and in South America.

In addition, AIT has successfully established itself as a centre of excellence for implementing the Ministry of the Interior's (BMI) national cyber security simulation exercises, carried out in collaboration with KSÖ (the Competence Centre for a Secure Austria). The aim of these exercises is to enhance the cyber security capabilities of Austrian operators of critical infrastructure. This significantly reduces the risk of substantial economic and societal damage running into tens of millions.

AIT has thus established itself as a cyber security competence centre for the professional development of operators of critical infrastructure across the EU. The range of services is continuously being expanded to include further operators of critical infrastructure, as well as companies worldwide.

> AIT's expertise and state-of-the-art facilities enable high-quality training and demonstrations on computer security, which can make a significant contribution to capacity building as well as research and development activities.

Lydie Evrard
IAEA Deputy Director General and
Head of the Department of Nuclear Safety and Security

Training takes place in highly realistic simulation environments to teach how to detect and defend against cyber attacks.

Find out more:

- Productivity
- Security
- People

Artificial Intelligence in Public Administration

Efficiency, transparency and trust

The AIT AI Ethics Lab, led by Peter Biegelbauer, has collaborated with the Research Institute to produce guidelines for the responsible use of AI and is in high demand as an expert within the public sector.

The rapid development of artificial intelligence (AI) presents public administrations worldwide with the challenge of deploying innovative technologies in a targeted manner, while also upholding ethical and legal principles. Digitalisation offers enormous potential to make administrative processes more efficient, provide citizens with better services, and deploy resources more effectively. At the same time, however, administrations must ensure that AI systems are used responsibly to avoid discrimination, guarantee transparency, and bolster public confidence in state institutions.

In order to successfully navigate this balancing act, AIT has developed a practical guide to the responsible use of AI in public administration, commissioned by the Federal Chancellery (BKA). Being the first comprehensive work of its kind in the German-speaking world, it serves as a guide for decision-makers and public administration staff, covering the technical, ethical, and legal aspects of AI use. It provides practical recommendations for implementing and using AI systems and illustrates this with specific use cases. Thanks to a broad-based dialogue involving academia, administrative experts and political stakeholders, the guide not only conveys theoretical principles, but can also be directly integrated into day-to-day administrative practice.

The guide, which is currently being revised, will form the basis for new administrative guidelines in line with EU debates. It will support the introduction of AI-supported processes and promote data-driven, transparent and citizen-friendly administration. It assists public institutions in managing digital transformation, streamlining workflows and enhancing the quality of services provided.

This project has a far-reaching social impact: the effective and ethical use of AI increases government decision-making transparency, reduces bureaucratic hurdles, and improves access to essential services, particularly for disadvantaged groups. At the same time, the guide helps to allay fears surrounding AI, promoting a better understanding of its potential and risks. The positive effects also extend to policymaking, as a technology-supported administration that is informed and efficient can help create a sustainable, inclusive and future-proof society. This work has also been recognised as significant on several occasions by official bodies.

The guide has international appeal and has been recognised as 'best practice'. It has the potential to serve as a model in other countries, too. In order to contribute to international discussions, the BKA has produced an English version of the guide.

The rapid development of Artificial Intelligence (AI) presents public administrations worldwide with the challenge of deploying innovative technologies in a targeted manner without neglecting ethical and legal principles.

Find out more:

Digital Health Systems and Data-driven Care

Digital health systems are most effective when they are integrated into existing care structures and deployed along clear care pathways.

AIT develops digital solutions that range from the collection and analysis of individual health data to providing systemic decision support. By linking sensor technology, data analysis and care processes, AIT helps to prevent, treat and provide aftercare for health conditions, while also contributing to the development of more resilient and scalable healthcare systems.

- Productivity
- Safety
- People

Survivorship Passport

Long-term support for childhood cancer survivors

By consolidating all relevant data, follow-up care is significantly improved.

The Survivorship Passport is a key tool for the structured, cross-sectoral long-term support of childhood cancer survivors and represents a paradigm shift in oncological aftercare: moving away from fragmented information towards continuous, transparent and quality-assured care across institutional and care boundaries. The aim is to make relevant information from acute treatment and follow-up care during childhood available in a standardised, digital format, thereby sustainably improving the reliability of care in adulthood. To this end, the Survivorship Passport consolidates treatment history and recommended follow-up care in a structured format and makes this accessible to patients and healthcare providers via the ELGA electronic health record.

For childhood cancer survivors, the new system offers continuous, transparent and quality-assured care across institutional and care boundaries.

A decisive milestone was reached with the implementation of the Survivorship Passport as an ELGA outpatient record. This successful registration, for which AIT researchers have already received awards, marks the transition from an innovation project to the national healthcare infrastructure and demonstrates the technical maturity and interoperability of the solution. The Survivorship Passport was first piloted at St. Anna Children's Hospital, where it was successfully integrated into real-world care processes. This step represents a national breakthrough and lays the foundation for a wider roll-out to other centres and specialist departments.

Beyond its immediate benefits, the Survivorship Passport acts as a strategic driver of innovation: it has a modular structure, is scalable and can be adapted to other conditions. In doing so, it creates a sustainable foundation for coordinated care management and strengthens the position of the participating organisations as pioneers in digital healthcare.

The Survivorship Passport combines quality of care, digitalisation and system efficiency – and, with its successful integration into ELGA, sets a milestone for the future of follow-up care in Austria.

All relevant information from acute treatment and follow-up care is made available in a standardised, digital format.

- Productivity
- Safety
- People
- Scaling

Accurate Detection of Anomalies in Epilepsy Data

The encevis software reduces the risk of misdiagnosis and saves time and money.

Medical examinations generate vast amounts of data, which makes evaluation and interpretation extremely challenging. For instance, measuring brain waves, particularly in long-term EEGs, puts considerable strain on humans and they can quickly become overwhelmed. Modern data analysis tools, such as the EEG analysis software 'encevis' developed at AIT, can help with this. Advanced AI algorithms deliver objective results and minimise human error. This reduces the burden on doctors and medical staff, enabling them to prioritise patient care. This leads to a more efficient use of resources and enables faster diagnosis and treatment.

In the case of epilepsy, this brings significant medical benefits. The rapid processing of large EEG datasets ensures that critical decisions can be made without delay. The precise detection of, for example, non-convulsive seizures or other typical patterns (seizure burden, status epilepticus, etc.) minimises the risk of misdiagnosis or delayed treatment, thereby reducing the long-term costs of complications and follow-up treatment.

By combining encevis with other technologies, researchers at AIT, in collaboration with three leading European epilepsy centres, are currently also developing a new solution that shifts key aspects of diagnosis and treatment to the outpatient setting. This reduces the burden on both patients and clinics. The solution is based on encevis and AIT's established telehealth platform, which is being expanded to include a digital seizure and dietary diary and offers a wide range of options for data collection and communication between patients and healthcare professionals. This combination forms the basis for modern, patient-centred and data-driven epilepsy care of the future.

In addition to the technological advantages, encevis also has a significant economic impact. By automating EEG analysis, the software considerably reduces the time and cost involved. This allows for a more efficient use of resources.

In the latest version of the software, released in 2025, an innovative AI-based algorithm for recognising sleep stages from the EEG has been integrated. Furthermore, a seizure detection feature has been developed which, for the first time, enables reliable detection of seizures in children and adolescents. As part of a research contract with UNEEG Medical, automatic seizure detection has also been fundamentally further developed for subcutaneous EEG signals (SubQ-EEG). Compliance with the highest regulatory standards, such as the MDR and FDA, as well as validation using extensive clinical data from leading medical centres in Europe and the USA, underline the software's reliability and innovative strength.

The precise detection of irregularities in the EEG minimises the risk of misdiagnosis or delayed treatment, thereby reducing the long-term costs of complications and follow-up treatment.

> The rapid processing of large EEG datasets ensures that critical decisions can be made without delay.

Tilmann Kluge
Head of the AIT Competence Unit "Medical Signal Analysis"

Find out more:

- Productivity
- Safety
- People
- Scaling

Lowering Blood Pressure without Medication

Targeted breathing exercises, combined with biofeedback, can significantly reduce the risk of cardiovascular disease.

A compact measuring device analyses pulse wave velocity and transit time – this data is used to generate helpful feedback for patients.

Cardiovascular diseases remain the leading cause of death worldwide. A key contributing factor is high blood pressure: hypertension accelerates vascular damage and increases the risk of heart attack, stroke, heart failure and kidney disease – often progressing for years without any noticeable symptoms. Early detection and effective treatment of high blood pressure are therefore crucial steps towards reducing the global burden of cardiovascular disease and improving long-term health outcomes.

To this end, the BPRelax system was developed at AIT, which can lower blood pressure without the use of medication – specifically through a special breathing exercise combined with biofeedback. In studies, this method demonstrated a reproducible and sustained reduction in systolic blood pressure to the same extent as one blood pressure medication. The underlying research has been recognised with scientific awards, including the Paul Dudley White International Scholar Award from the American Heart Association and awards from the German Hypertension League.

The BPRelax system consists of a compact measuring device, somewhat reminiscent of a small gaming controller, and a medical app that processes the signals and provides the user with real-time feedback on the effectiveness of the breathing exercise. This enhances the positive effects.

Technically speaking, the biofeedback is based on an innovative measurement of pulse wave velocity and transit time known as ARCSolver. This established technology for analysing pulse waves and calculating key cardiovascular parameters has recently been extended to include ultrasound measurement of the carotid artery, in addition to biofeedback. The measuring device is certified as a medical device; the medical app is currently being optimised and will also be certified. Certification as a medical device facilitates integration for partners, accelerates market launch and lays the foundation for continuous further development, thereby strengthening ARCSolver's leading position in the field of cardiovascular risk assessment. Together with its partner company GO Europe GmbH, AIT is producing an initial batch of 3,000 devices for distribution in the DACH region.

The method demonstrates a reproducible and sustained reduction in systolic blood pressure to the same extent as blood pressure medication.

Find out more:

- Productivity
- Safety
- People
- Scaling

A Telehealth Platform for Better Health

Innovative technologies are enabling significant advances in patient care.

Telemedicine offers a solution to the many challenges facing the healthcare system. It improves access to healthcare, enhances the quality of care and saves time and money within the sector. One example is the care of patients with heart failure. A telehealth platform developed at AIT allows patients to enter data such as their weight, blood pressure, how they are feeling and their medication via a computer or smartphone. This data is then securely transmitted to a clinical treatment team. If any abnormalities are detected, the healthcare professionals responsible for the patient's care will make contact and, if necessary, adjust the treatment. The AIT telehealth platform connects patients with the relevant healthcare professionals. The key is to facilitate communication between patients and healthcare professionals that is as straightforward as possible, and, building on this, to implement treatment management through clearly defined processes – with traceable documentation and data transmission that complies with data protection regulations.

The AIT technology was first rolled out in practice in Tyrol under the name 'HerzMobil'. Studies showed a 65 percent reduction in the risk of death within 12 months and a 39 percent reduction in the risk of readmission to hospital within 6 months. In addition, HerzMobil Tyrol proved to be cost-effective compared to standard care. More recently, HerzMobil has also been piloted in the provinces of Carinthia, Styria and Lower Austria.

In clinical practice, the system is operated and further developed by the AIT spin-off telbiomed, based in Graz. It has a modular design and can be easily adapted to other chronic conditions – for example, in the areas of wound management, eating disorders, post-transplant care, diabetes or telerehabilitation.

Patients enter data such as weight, blood pressure, well-being and medication via a computer or smartphone; this is then securely transmitted to a clinical treatment team.

During the COVID-19 pandemic, the platform was adapted within a very short time for home quarantine and as a health diary for medical staff, and was also deployed in Germany, Brazil and Australia. An Australian study showed that the effective and earlier detection of deteriorations, thanks to telehealth care, led to shorter hospital stays and lower mortality rates.

With its telehealth platform, AIT has developed a pioneering technology that plays a central role in modern healthcare. The development of such solutions has earned AIT considerable international recognition. In addition to organising the annual dHealth conference, which serves as a central platform for the Austrian digital health community, the researchers have also won numerous awards, such as the prestigious Living Standards Award from Austrian Standards.

> The AIT Telehealth Platform connects patients with the relevant healthcare professionals. It is crucial to facilitate communication between patients and healthcare professionals that is as straightforward as possible, and, building on this, to implement therapy management through clearly defined processes – with traceable documentation and data transmission that complies with data protection regulations.

Anton Dunzendorfer
Head of the AIT Competence Unit Digital Health Information Systems

Find out more:

Human-centered Digital Transformation

The Austrian Industrial Strategy 2025 emphasises the importance of skills, safety and acceptance in the context of technological change. Digital systems must support people – not overwhelm them.

AIT integrates human-centred design, simulation and training into the development of digital systems that are effective and usable under real-world operating conditions. This enhances safety, productivity and acceptance, particularly in safety-critical working environments. Human-centred digitalisation thus becomes a key factor for successful sustainable industrial transformation.

- Productivity
- Safety
- People
- Scaling

Green Manikin: Training for Medical First Responders

A mixed-reality system provides an immersive learning environment to help make well-informed decisions under pressure

By using haptic feedback, AI-driven interactions and real-time speech recognition, the system enables realistic training scenarios with virtual patients.

Medical emergencies require quick and precise decisions under immense pressure. Whether in mass casualty incidents, trauma care or reanimation – medical staff must act in fractions of a second to save lives. Conventional training methods reach their limits here: static simulations or live exercises are costly, logistically complex and can only replicate a limited range of realistic scenarios. The growing demand for innovative training solutions that better prepare medical professionals for unpredictable emergencies calls for a new approach.

Green Manikin is a mixed-reality training platform that combines the best of real and virtual simulation. Through the use of haptic feedback, AI-driven interactions and real-time speech recognition, the system enables realistic exercises with virtual patients. Paramedics and first responders can work with real medical equipment whilst simultaneously immersing themselves in digital scenarios that simulate life-threatening situations. This immersive learning environment not only improves technical skills but also the ability to make well-informed decisions under pressure. Furthermore, the integration of AI and biometric tracking systems opens up new possibilities for personalised learning processes and the development of new standards in medical simulation. More effective training for medical emergency personnel ultimately means improved patient care and higher chances of survival in emergencies.

Green Manikin offers a resource-efficient and scalable alternative to conventional training, as it requires less physical infrastructure and the system can be flexibly adapted to new medical challenges. This is particularly relevant for regions with limited training resources or for emergency services who need to be regularly prepared for extreme scenarios, for example in disaster response or military medical services. In April 2026, Green Manikin was awarded third place in the prestigious Houska Prize in the 'non-university research' category.

Green Manikin is being further optimised through close collaboration with first-aid organisations such as Johanniter Austria and technology companies in the simulation sector, and is being tested in pilot projects. In future, the platform is to be expanded to cover a broader spectrum of medical emergencies and adapted for further areas of application such as military medicine or civil defence. In doing so, Green Manikin not only improves individual medical skills but also strengthens the resilience of healthcare and emergency systems as a whole – a crucial step towards a safe and sustainable society.

In emergency situations, medical staff must act in fractions of a second. Conventional training methods reach their limits in such scenarios.

Find out more:

- Productivity
- Safety
- People

BuildSaVR

Accident prevention training for the construction industry

Through interactive, risk-free 'trialling' in virtual reality, the safety awareness of construction workers is sustainably increased.

Statistically, the construction industry has the highest accident rate – according to AUVA, there were 54 accidents per 1,000 workers in Austria in 2023. Accidents involving heavy construction machinery such as excavators or road rollers often have serious consequences. Conventional safety instructions are often based on theoretical lectures or static presentations, which are unable to adequately convey spatial awareness of danger zones and 'blind spots'. Furthermore, training with real construction vehicles is costly, resource-intensive and carries risks of its own.

Working closely with the construction group STRABAG, AIT has developed an efficient training solution that simulates hazardous scenarios, thereby enabling safe, realistic and repeatable training at any time. The virtual reality (VR) solution BuildSaVR provides immersive training in a fully modelled, realistic construction site environment. The system currently comprises three specialised training modules each for the construction machines road roller, excavator and dumper. In the first module, construction workers learn the basics of safety inspections to systematically check vehicles for defects. The second module sharpens situational awareness, with the interactive change of perspective raising awareness of danger zones and blind spots. The third module focuses on the targeted application of the safety knowledge acquired within complex, realistic scenarios. BuildSaVR is based on a consistently human-centered co-creation approach, in which occupational safety officers, training experts, XR developers from AIT and STRABAG, as well as the end-users themselves, were involved in the iterative development process from the outset to ensure maximum practical relevance.

BuildSaVR has already achieved very positive results and is being used in practice at STRABAG in apprentice workshops and at the STRABAG Training and Education Center as a supplement to traditional training methods. With this innovation, STRABAG is positioning itself as a technological pioneer in work safety. BuildSaVR is highly scalable and reduces costs, as the VR training can be carried out anywhere without downtime for expensive construction machinery. The accompanying scientific evaluation at AIT TX.Lab has yielded valuable insights into the effectiveness of XR training. This strengthens AIT's position as a leading research institution in the field of human-computer interaction and immersive technologies. The BuildSaVR project was awarded the prestigious eAward in the 'Future Technologies' category in 2025.

Following its successful rollout, BuildSaVR is set to be continuously expanded, for example with additional modules for specific specialist areas such as 'Working at Height', 'Road Construction' and 'Barriers Planning'.

> BuildSaVR is an enormously important solution for the continuous development of employees, which also saves time and money and massively improves the quality of training
>
> **according to the eAward jury**

Find out more:

SUSTAINABLE AND RESILIENT INFRASTRUCTURE FOR INDUSTRY AND THE PUBLIC

Physical infrastructure as a driver of resilience and sustainability.

Modern, resilient infrastructure is essential for competitiveness, climate neutrality and economic resilience – these are key objectives of the Industrial Strategy Austria 2035. Energy, mobility and industrial systems must reduce emissions while remaining resilient to crises, geopolitical risks and technological complexity.

AIT develops and integrates technologies that make infrastructure climate-resilient, safe and future-proof throughout its entire lifecycle – from strategic planning and operation to crisis preparedness.

OBJECTS YET TO BECOME #9

Nikolaus Gansterer

Envision a horizontal circle. Start stretching your field of view beyond its outer periphery. Once the lines of sight meet in the back of your mind, shout out loud!

Sustainable and Resilient Industrial and Energy Systems

The transformation of industrial and energy systems towards lower emissions, higher efficiency and security of supply is a key priority of Austrian industrial policy.

AIT facilitates the decarbonisation of energy-intensive industries through integrated technological solutions and strategic transformation pathways. This reduces emissions, lowers investment risks and strengthens the competitiveness of the industrial location.

- Resources
- Security
- People
- Scaling

Lienz Climate Neutrality Roadmap

Scenarios and options for action, including for smaller towns

Cities play a central role in climate protection. Through the 'Lienz 2040 Climate Neutrality Roadmap' project, the City of Lienz is working together with AIT to develop a clear and realistic path to climate neutrality. The aim is to consider climate protection, urban development and the economic future as a whole and to implement them step by step.

A comprehensive energy and greenhouse gas balance for the year 2023 was calculated as the basis for the project. For the first time, this provides a transparent picture of where emissions are currently generated in Lienz – for example, in the buildings, mobility, energy supply and industry sectors. On this basis, various future scenarios up to the year 2040 were developed: a baseline scenario (business as usual) incorporating the city's already planned energy policy developments, and a further scenario specifically geared towards a sustainable urban energy system leading to climate neutrality. This allows for a clear comparison of policy options and their impacts.

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The aim is to consider climate protection, urban development and the economic future as a whole and to implement them step by step.

An important part of the project was the active involvement of local stakeholders: representatives from the administration, politics, business and civil society worked together on solutions that are both technically sound and practical. Climate neutrality is thus understood not as a theoretical goal, but as a joint development process for the city.

The climate neutrality roadmap comprises a concrete catalogue of measures for all relevant areas, as well as an easily comprehensible monitoring system concept with key performance indicators. This enables the City of Lienz to regularly review progress and adjust measures as required.

The project demonstrates how even smaller towns can embark on a realistic path to climate neutrality with a solid data foundation, clear objectives and broad participation. The approach is designed in such a way that it can also be applied to other municipalities.

The City of Lienz and the AIT were awarded the prestigious ÖGUT Environmental Prize in the 'Sustainable Municipality' category for the project.

> Climate protection and sustainable urban development are key challenges for the future. With the greenhouse gas inventory and scenario analysis, we are creating a solid foundation to consistently pursue our goals by 2040.

Elisabeth Blanik
Lienz Mayor

Find out more:

- Resources
- Productivity
- Scaling

Generation of Superheated Steam without Natural Gas

In collaboration with Takeda and SPH Sustainable Process Heat, an innovative high-temperature heat pump has been developed and commissioned.

The decarbonisation of industrial process heat is one of the greatest challenges of the energy transition. A significant proportion of industrial heat demand lies in the temperature range below 200 °C and has so far been met predominantly by fossil fuels. An alternative approach was realised with the NEFI project AHEAD (Advanced Heat Pump Demonstrator), which enables the complete replacement of fossil-fuel-based steam generation with electrically powered, highly efficient heat pump technology.

As part of the project, the first industrial high-temperature heat pump was installed at Takeda's biopharmaceutical production site in Vienna, providing completely CO_2-free process steam. It achieves process temperatures of 184 °C at 11 bar and specifically utilises the seasonally available waste heat from existing refrigeration systems. This enables CO_2-free steam generation for more than seven months of the year – a technological breakthrough for pharmaceutical production. The system operates entirely with natural refrigerants.

The measurable effects underscore the industrial added value: the annual savings potential amounts to up to 1,600 tonnes of CO_2, which corresponds to a reduction of around 80 percent of previous emissions at the site. In addition to direct emissions reduction, AHEAD also increases resilience to volatile energy prices and creates a robust foundation for long-term competitive production processes. AIT and Takeda were honoured for the project with the DECA Award 2025 in the 'Industry' category and, in 2023, with the Net-Zero Industries Award in the 'Outstanding Project' category.

The demonstration operation is accompanied by scientific monitoring by AIT. Performance data, operating strategies and scaling potential are systematically analysed and translated into digital system models. The aim is to thoroughly assess the transferability of the technology to other sites and energy-intensive sectors – such as chemicals, food or paper.

AHEAD is a project of the NEFI – New Energy for Industry innovation network and is funded by the Climate and Energy Fund. As a demonstrator in an industrial setting, the project exemplifies how applied research, industrial implementation and climate policy objectives can be effectively combined. AHEAD thus sets a new benchmark for CO_2-free process heat and for the scalable transformation of industrial energy systems.

> CO_2-free steam generation is a key milestone on our path to net-zero greenhouse gas emissions in our own operations by 2035.
>
> Maria Löflund
> Head of Takeda's Vienna production site

The AIT research team led by Veronika Wilk (3rd from right) developed a system that reduces emissions by 80 percent.

Find out more:

- Resources
- Productivity
- Scaling

GreenBricks

CO_2-neutral brick production

With the help of AIT, Wienerberger has established the most modern and energy-efficient brick production facility in Europe.

The brick industry faces the challenge of drastically reducing its high CO_2 emissions in order to meet increasing environmental requirements and remain competitive in the long term. Gas-fired high-temperature kilns are particularly energy-intensive and, due to the production processes, also cause high CO_2 emissions. In view of stricter climate targets and rising energy costs, pressure is mounting on the industry to develop sustainable alternatives.

The GreenBricks project, funded by the Climate and Energy Fund as part of the NEFI innovation network, has implemented a concept for virtually CO_2-neutral brick production for the first time. At the heart of the innovation is the electrification of the production process using the world's largest tunnel kiln powered exclusively by green electricity. This is complemented by the use of CO_2-neutral clay mixtures and optimised waste heat utilisation with heat pumps in the drying process.

This reduces CO_2 emissions by 90 percent and energy consumption by 30 percent – a decisive advantage for the industry in times of volatile energy prices.

The industrial production of virtually CO_2-neutral bricks opens up new market segments and enables manufacturers to prepare early for future environmental regulations. Companies that focus on sustainable building materials benefit from rising demand and can secure their long-term competitiveness. In addition, the technology contributes to the training of skilled workers in the industry, as new manufacturing processes and digital control systems are integrated.

The scientific dimension of the project is evident in the close collaboration with research institutions and industry partners. As part of the GreenBricks project, two master's theses and a doctoral thesis were successfully completed. The insights gained from these directly inform the further development of sustainable production methods and help adapt innovative solutions for other energy-intensive industries.

The project's success sends a signal to the entire sector: through the practical demonstration operation at the Wienerberger site in Uttendorf, the scalability of the concept is being tested with a view to transferring it to other production sites and other energy-intensive sectors such as the refractory industry.

The AIT team developed an innovative energy concept that reduces CO_2 emissions by 90 percent and energy consumption by 30 percent.

> With the commissioning of the electric furnace in Uttendorf, we have carried out genuine pioneering work in the industry.

Johann Marchner
Country Managing Director of Wienerberger Austria.

Find out more:

- Resources
- Productivity
- Scaling

Industrial Flexibility for Coordinated Redispatching

Since electricity is usually not generated where it is consumed, high feed-in levels – particularly from volatile renewable sources – can lead to overloading of individual power lines. Redispatch is used to prevent such overloads and ensure stable grid operation. This involves reducing feed-in on one side of a bottleneck and increasing it on the other. This service has typically been provided by large power generation plants.

As part of the NEFI flagship project Industry4Redispatch (I4RD), this approach is being expanded: in addition to generation plants, large consumers, particularly industrial plants, can also actively participate in redispatch. By specifically adjusting their electricity consumption, industrial plants can help relieve the grid during bottlenecks.

The project is developing a redispatch product specifically tailored to the requirements of industrial plants. To this end, clear rules for bids, time slots and quality criteria are being established. At the same time, close coordination is being established between transmission system operators and distribution system operators. This ensures that the use of flexibility does not lead to new bottlenecks in the distribution network. To this end, factors such as network capacities are taken into account and the impacts of measures are assessed in advance.

Another focus is on economic incentives and technical solutions for industry. With the help of energy management systems, businesses can optimise their electricity consumption whilst simultaneously providing flexibility for redispatch. Both the simulation and the demonstration in industrial facilities show that the installed optimisation software can increase efficiency and reduce electricity costs.

Through I4RD, AIT, together with its partners, is laying the groundwork for industrial facilities to actively contribute to the stability of the electricity system. At the same time, dependence on conventional power stations is reduced. The project demonstrates how flexibility from industry can become a key component of the energy transition and a secure electricity supply. It also shows that flexibility can be utilised for the transmission grid in such a way that the condition of the distribution grids can be taken into account in advance, thereby accessing flexibility where it makes the most sense for the entire system.

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At Wiesbauer, surplus production energy is made available as flexibility.

By specifically adjusting their electricity consumption, industrial companies can help relieve the transmission grid during bottlenecks, whilst the status of the distribution grid is taken into account at the same time.

Find out more:

Smart, Safe and Automated Mobility & Machinery

Mobility and industrial machinery systems are central to industrial value creation. Their future viability depends on automation, safety and robustness – even under extreme conditions. AIT develops and validates technologies that enable the safe deployment of intelligent vehicles and machines. System integration and test environments accelerate the transition from research to industrial application.

Intelligent Driver Assistance Systems

- Safety
- People
- Scaling

Greater safety and efficiency for tram transport

Trams play a key role in sustainable urban mobility. At the same time, due to their specific driving characteristics – long braking distances, inability to swerve – they face particular challenges in complex traffic situations. Despite the high level of experience among drivers, accidents occur time and again. Against this backdrop, there arose a need to develop driver assistance systems specifically for tram operations.

Based on AIT's 3D real-time stereo vision technology, 'ODAS' – the world's first driver assistance system for collision avoidance in trams – was developed in collaboration with Bombardier (now Alstom) and Mission Embedded, and was first put into series operation across an entire fleet of vehicles in Frankfurt. The system detects obstacles, assesses the risk of collision in real time and warns drivers of potential hazards. A subsequent development led to 'COMPAS', which, in addition to obstacle detection, also integrates speed control (overspeed prevention) as an additional assistance function.

The technology is now in use in numerous cities worldwide, including Frankfurt, Zurich, Blackpool, Duisburg, Dresden, Melbourne, Brussels and Essen. Many new Alstom trams are equipped with the system, meaning the assistance system is increasingly establishing itself as standard technology. The high demand from operators for such systems is evidence of their positive impact on reducing collisions and property damage. In addition to the safety benefits, the technology also has economic implications. The developments, financed by the vehicle manufacturer, have enabled long-term value creation – through securing the local presence and creating jobs in Vienna, particularly at Alstom and Mission Embedded.

Development work is continuing on an ongoing basis. For instance, the COMPAS trams already enable precise mapping of the route network, upon which a highly available system for vehicle self-localisation is built. At AIT, AI systems are being developed that, for the first time, enable vehicles to understand their surroundings, thereby laying the foundations for the intelligent tram of the future. Within the research framework, it has been demonstrated that effective automated monitoring of the rail vehicle infrastructure is possible using the sensors of the assistance system in combination with the localisation system and AI scene understanding.

The system detects obstacles, assesses the risk of collision in real time and warns drivers of potential hazards.

Due to their specific driving behaviour – such as long braking distances and the inability to swerve – trams face particular challenges in complex traffic situations.

- Productivity
- Safety
- Scaling

Smart Hydraulic Excavator

Physics meets AI: A step towards the automated construction site

The project team has succeeded in taking the automation of construction machinery a decisive step forward.

Hydraulic excavators are key machines in the construction industry – yet to this day they are still predominantly operated manually. The reason: hydraulic systems are highly complex, and machine behaviour can vary significantly depending on the load, ground conditions or operating mode. As a result, automation solutions have so far often been severely limited, machine-specific and associated with a high calibration effort.

A joint research project by AIT, Bosch Rexroth AG and Robert Bosch GmbH addresses this challenge with a new approach to controlling hydraulic excavators. The aim is to develop standardised, machine-independent functional software for assistance and automation functions in hydraulic excavators.

The core idea is a uniform interface that 'translates' the manufacturer-specific characteristics of the hydraulics, such as the interaction of oil, pressure and valves, into a common format. This creates a kind of common language for motion commands, in which assistance systems and autonomous functions can access the same clearly defined interface. This abstraction is a decisive step towards scalability: autonomous functions and automated motion sequences can be more easily transferred to different machine types and, in the long term, deployed across entire machine fleets.

The technical foundation is a hybrid, physics-informed AI architecture. A physics-based base model describes machine behaviour using minimal data and ensures stability as well as predictable and traceable system behaviour. This is supplemented by an online learning AI model that compensates for deviations in real time and continuously adapts to changing operating conditions – such as varying loads, ground conditions or component wear.

The approach was tested on a 12-tonne hydraulic excavator under real-world operating conditions. In typical working scenarios such as levelling flat surfaces and slopes (e.g. road verges), the deviation from the desired movement was significantly reduced by the online-trained AI model: by up to 60 % on flat surfaces and up to 70 % on slopes. As the control deviations are in the range of a few centimetres, the requirements of the construction industry were thus met.

The results show that a standardised interface for hydraulic excavators is technically feasible and represents a key enabler for automation. By combining a physical model with an AI model adapted online, robust, adaptive and transferable control concepts can be realised. In the long term, this approach opens up new prospects for more productive, safer and more automated construction sites – from the use of intelligent assistance systems to fleets of autonomously operating machines.

> The smart hydraulic excavator is a key building block for the next stage of development in construction machinery automation.

Dr. Adrian Trachte
Bosch Research Group Leader – Adaptive Systems

Find out more:

- Productivity
- Security
- Scaling

In-flight Icing

combating aircraft icing

© Michele De Gennaro

AIT experts conduct icing tests in the climate-wind tunnel, which are linked to simulations and AI models.

Integrating numerical simulation, experimental validation and data-driven methods

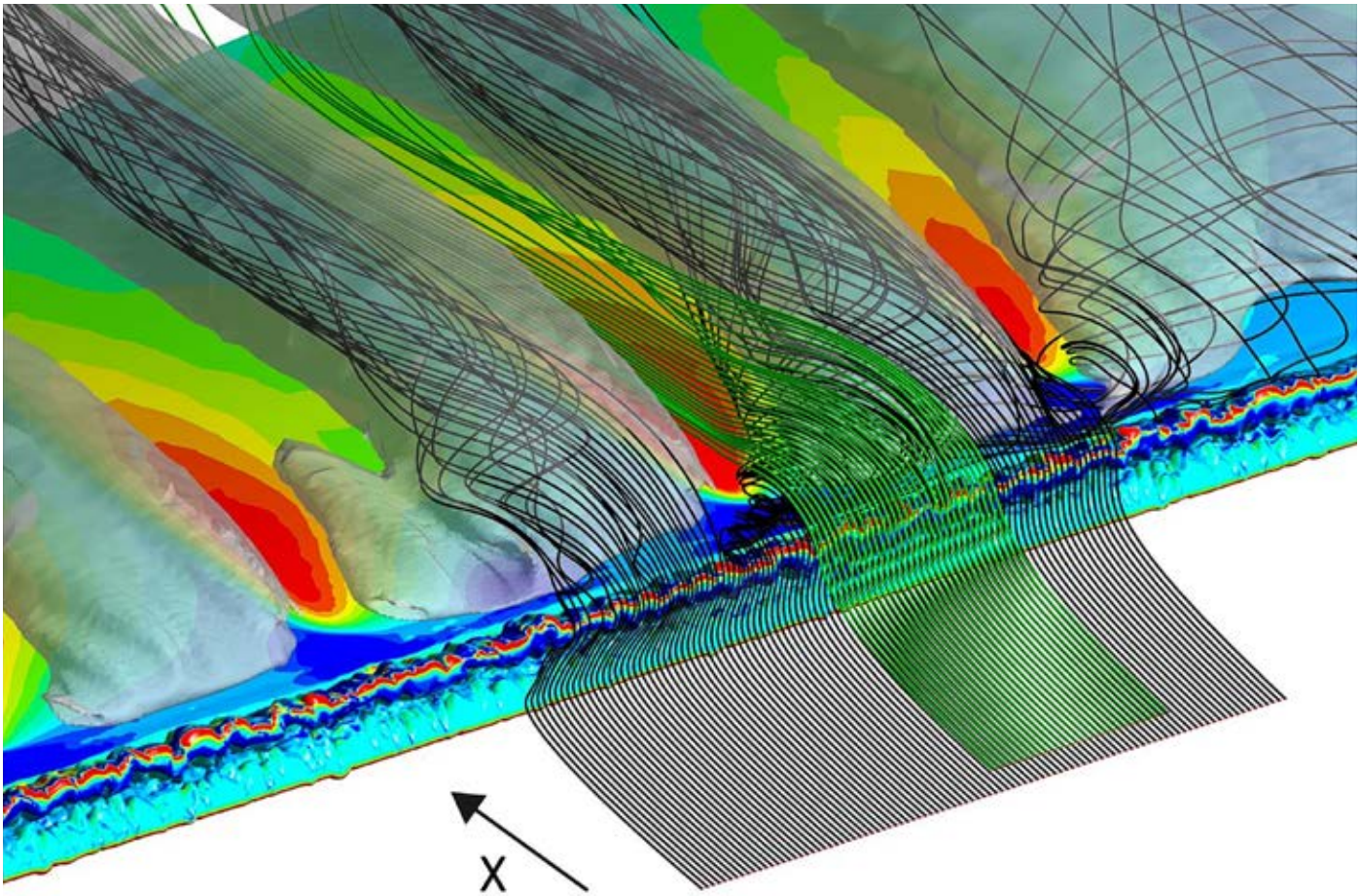
Icing during flight must be taken into account in the design, configuration and operation of aircraft. This is because ice formation on wings, tail surfaces, rotors or engine inlets affects fluid dynamics, lift and controllability, whilst simultaneously increasing the energy requirements of anti-icing systems. With new aircraft architectures, electrified propulsion systems and stricter efficiency and sustainability targets, established design approaches are increasingly reaching their limits. At the same time, regulatory requirements for realistic, verifiable evidence of icing effects are increasing – ideally as early as the initial development phases. The key challenge lies in striking a balance between physical accuracy, computational effort and industrial applicability.

In the field of in-flight icing, AIT pursues an integrated approach that systematically combines numerical simulation, experimental validation and data-driven methods. This is based on high-resolution three-dimensional simulations of ice accretion under realistic atmospheric conditions, coupled with aerodynamic analyses of iced configurations. These are validated through measurement campaigns in international icing wind tunnels as well as through proprietary optical measurement and evaluation methods.

Building on this physical foundation, AI-supported methods are employed. Physics-based neural networks and data-driven surrogate models make it possible to predict key icing parameters – such as droplet fields, impingement zones, ice forms or aerodynamic performance changes – with high accuracy and significantly reduced computational effort. This makes it possible, for the first time, to efficiently integrate complex icing effects into design and optimisation processes. This allows for a reduction in computation times by several orders of magnitude whilst maintaining the accuracy required for safety-critical applications.

For industry, this results in shorter development cycles and reduced testing costs, as well as new degrees of freedom in the design of energy-efficient anti-icing and de-icing systems – a key aspect particularly for electric and hybrid aircraft.

AIT's expertise in the field of in-flight icing is recognised internationally and underpinned by numerous scientific publications, conference papers and collaborations with leading industry and research partners. International awards, including an EREA Best Paper Award, confirm the scientific quality and level of innovation.



Future activities will focus on scaling AI-supported methods towards integrated digital workflows, modelling complete aircraft configurations, linking with digital twins, and incorporating passive and hybrid protection concepts. Robust digital chains of evidence for icing will make a significant contribution to safe, efficient and regulatory-compliant next-generation aviation systems.

Ice formation on wings, tail surfaces, rotors or engine inlets affects the flow mechanics, lift and controllability of aircraft.

Find out more:

Resilient Infrastructure Monitoring & Crisis Preparedness

Economic resilience requires that critical infrastructure can be monitored, protected and secured at an early stage in the event of a crisis. Sensor technology, monitoring and secure communication systems form the backbone of this. AIT develops integrated systems for situational awareness, early warning and secure communication – including quantum and photon technologies as the basis for future critical infrastructure. This sustainably strengthens the capacity of industry and the public sector to take action.

- Resources
- Productivity
- Security
- People

Satellite Monitoring of Structures

Innovative measurement methods can extend the service life of bridges.

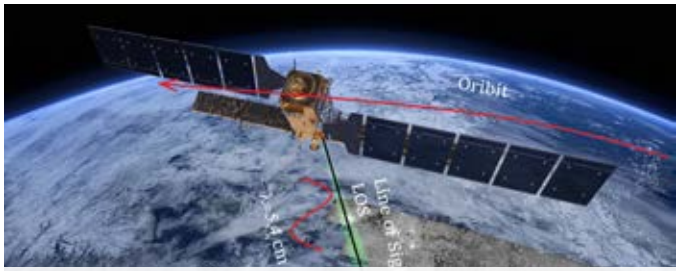
Transport infrastructure is the backbone of our economy and daily lives. For years, AIT has been conducting research into intelligent solutions for efficient and sustainable mobility. One of our key areas of focus is making existing structures last longer while ensuring they remain safe and sustainable. Extending the service life of structures without compromising operational safety reduces costs and makes a significant contribution to climate protection: the average bridge contains around 2,000 tonnes of CO_2. Targeted maintenance strategies can significantly reduce emissions.

For monitoring and detecting safety-critical changes, AIT uses state-of-the-art sensor, satellite and AI technologies that identify changes in condition at an early stage and enable data-driven decision-making. Satellite-based structural monitoring employs radar remote sensing (Synthetic Aperture Radar, SAR) and, in particular, radar interferometry (InSAR) to detect deformations in infrastructure structures without physical contact. This approach not only observes individual measurement points but also reveals trends and anomalies across entire sections of infrastructure – for example, across numerous structures along a network or in areas prone to settlement. The data is based, among other things, on freely available Sentinel-1 radar data, which enables broad temporal coverage and thus improved temporal resolution.

The key added value lies in the transition from isolated individual measurements to network-wide condition monitoring: monitoring becomes scalable because not every structure needs to be equipped separately with discrete sensors. At the same time, the measurement is technically robust: bridge movements can be determined with millimetre precision using ESA satellite data and InSAR – without the need for local sensors on the structure. Additionally, depending on the available data history, the analysis can be carried out retrospectively as far back as 2015. This makes long-term deformation trends quantifiable, and potentially critical areas can be identified at an early stage.

Ongoing development focuses on accuracy and practical applicability. This includes so-called 'corner reflectors' for improved detection of discrete points, the integral consideration of temperature-induced deformations (diurnal variations and seasonal effects), and the measurement and modelling of the structure's temperature. Sensor fusion is used specifically to reduce errors and increase resolution – right through to the derivation of a 'critical deformation' as a decision-relevant metric.

Satellite-based monitoring is minimally invasive: no or only isolated, wireless installations on the structure are required.



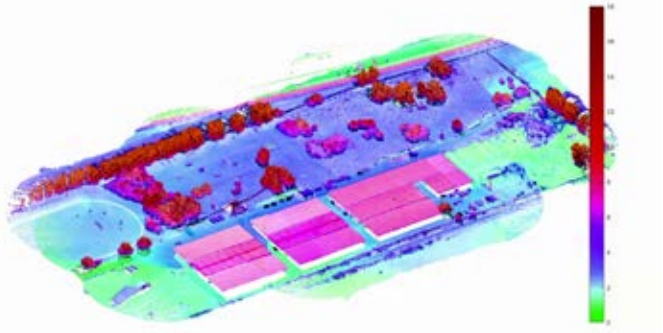
AIT researchers use so-called "corner reflectors" to increase the accuracy of point detection.

Find out more:

- Resources
- Security
- People

CBRN Sensor Systems for Crisis Management

AIT technologies significantly improve the defence against chemical, biological, radiological and nuclear (CBRN) threats.



In crisis and disaster management, chemical, biological, radiological, nuclear and explosive (CBRN) incidents require particularly rapid and coordinated responses due to their high potential for danger. They affect both civilian and military sectors and endanger not only the general public but also emergency services, security forces and military units. To make matters worse, such events often have serious, far-reaching consequences and create environments that are dangerous or inaccessible to people. Rapid, precise situational awareness – for example, regarding hazardous substances, risks or CBRN situation maps – and reliable information exchange are therefore crucial.

At present, however, there is no widely available semi-automatic system capable of generating a spatially high-resolution situational picture in real time without direct human intervention. Furthermore, civilian and military information systems are only limitedly interoperable – and even less so between different nations. This hinders a rapid, secure response and impedes cooperation between civil defence, police and the military across organisational and national boundaries.

Modern digital technologies, such as those developed at AIT, offer significant support in this regard: the integration of mobile and stationary sensors improves situational assessment, whilst digital communication systems enable more efficient coordination of civil and military forces. Research and development work at AIT in this area is funded by EU programmes, primarily the European Defence Fund (EDF), as well as nationally through the KIRAS and FORTE security research programmes and through direct commissions from the Federal Ministry of Defence (BMLV).

Data fusion, as well as 3D environmental and terrain classification, play a central role in CBRN situation assessment, decision support, interoperability and data exchange. Technologies such as the 3D analysis software Horus3D or radiological mapping using drones (RaptoRin) enable rapid and detailed assessment of hazardous situations. The spectrum ranges from dose rate maps and the analysis of hard-to-access areas to the deployment of robots in complex indoor environments and remote control based on a digital twin generated in real time.

Thanks to AIT's specialised technological expertise and its close cooperation with the Federal Ministry of Defence (BMLV), Austria has successfully positioned itself as a leading technology nation in the EU in this field.

The current focus is on the components Detection, Identification and Monitoring (DIM) and Knowledge Management (KM). In future, Hazard Management (HM) and Physical Protection (PP) are also to be integrated more closely in order to further expand existing 'system of systems' approaches.

Drones play a crucial role in establishing a situational picture.

> By using modern technology, for example, an operation can be reduced from 2 hours to 40 minutes, and there is no need to send soldiers directly to the source of danger.

Jürgen Schlechter
Commander of the ABC Defence Centre

Find out more:

Mobility Observation Box

- Security
- People

The video-based traffic monitoring system provides objective data on road safety.

© DEKRA

AIT transport researchers are installing the Mobility Observation Box, which collects high-resolution traffic data anonymously and on the move for up to ten days.

Measures to improve road safety or optimise driving behaviour are often only implemented after accidents have occurred. This is mainly because the risk of accidents on specific sections of road is difficult to quantify in advance. Although serious traffic accidents are relatively rare, critical situations such as near-misses or risky manoeuvres occur far more frequently and clearly indicate an increased risk of accidents.

With the Mobility Observation Box (MOB), AIT has developed an innovative, video-based traffic monitoring system that enables objective conflict and behaviour analysis. The MOB replaces previous manual and subjective surveys with precise, continuous observation of traffic events. Automatically classified interactions between people and vehicles can be analysed over defined periods without affecting the flow of traffic. Using AI, trajectories and road safety indicators are generated from the video data. The privacy of road users always remains protected. All processing is carried out in strict compliance with data protection regulations; image data is stored temporarily exclusively in a secure area of the AIT network, and sensor information is encrypted throughout.

The versatile applications of MOB have already been demonstrated in various projects, including those carried out in collaboration with the Austrian Automobile, Motorcycle and Touring Club (ÖAMTC). For instance, the system was deployed at several school locations in Austria to identify and assess high-risk traffic situations, with the aim of improving road safety. The findings were then discussed with the schools in question. Targeted measures to improve road safety around schools were then recommended to towns and local authorities. Furthermore, MOB has been used in Austria, Germany and Switzerland to conduct comprehensive interaction analyses focusing on e-scooters. The resulting data is incorporated into guidelines and legal regulations, which are discussed in forums such as the Austrian Road Safety Advisory Board of the Federal Ministry for Innovation, Mobility and Infrastructure. Additionally, the system optimises traffic light timing by analysing traffic flows, thereby reducing congestion, economic losses and environmental impact.

MOB technology has been honoured with several international awards – for example, the DEKRA Award, the Ö3 Transport Award 2022 and the European Excellence in Road Safety Award. In addition to its use in research and road safety, MOB will increasingly be used in future to analyse internal traffic flows, for instance to evaluate occupational safety on company premises. A further development for use in poor lighting conditions, for example in tunnels or at night, is currently being planned.

The Mobility Observation Box replaces previous manual and subjective surveys with precise, continuous observation of traffic conditions.

Find out more:

- Security
- People
- Scaling

Highly Secure Quantum Communication

Tapp-proof IT systems for public authorities and operators of critical infrastructure.

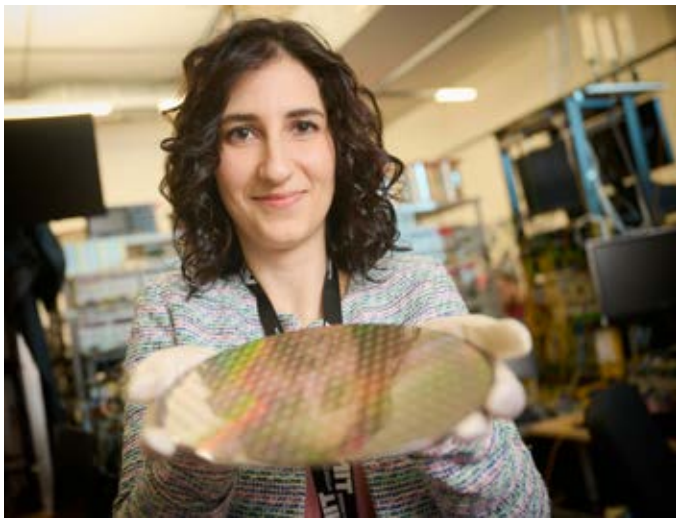
As digital communication becomes more widespread, so do the risks posed by cyberattacks and data misuse. Furthermore, the threat posed by future quantum computers, which could break current encryption methods, is growing. One key countermeasure is secure cryptography. Although modern methods are considered virtually unbreakable, they require absolutely secure key transmission. This is where quantum physics comes in: by using 'entangled' particles, communication can be designed so that any attempts at eavesdropping are detected immediately. Some 25 years ago, the Viennese physicist Anton Zeilinger demonstrated that this physical principle works in practice – for which he was awarded the Nobel Prize in 2022.

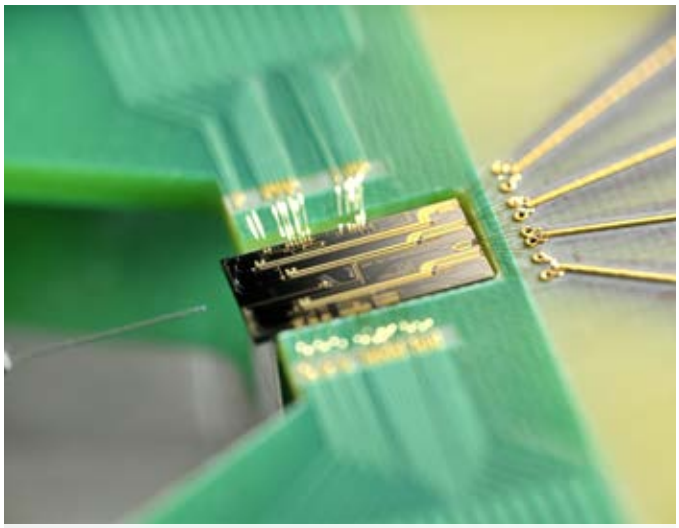
Researchers at AIT have been involved from the very beginning. They are developing key technologies for quantum cryptography and coordinating major European initiatives to establish highly secure communication networks, such as EuroQCI (fibre optics) and IRIS² (satellite). In doing so, AIT has established itself as a key centre of expertise and technology provider, as well as a driving force behind a European quantum encryption industry.

This has led to significant contracts, including from the European Space Agency, industry partners and the European Commission. Projects such as 'Nostradamus', QCI-CAT and PETRUS are strengthening testing, verification and pilot infrastructures across Europe. In parallel, AIT is involved in the EU Quantum Technologies Flagship in building a supplier ecosystem. The Quantum Technologies Flagship is a long-term research and innovation initiative that aims to put Europe at the forefront of the second quantum revolution.

In Austria – supported by the KIRAS security research programme – a quantum-secure network was demonstrated between four federal ministries in Vienna and along the Graz-Vienna route. Applications such as secret sharing, video chat and backups were successfully secured using Quantum Key Distribution (QKD). Furthermore, AIT provides strategic advice to the European Commission, for instance on standardisation issues, and holds around 30 patents in this field.

AIT's work makes a direct contribution to the industrialisation of modern encryption technologies 'Made in the EU' and strengthens Europe's digital sovereignty. In future, AIT will coordinate the expansion of EuroQCI in Austria and its connection to neighbouring countries, establish an optical ground station and work closely with infrastructure operators. Projects such as MOZART are also investigating QKD-secured connections for public authorities. At the same time, AIT is continuing to drive forward the development of a European supplier ecosystem for quantum encryption.





Miniaturised components and systems for highly secure communication are being developed in AIT laboratories.

> Technological sovereignty in the key technologies of the future has recently come into sharp focus. Quantum technology is one of these key technologies and is therefore a strategically important technology for Austria and Europe.

Christoph Neumayer
Secretary General of the Federation of Austrian Industries (IV)

Find out more:

Biological and Circular Systems

The Industrial Strategy Austria 2035 emphasises the importance of the circular economy, the bioeconomy and resource efficiency as complementary approaches to technological innovation. Bio-based and circular systems help to reduce dependencies, close material cycles and increase the resilience of industrial value creation. AIT develops bio-based and ecological solutions that operate at the interfaces between agriculture, industry and the environment. By integrating biological processes into existing value creation and supply systems, AIT supports the development of robust, resource-efficient and long-term sustainable infrastructures. However, the development of a sustainable and efficient circular economy is also a key focus of AIT's work in many other research areas.

- Resources
- Productivity
- People
- Scaling

Microbiome Solutions for Climate-resilient Crop Production

Targeted use of microorganisms to strengthen plants

© Alexander Müller

In 2015, the UN adopted 17 Sustainable Development Goals (SDGs) aimed at improving people's lives and promoting sustainable development worldwide. In response, the European Union has set itself ambitious targets, including halving pesticide use and nutrient loss in soil by 2030, as well as expanding organic farming to 25 percent. These targets are extremely ambitious – particularly in view of the threat to agricultural yields posed by plant diseases, novel pathogens and extreme weather events. Furthermore, the high energy requirements for the production of mineral fertilisers make alternative solutions indispensable.

AIT is developing innovative microbial applications based on the complex interactions between plants and their microbiome – the totality of all microorganisms (bacteria, fungi, archaea, viruses, etc.) living on and within plants. The aim is to strengthen plants' resilience to stress factors, repel pests or better supply the plant with essential nutrients by introducing specific natural microorganisms.

In recent years, researchers at AIT have successfully identified such microbial strains and licensed them to international companies, including the market-proven biointrinsic™ W10 from Indigo Ag and the biopesticide strain KLA5-2 currently under development at RovensaNext. Beyond individual microbial strains, AIT offers comprehensive services to support companies in product development and registration.

Based on patented AIT innovations for incorporating microbial products into seeds, the spin-off company Ensemo GmbH was founded (https://www.ensemo.com/), which successfully launched its first product in 2024 (see also p. 55).

AIT researchers are investigating the interactions between plants and microorganisms and applying this knowledge in a targeted manner.

The research and service development are largely supported by externally funded projects, many of which are led by AIT. These include, among others, the major EU projects SAGROPIA (https://sagropia.eu/), SUSFERT (https://www.susfert.eu/), RATION (https://www.ration-lrp.eu/project/) and Microbiomes4Soy (https://microbiomes4soy.eu/). The research findings have been published in numerous scientific journals. Of particular note is a publication in the renowned journal Nature Reviews Microbiology (23, 9–23 (2025)).

The knowledge generated on the targeted use of microorganisms, as well as the applications developed to strengthen plants, make a significant contribution to sustainable and safe food production. Microbial solutions offer environmentally friendly alternatives to harmful pesticides and fertilisers, thereby contributing to the sustainable transformation of agriculture.

The targeted use of microorganisms offers an environmentally friendly alternative to harmful pesticides and fertilisers.

Find out more:

- Resources
- Security
- People

Animal-free Research and Innovation

AIT develops innovative cell culture models of biological barriers as alternatives to animal testing and is a key European hub in this field.

Animal-free innovation is steadily gaining importance in Europe. The drivers of this development are ethical requirements, the regulatory mandate to use alternative methods where available, and the scientific imperative to develop models for research and safety assessment that are more relevant to humans. Meanwhile, the European Commission is developing a roadmap for the gradual elimination of animal testing in chemical safety assessments. The internationally recognised ethical framework for this is the so-called '3Rs principle' (Replace, Reduce, Refine). This aims to avoid animal testing (by replacing it with non-animal alternatives), reduce the number of animals used, and minimise their suffering.

In its research in this field, AIT focuses primarily on human-based in vitro models – particularly in the area of biological barriers such as the blood-brain barrier. Such systems make it possible to map the mechanisms of action of chemical substances and drugs more precisely and to generate data that is closer to human physiology than traditional animal models. AIT is contributing this expertise to several EU projects: In PARC, the European Partnership for Chemical Risk Assessment, around 200 institutions from across Europe are collaborating to develop the next generation of chemical risk assessment. This includes innovative methods for neurotoxicity testing, in which blood-brain barrier models are essential. In the EU project CHIASMA, in vitro and in silico approaches are combined with AI-supported analyses to assess chemicals and materials more robustly, more quickly and with greater relevance to human safety and sustainability; here too, blood-brain barrier models play a central role.

Winfried Neuhaus and his team are driving forward the development of in vitro models.

AIT is positioned in the field of animal-free innovation not only as a research institution but also as a European network hub. Through the "European Society for Alternatives to Animal Testing" (EUSAAT), of which AIT Principal Scientist Winfried Neuhaus is President, current developments regarding the 3Rs and alternative methods are communicated to the scientific community. Through the Austrian RepRefRed Society, AIT is also a member of the European network EU3Rnet, which connects European 3Rs centres to promote best practices, visibility and joint initiatives. Through the COST Action IMPROVE, led by Neuhaus, these activities are further extended into the European Research Area. Furthermore, he contributes his expertise via the Mirror Group of the European Partnership for Alternative Approaches to Animal Testing (EPAA) to this platform, where the European Commission, industry and other stakeholders are working on the further development of alternative approaches.

A new addition is the "European Research Area (ERA) on New Approach Methodologies (NAMs)", which further elevates the profile of this topic at the policy level; Neuhaus is involved here as Austria's representative, nominated by the BMFWF.

AIT thus combines scientific excellence, European networking and application-oriented methodology development in a field of high strategic relevance.

> Innovative blood-brain barrier models make it possible to map the mechanisms of action of chemical substances and drugs more precisely and to generate data that is closer to human physiology than traditional animal models.

Winfried Neuhaus
Principal Scientist at AIT

Find out more:

- Resources
- Productivity
- Scaling

RecAL

Sustainable Aluminium Recycling

The production of aluminium is highly resource- and energy-intensive. Consequently, recycling this lightweight metal – which is ubiquitous in engineering – is even more important than in other sectors. Recycling aluminium from existing end-of-life (EoL) and production waste requires only five percent of the energy needed to produce primary material. However, the problem is that the metal is alloyed with a variety of other elements that cannot practically be separated from one another. The current practice of mixing different EoL alloys inevitably leads to downcycling and a reduction in the available raw materials.

In the European research project RecAL (Recycling technologies for circular ALuminium), led by the AIT subsidiary LKR Leichtmetallkompetenzzentrum Ranshofen (Light Metal Technologies Ranshofen) – in collaboration with 19 partner organisations from nine European countries – a novel approach is being pursued which aims to transform the European aluminium industry towards a circular economy through innovative recycling technologies, digital networking and new alloying strategies. Every step of the production and reuse cycle along the entire value chain is being strategically examined.

A key focus of RecAL is on solutions that enable greater tolerance for recycled material in alloy design whilst preserving material properties. Digitally controlled sorting processes are also being developed. This approach is complemented by the establishment

Researchers at the LKR are working in the laboratories on new material compositions and processing methods.

of a digital 'RecAL Hub', a platform that intelligently links recycled material streams, innovative recycling technologies, and producers and consumers – a crucial step towards transforming the linear material flow into a closed-loop system. Alongside materials research, the focus is on robotics, sensor technology and digital twins to manage aluminium flows transparently and efficiently throughout their entire life cycle. This aims to create recycled material streams with significantly improved purity.

The aim is to network stakeholders across Europe in order to significantly increase the proportion of secondary aluminium, conserve resources and sustainably improve the industry's carbon footprint. "With RecAL, we want to show that high-tech and the circular economy are not a contradiction," emphasises Gerald Prantl, project manager at the LKR. A Europe-wide aluminium circular system lays the foundation for an industrial future that combines ecology and competitiveness, whilst also strengthening Europe's resilience with regard to this valuable raw material.

The ReCal project, which runs until 2028, is attracting considerable public interest due to its high level of innovation and significant impact on European industry – in 2025, it was awarded the ÖGUT Environmental Prize in the category "Circular Economy through Research & Innovation".

Current practices in aluminium recycling inevitably lead to downcycling and a reduction in the availability of raw materials.

Find out more:

EXCELLENCE, NETWORKS AND INNOVATION AT AIT

AIT is committed to excellence and strives to achieve technological leadership in its fields of activity. Transforming scientific findings into competitive innovations requires scientific excellence and close collaboration with partners in regional, European, and international networks. This performance is demonstrated, among other things, by publications in renowned scientific journals, the awarding of prestigious prizes, and the establishment of successful spin-offs.

In all these areas, AIT makes tangible contributions that go beyond scientific excellence to support the translation of research into innovation and application, thereby underscoring its role as a reliable partner in the national and European innovation ecosystems.

OBJECTS YET TO BECOME #1

Nikolaus Gansterer

Take a long silver string. Follow it until you fall into a sudden deep sleep. When waking up, tie the string to the bottom of your memory.

An Overview of AIT's Research Impact

- **FWCI (2025):** 1.42
  Field-Weighted Citation Impact;
  global average=1.0
  AIT ranks in the upper range of the peer group of European RTOs (1.17–1.63)
- **FWCI (2021–2025):** 1.28
  Five-year average citation impact
  (global average=1.0)
  AIT falls within the European
  RTO comparison range (1.07–1.44)
- **International collaboration:** 58.8%
  of publications with international co-authors
  AIT is above the European
  RTO comparison range (33.8%–56.4%)

Created using the SciVal analysis tool (Elsevier).

Notable Publications in Academic Journals

Wire-Arc directed energy deposition of metastable-ß alloy Ti-15V-3Cr-3Sn-3Al using thick wire feedstock: Microstructure and mechanical response.

J. L. Neves, T. Wojcik, D. Obersteiner, J. Grillitsch, D. Holec, D. Kiener, T. Klein
Materials & Design, 259, 114757, 2025
https://doi.org/10.1016/j.matdes.2025.114757

Ti-15V-3Cr-3Sn-3Al is a metastable-ß alloy initially developed to improve cold formability and reduce downstream processing costs compared to hot-forming Ti-6Al-4V. It is primarily used in sheet and welded forms, with secondary applications in castings and forgings. However, high formulation costs and strict process windows reduce expected cost benefits. This study explores an alternative manufacturing route for large-scale components using the available thick wire format (Ø 3.0 mm). Ti-15V-3Cr-3Sn-3Al was deposited via plasma-based wire-arc directed energy deposition. Samples were evaluated in two conditions: (1) solution-treated (2) solution-treated and aged. Mechanical testing included tensile and hardness measurements, while microstructural analysis used a broad range of techniques. Deformation behaviour and fracture surfaces were also examined. The ß-phase microstructure in the as-built condition contained αGB at grain boundaries, which dissolved during solution treatment, leaving a fully ß-phase matrix. Aging resulted in the precipitation of fine α-laths, providing expected strengthening. In this condition, the material achieved an ultimate tensile strength > 1150 MPa and failure strain > 6 %, with anisotropy observed only in ductility. In the solution-treated condition, continuous softening was observed during tensile testing. This study provides insight into properties of Ti-15V-3Cr-3Sn-3Al in additive manufacturing, laying the groundwork for alternative processing routes for titanium alloys.

Digital production technologies and exports.

B. Dachs, A. Wolfmayr
Industry and Innovation, 33(1), 13-33, 2025
https://doi.org/10.1080/13662716.2024.2421952

This paper studies the relationship between digital production technologies and exports. Using data from the European Manufacturing Survey 2018 for Austrian, Croatian, German and Swiss manufacturing firms, we apply structural equation modelling to examine two possible transmission channels between digital production technologies and exports: first through productivity; second, through product-related services.

The results reveal some heterogeneity in the ways different technologies relate to exports: while robots show a positive link with exports through the productivity channel, additive manufacturing and connected sensors are found to be positively related only to services which in turn influence exports. The results for logistics technologies, in contrast, suggest a positive relation with export activity through both channels.

Aerodynamics and ice tolerance of the large passenger aircraft advanced rear end forward swept horizontal tailplane with leading edge extension.

J.H. Page, I. Ozcer, A. Zanon, M. De Gennaro
R.C. Llamas-SandinAerospace Science and Technology, 161, 110018, 2025
https://doi.org/10.1016/j.ast.2025.110018

The advanced rear end (ARE) forward swept horizontal tailplane (FSHT) may allow a more compact empennage, reducing weight, drag, and, thus, fuel burn. Large passenger aircraft (LPA) empennages are typically sized up to satisfy performance and handling requirements under critical icing conditions. One such requirement is sufficient low speed (negative) lifting performance for the roundout manouevre following 45 min of flight in a holding pattern in icing conditions. The FSHT geometry has the possibility to include a leading edge extension (LEX) in the droplet shadow zone of the fuselage contraction where it could have some protection from icing, allowing tail size reduction.

This paper addresses the topics of three-dimensional inflight icing simulation and CFD analysis of iced tails in the industrial environment, inflight icing of the FSHT with LEX, and lifting performance and aerodynamics of the iced FSHT with LEX. Full aircraft air flow and droplet calculations were carried out using the finite element method with solution error-based anisotropic mesh adaptation, on a single geometry, to calculate inlet and outlet condition profiles for an empennage-only icing simulation domain. Full aircraft-representative, three-dimensional, multishot icing simulations were then carried out to calculate 45 min ice accretion in a holding pattern in Appendix C glaze icing conditions, for eight different FSHT geometries. Following that, three-dimensional CFD with the k-ω SST turbulence model was used to calculate the lifting performance and aerodynamics of each geometry, with and without ice, in a roundout flight condition from 0° to -15° angle of attack (AoA). The practice and feasibility of using three-dimensional multishot icing simulation in the LPA design environment are described.

Analysis is then presented for three variations in FSHT forward sweep with a fixed gothic LEX, three variations in LEX chord with a 10° FSHT, and three variations in LEX span with a 10° FSHT. Iced lifting performance is found to correlate positively with forward sweep and exhibit a more nuanced relationship to LEX chord and span. In addition to the expected LEX vortex, a tip leading edge vortex is identified as a key ice tolerant FSHT lifting flow mechanism. Detailed flow field analysis provides insight into the complex interplay between the two flow mechanisms and the implications for iced lifting performance.

Remote patient monitoring for managing acute COVID-19, and mortality and hospital use in Sydney, New South Wales, 2021–22: a retrospective observational cohort study.

MG Kim, PT Phan, C McMaster, P. Indraratna, J. Yu, A. Martin, R. Pinheiro, L. Altman, G. Schreier, B. Kwan, P. Konecny, JJ. Post, N. Lovell, S.-Y. Ooi, K. Overton
Medical Journal of Australia, vol. 222, no. 11, pp. 550-557, 2025
https://doi.org/10.5694/mja2.52685

Objectives: To evaluate the influence of remote patient monitoring (RPM) for managing people with acute coronavirus disease 2019 (COVID-19) on 28-day mortality and hospital use in Australia.

Study design: Retrospective observational cohort study; analysis of deterministically linked NSW Notifiable Conditions Information Management System and hospital, emergency department, and non-admitted patient data.

Setting, participants: South Eastern Sydney Local Health District catchment area residents aged 15 years or older for whom positive severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) test results (polymerase chain reaction or rapid antigen testing) during 26 November 2021 – 30 June 2022 were recorded.

Primary outcome: All-cause mortality within 28 days of positive SARS-CoV-2 test result. Secondary outcomes: Hospital length of stay, and numbers of emergency department presentations, hospital admissions, and intensive care unit admissions within 14 days of positive test results. All analyses were undertaken for the unadjusted data (original cohort analysis) and after propensity score matching and inverse probability treatment weighting.

Climatological hazard indicators for a robust and integrated energy infrastructure in Austria.

O. Maier, L. Liebmann, K. Hasel, R. Berg, F. Lehner, M. Bügelmayer-Blaschek, H. Formayer, D. Suna
Scientific Data, 12(1862), 2025
https://doi.org/10.1038/s41597-025-06121-2

Climate change increasingly exposes energy infrastructure to compound weather related hazards, requiring systematic and data driven risk assessment approaches. This paper presents a set of climatological hazard indicators designed to support a robust and integrated energy infrastructure in Austria. The indicators cover key climate related stressors – such as heat extremes, cold spells, droughts, heavy precipitation, flooding, and wind – and are derived from long term climatological datasets using a consistent and transparent methodology. Spatially and temporally resolved metrics are developed to enable cross sectoral comparison and integration into energy system planning, operation, and resilience assessments. The framework supports the identification of vulnerability hotspots and the prioritization of adaptation measures across interconnected energy infrastructures.

Embodied Measurement: Tangible Interactions to Enhance the Validity of Self-Report Measures.

JC. Uhl, G. Regal, L. Koesten, M. Oppermann, M. Murtinger, M. Tscheligi
In: N. Yamashita, V. Evers & K. Yatani (eds), Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems, ACM – Association for Computing Machinery, New York, NY, USA, pp. 1-16, CHI 2025: ACM CHI Conference on Human Factors in Computing Systems, Yokohama, Japan, 26/04/25 https://doi.org/10.1145/3706598.3714055

This work introduces the concept of Embodied Measurement (EM), designed to improve the validity and inclusivity of cognitive load assessments by incorporating physical interactions that mirror mental effort. We implemented haptic force-feedback turning knob as an alternative to traditional Likert-scale ratings and compared it with visual (mouse-based) and combined (haptic and visual) modalities. Participants completed a cognitive load task with varying difficulty levels using each modality, while biosignals such as heart rate variability, skin conductance, and pupil size were recorded to objectively assess cognitive load. In addition, qualitative feedback was gathered to explore participants' experiences with each input method. Our findings highlight the potential of EM to offer more tangible and intuitive ways of measuring cognitive load, with the combined modality providing the most comprehensive feedback. This study contributes to human-computer interaction (HCI) research by proposing new approaches for measuring cognitive and emotional effort through physical interaction.

Highly specialized laboratories provide the foundation for excellent scientific work and collaborations with top-tier partner institutions.

Nonlinear model predictive temperature control of a cooling process for steel strips undergoing phase transformations.

M. Niederer, P. Zeman, S. Sannes, H. Seyrkammer, G. Helekal, A. Kugi, A. Steinböck
Control Engineering Practice, vol. 165, 106512, 2025
https://doi.org/10.1016/j.conengprac.2025.106512

The cooling of hot steel causes phase transformations that are directly influencing the material properties. Precise temperature control is therefore essential for producing high-quality steel products. The paper proposes a nonlinear model predictive controller for accurate tracking control of the strip temperature in a cooling section of a continuous steel strip processing line of voestalpine Stahl GmbH. The controller is based on a dynamic model of the local temperature and phases of the strip material. The controller computes optimal trajectories of the system inputs so that the strip reaches a strip-specific target temperature. A tailored constrained nonlinear dynamic optimization problem is numerically solved in the control algorithm using the Levenberg-Marquardt method. The gradient and the approximate Hessian of the objective function are analytically computed using an adjoint-based approach. Measurements at the real processing line demonstrate the excellent control performance. Long-term analysis shows that the model predictive controller improves both the accuracy and the homogeneity of the strip temperature compared to the previously used PI-control scheme. On average, the reduction of the mean temperature error is 51 %, and the improvement of the temperature homogeneity is 25 %.

Open Source Software

MovingPandas

MovingPandas is a Python library for mpovement data exploration and analysis.

Principle contributor and manager: AIT Senior Scientist Anita Graser.

MovingPandas provides trajectory data structures and functions for handling movement data based on Pandas, GeoPandas, and HoloViz.

- 1.4k stars
- 208 forks

MovingPandas is under active development and there are some exciting features coming up.

https://movingpandas.org/

AIT Spin-off Initiative

The AIT business model aims to commercialize the results of independent research for the benefit of industry, the economy and society. Industry and the business sector integrate these research results into their own value creation, products and services. In cases where IP (intellectual property rights), know-how or other research results – such as prototypes – have high market potential but are not taken up by established companies – for example, because new application domains are not part of their strategic focus – commercialization via a spin-off can be a sensible approach, especially if the technology to be commercialized has scaling potential.

By founding spin-offs, promising technologies can be transferred into independent, agile organizations that focus specifically on market entry, scaling, and customer acquisition. AIT remains connected to its spin-offs through continued joint research and economic exchange and benefits in the long term from economic success and enhanced reputation through equity investments, licensing agreements or strategic partnerships.

Last but not least, spin-offs offer talented researchers attractive career prospects in an entrepreneurial environment and foster a culture of innovation and impact within the organization and across the entire economy.

The spin-off support process at AIT.

In the spin-off and start-up ecosystems, AIT plays the role of "content creation" and team development. The institute's staff and research topics lay the foundation for successful spin-off development.

Continuous support for founding teams in matters of business model development, market validation, grant scouting, and matching with co-founders, as well as coaching throughout the spin-off process, increases the chances of success for a potential spin-off.

The spin-off support process thus becomes, alongside the teams and topics, a key component in the creation of new companies. AIT has developed and tested this process and described it along typical process phases and based on defined milestones. A small specialized team, embedded in the Austrian start-up ecosystem, supports the founding teams on their spin-off journey.

At AIT, spin-off creation does not begin with a concrete founding idea, but rather with the provision of entrepreneur training and informational events addressing questions related to spin-off formation. The entrepreneurial mindset is cultivated as part of AIT's culture.

Support for individual spin-off journeys does not end after thecompany is founded. The AIT spin-off coaching team remains involved in later phases of the spin-off and assists in finding contacts for funding, venture capital, or in connecting with specific consulting services offered by other players in the start-up ecosystem.

Partnering with Support Organizations

For AIT, providing the best possible support to spin-off teams also means partnering with the best support organizations in the innovation ecosystem. Support services can best be delivered in cooperation with established, experienced organizations: learning curves and know-how, infrastructure, training opportunities and exchange with peer groups – all of this can be accessed more effectively, at scale, and more quickly through a network of support organizations.

That is why AIT is engaged in a network of "Research Performing Organizations" – universities and research institutions – to make the range of support services offered by each organization as accessible as possible to cooperation partners.

In the spirit of a "hub," high, recognizable quality in support services for spin-offs is to be offered by all affiliated organizations. This also facilitates access to "verticals" (e.g. quantum technology, life sciences, green tech, etc.) and the specific expertise within those fields regarding markets, technologies, risks and investors. A consolidated view of all spin-offs supported by the hub is also expected to generate greater visibility for investors in the future.

Together with transparent, professionally managed support structures, this reduces the risk for investors and makes spin-offs "investable" and "scalable". This increases the likelihood that spin-offs will remain successful and be able to scale up in the European market as well.

Innovation for Environmentally Friendly Agriculture

The AIT spin-off "Ensemo" was already featured in the last Impact Report; its technology enables the industrial application of biological solutions in crop farming by introducing live microorganisms into seeds. Specifically, this groundbreaking method improves plants' natural nitrogen fixation, reduces dependence on chemical fertilizers and simultaneously helps ensure stable yields. In the process, the seeds are opened, treated with a specially developed biological solution and sealed with a biodegradable adhesive. This protective layer ensures that the microorganisms remain in a stable environment and can reach their full potential during growth.

In cooperation with SAATBAU LINZ, field trials have shown that this results in yield increases of 3 to 19 percent – while simultaneously reducing the use of synthetic fertilizers. In early 2026, Ensemo successfully secured a "Blended Finance Grant" from the EIC Accelerator Program totaling 4.5 million euros – 2.5 million euros from the EIC and 2.0 million euros in private investment. This marks an important step toward scaling this AIT spin-off.

Radiation Exposure in Space

In 2025, the spin-off "Confident Space Technology" was founded – the first spin-off of Seibersdorf Labor GmbH, a wholly owned subsidiary of AIT. The company offers a solution for the impact of space radiation on electronic components. Until now, protection against cosmic and solar radiation has relied on expensive ground tests, conservative shielding and oversized components. The SATDOS system, newly developed at Seibersdorf Laboratories, challenges this paradigm: for the first time, satellite operators and component manufacturers can measure, model and manage radiation exposure directly in orbit in real time. The data can be fed into forecasting tools to enable smarter planning and longer mission durations. SATDOS is a compact and modular space-qualified dosimetry payload designed for integration into CubeSats and SmallSats. An in-orbit demonstrator of SAT-DOS has already been successfully tested in space for over a year as part of an ESA project.

LISTEN.
LEARN. LAUNCH.

Austrian Startup Monitor

Data-driven insights into the Austrian startup ecosystem

Startups are a key driver of economic dynamism and technological transformation. They possess high growth potential and inject new momentum into the economy through innovative business models, products, and services. To provide reliable data on the development and challenges of Austrian startups, the Austrian Startup Monitor (ASM) has been compiled annually since 2018. This empirical study is conducted by AIT in collaboration with AustrianStartups and the WU Startup Center. The goal is to provide well-founded information for the startup community, policymakers, research institutions, and economic policy stakeholders to enable the evidence-based development of the startup ecosystem.

The Austrian Startup Monitor 2025 is based on a survey of 635 founders and CEOs. The 2025 edition focuses on key technologies.

These technologies hold application potential for numerous sectors, and their development is increasingly supported by European and Austrian policymakers. 71 % of the startups surveyed are developing key technologies. The most frequently cited are artificial intelligence, followed by life sciences and biotech, energy and environmental technologies, advanced production technologies and robotics, as well as chips, electronic components, and systems.

Women account for 21 % of founders, which is higher than in previous years. The number of startups primarily pursuing social and/or environmental goals continues to rise. Currently, 62 % of all startups are classified as green or social startups.

The Austrian Startup Monitor serves as an important basis for decision-making for numerous economic and research policy stakeholders. For example, the Austrian Business Agency uses the findings to inform its strategies for attracting international companies. The study is made possible through the support of key funding bodies, including the Federal Ministry of Economy, Energy, and Tourism; the Federal Ministry of Innovation, Mobility, and Infrastructure; the Federal Ministry for Women, Science, and Research; the Austrian Federal Economic Chamber; the Austrian Research Promotion Agency; and Austria Wirtschaftsservice.

Thanks to its scientific foundation and comprehensive empirical approach, the ASM provides a solid basis for decision-making regarding policy measures and economic support strategies. It helps to specifically improve the framework conditions for startups, increase the international competitiveness of Austrian companies, and create an innovation-friendly environment in the long term.

The goal of the Austrian Startup Monitor is to provide well-founded information for the startup community, policymakers, research institutions, and economic policy stakeholders to enable a fact-based development of the startup ecosystem.

Find out more:

NOSI – Digitizing Smell

NOSI, an AIT spin-off, is developing a novel sensor and an adaptive AI system for scent recognition.

NOSI Founders: Klara Brandstätter, Patrik Aspermair and Johannes Bintinger (from left to right).

Three of the five senses have already been commercialized: sight, hearing and touch. NOSI (Network for Olfactory System Intelligence GmbH), a spin-off from AIT, now aims to take the next step: its goal is to industrialize the first user-oriented smell and taste technology. The NOSI team spent nearly ten years at AIT working on the digitization of smells and developed prototype applications in the process. In doing so, they also identified numerous weaknesses in current technology regarding reproducibility, reliability, scalability and user-friendliness.

In building an "electronic nose," NOSI is pursuing an industry-agnostic approach – specifically: a technology that can be trained to address many real-world user problems. The nose is simulated by an electronic sensor chip that is only a few centimetres in size and equipped with an array of polymer-coated sensors. These responsive polymers, each tailored to different chemical groups, enable the detection of a wide variety of compounds – because the different polymers produce unique reaction patterns when exposed to various chemicals, similar to a fingerprint. These reactions are converted into electrical signals which are recorded and compared with a database of scent patterns trained using AI. Thanks to this versatility, multiple sensors for different smells and scents are not required. With the database – which is constantly growing – a brand-new sensor chip is capable of distinguishing hundreds of smells right out of production.

The technology therefore promises a wide range of applications – from healthcare to smart homes and environmental monitoring to production monitoring. For example, NOSI is currently working in the field of waste management on the automatic detection of improperly disposed waste; in the field of elderly care with the monitoring of bedridden patients; in the field of fire prevention with the early detection of smoldering fires, for example in warehouses or in connection with lithium-ion batteries; or in the hospitality industry with the detection of potential bed bug infestations.

NOSI's patented technology has already won numerous awards, including "Startup of the Year 2024" at the #glaubandich Challenge and as the winner of the Infineon Austria Startup Challenge 2025. The company received initial funding through a pre-seed grant from Austria Wirtschaftsservice (AWS) and from the incubator accent. NOSI aims to become the market leader.

Find out more:

Collaboration in Networks

The AIT Austrian Institute of Technology works closely with partners from business, industry, civil society, and public institutions within regional, European, and international networks. The research topics are closely aligned with the needs of industry and current societal challenges.

NEFI

New Energy for Industry

Innovation for a climate-neutral industry.

The NEFI – New Energy for Industry innovation network was founded in 2018 to drive the transformation of industry toward climate-neutral production. In collaboration with 120 partners from industry, research, and politics, NEFI focuses on innovative solutions that significantly reduce CO_2 emissions in industrial production. In 39 projects to date, with an investment volume of around 150 million euros, technologies are being developed and demonstrated that make renewable energies usable in industrial processes. The NEFI innovation network focuses on key technologies that strengthen the competitiveness of the participating companies.

Particularly noteworthy is the close integration of scenario development and technology work: While the scenarios define concrete transformation pathways, the projects specifically focus on developing the necessary technological solutions. These transformation pathways are based on six defined technology fields:

- Electrification and energy efficiency
- Flexibilization of industrial energy systems
- CO_2-neutral gases and hydrogen
- Carbon Capture, Utilization & Storage (CCU/S)
- Circular economy
- Industrial symbiosis

These thematic areas serve as the foundation for the NEFI Innovation Hubs, which accelerate the development of research and demonstration projects. An impact analysis by NEFI shows that scaling up the solutions already developed could achieve a 53 % reduction in CO_2 emissions by 2040.

AIT coordinates the innovation network together with Montanuniversität Leoben, the OÖ Energiesparverband and Business Upper Austria. Significant support for NEFI comes from the Climate and Energy Fund and the two industrially strong provinces of Upper Austria and Styria. The NEFI+ initiative, functioning as an innovation lab, will run until 2031 and strengthens collaboration between science and industry. By connecting research, practice, and policy, NEFI makes a significant contribution to the decarbonization of industry and helps establish sustainable value chains.

Find out more:

Support for SMEs in Digital Transformation

The EU initiative AI5innovation offers companies easy access to world-class research infrastructure and expertise

As part of the European Digital Innovation Hubs (EDIH) initiative, AI5innovation – the successor to the AI5production initiative – serves as a one-stop shop to help companies prepare for the challenges of digital transformation. The focus is on digital design and manufacturing, cybersecurity and artificial intelligence (AI) for Industry 5.0. The goal of the initiative, which targets Austrian manufacturing companies with up to 2,999 employees, is to increase the level of digitalization in production as well as competitiveness.

AIT and its subsidiaries LKR and Profactor are part of the project consortium, which consists of a total of 17 Austrian companies, as well as university (TU Wien, University of Vienna, and JKU) and non-university research institutions in Vienna, Upper Austria, Lower Austria, and Styria – project coordination is handled by the TU Wien Industry 4.0 Pilot Factory.

In close collaboration with the hub's partners, companies can evaluate and test customized digital technologies and development approaches. AI5innovation provides access to infrastructure for testing, measurements and experimental series, as well as the development of new products and processes. This offering is complemented by a diverse training programme that includes courses, webinars and workshops on relevant topics in digitalization and Industry 5.0. Additionally, support is provided in the search for financing for investments.

To assist companies, "Test-before-invest" (TBI) projects, among other initiatives, are carried out. For example, various research groups at AIT, in close collaboration with industry partners, pilot concrete solutions in test environments, such as for automated quality inspection, adaptive robotics or intelligent process control.

With its combination of technological excellence, methodological approach and industrial relevance, AI5innovation is a central building block for positioning Austria as a leading location for intelligent, resilient, and sustainable production.

Demand is high: Over the past three years, more than 180 digitalization projects have been implemented with companies across the entire hub. These use cases impressively demonstrate how AI and data-driven technologies can make production processes more efficient, sustainable and flexible.

The initiative is now also linked to the new AI Factory Austria (AI:AT). This close integration provides companies with a holistic approach to digitalization and AI – from the initial idea through testing to implementation. This creates a practical entry point into the use of AI for industrial applications and facilitates intensive technology transfer in the field of AI.

AI5innovation is a key component in positioning Austria as a leading hub for smart, resilient and sustainable manufacturing.

Find out more:

AI Factory Austria AI:AT

Easy Access to Supercomputers

AI Factory Austria AI:AT was established to support the private sector and the public sector in the use of artificial intelligence. Its primary goal is to make high-performance computing accessible to SMEs, start-ups, industry and public administration with as few barriers as possible, and to assist them in its practical application. AI:AT acts as a market-neutral, independent access point that brings together infrastructure access, hands-on expertise, capacity building and ecosystem networking.

AI:AT is jointly led by the AIT Austrian Institute of Technology and Advanced Computing Austria (ACA) within the framework of the EuroHPC Joint Undertaking (JU) and implemented by an Austria-wide consortium (TU Wien, University of Vienna, BOKU, University of Innsbruck, TU Graz, JKU, ISTA, ÖAW, INiTS, EODC). For AIT, AI:AT is strategically relevant because it operationalizes the bridge between research and economically and socially impactful applications.

The service portfolio is structured so that organizations at different stages of maturity can quickly find their bearings and receive appropriate support without replacing existing market offerings. At its core, AI:AT offers low-threshold services such as access pathway and onboarding support for European computing resources, data services, training and workshops, legal guidance and access to the network. More in-depth services are also offered as needed.

Since the launch of the training and enablement programme in July 2025, AI:AT has demonstrated a measurable impact. More than 20 training sessions with over 900 participants have been conducted, more than 40 projects and organizations have been supported – including start-ups and public administration institutions (e.g. the Austrian Court of Audit) –, more than ten partnerships have been launched and 30 events to strengthen the community have been held (as of March 2026). In parallel, AI:AT supports organizations in accessing European supercomputers as well as in the classification and support of computationally intensive AI projects in collaboration with the ecosystem. The website www.ai-at.eu has been established as a central entry point, including a continuously updated overview of training sessions and workshops.

The AI:AT Coworking Hub serves as a physical hub for project teams, exchange formats, and collaborations between start-ups, industry, research, and public administration. Currently, 94 coworking spaces are available across an area of approximately 1,800 square meters. As of March 2026, 67 coworkers from 28 companies and five industries are working at the hub.

The supercomputer is being procured as part of the EuroHPC Joint Undertaking. It is expected to go live in 2027.

The AI Factory has been established as a key resource for mastering AI technologies and implementing challenging AI projects.

Find out more:

Technology Talks Austria

AIT, in collaboration with more than 30 partners from Austria's technology community, organizes the country's leading conference on research and innovation.

At Technology Talks Austria 2025, EU Vice President Henna Virkkunen delivered a highly acclaimed keynote speech.

Technology Talks Austria is the leading conference on research and innovation in Austria, offering a European perspective and visibility. As a summit of the Austrian technology community, it offers a discussion platform bringing together all relevant partners from the domestic and European RDI landscape within a global context. The goal of Technology Talks Austria is to develop concrete conclusions and necessary measures on how business, industry, science, politics and society can successfully master challenges and make the best possible use of and strategically shape the opportunities that arise.

After 40 successful years as the Alpbach Technology Talks, the conference reinvented itself two years ago as "Technology Talks Austria" with a new concept and a new venue. In 2024 and 2025, more than 850 participants attended each year at the MuseumsQuartier Vienna. The central theme for 2024 was "Triple Transition – ecological, digital, and human". In 2025, the theme "Boosting Competitiveness – The Power of Research & Innovation" was at the center of the debates. And in 2026, everything revolves around the theme "Empowering Europe: Technological Leadership for a Resilient Future".

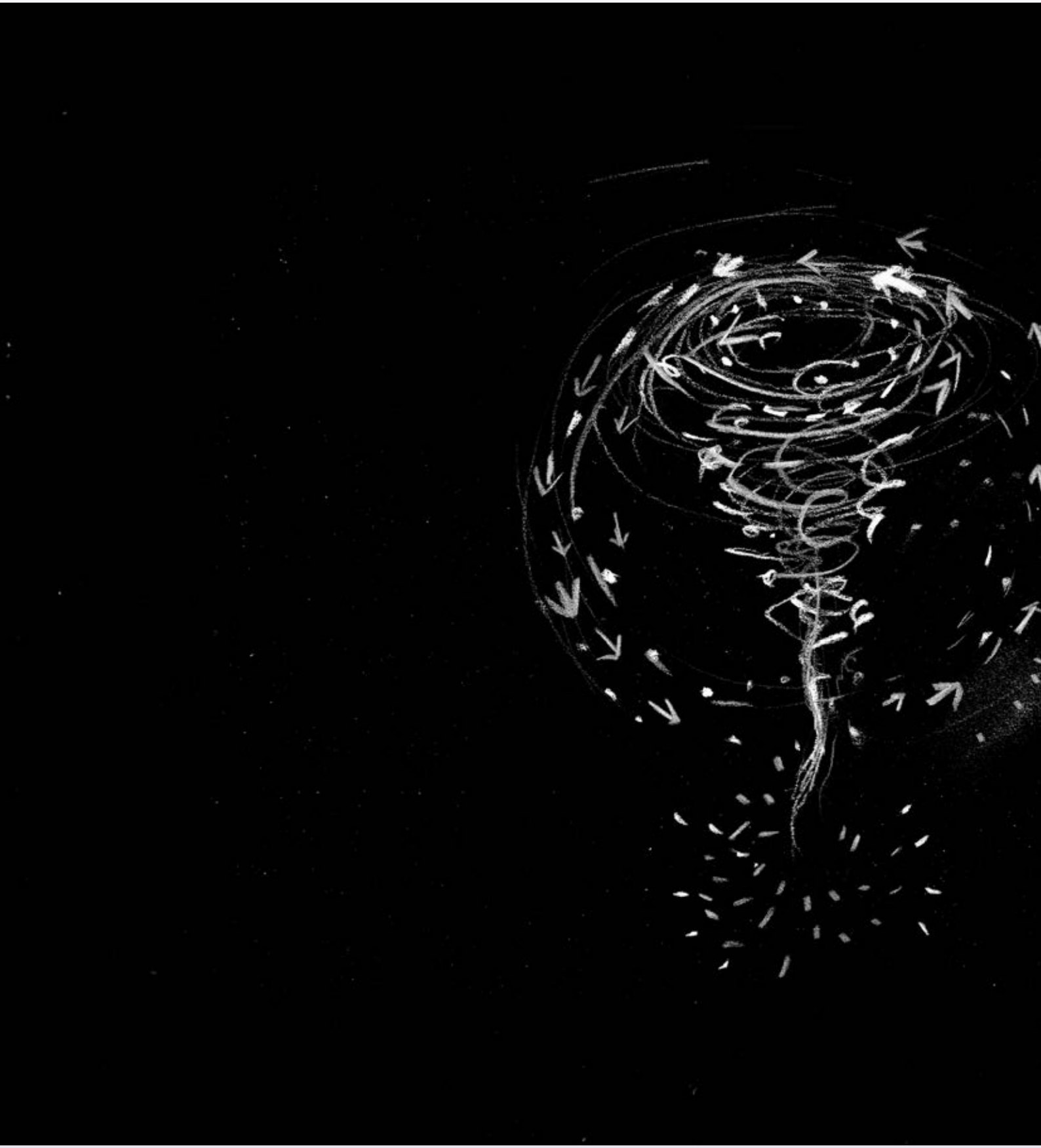
The themes are discussed through an innovative mix of high-caliber keynote presentations by internationally renowned speakers, various plenary debates and in-depth workshops – with ample opportunity for exchange and networking. All formats adopt a multi-stakeholder perspective: the three groups of science/research, business/industry, and politics/government are always involved.

Technology Talks Austria is organized by the AIT Austrian Institute of Technology in close cooperation with the Federal Ministries of Innovation, Mobility and Infrastructure (BMIMI), Women, Science and Research (BMFWF), Economy, Energy and Tourism (BMWET), as well as the Austrian Research Promotion Agency (FFG) and the Federation of Austrian Industries (IV).

The following organizations are involved as scientific partners in the programme planning: acatech (German Academy of Science and Engineering), AIT Austrian Institute of Technology, Christian Doppler Society (CDG), Forschung Austria, Institute of Science and Technology Austria (ISTA), TU Austria, the Austrian Science Fund (FWF) and the Austrian Academy of Sciences (ÖAW).

In addition, more than 30 partners from the Austrian research and technology community are involved in Technology Talks Austria.

Find out more:



WORLD-CLASS LABORATORY INFRASTRUCTURE AT AIT

A modern research infrastructure forms the foundation for scientific excellence and successful collaborations with companies and other research institutions. AIT operates a wide range of highly specialized laboratories, including those in the fields of energy technology, microbiome research, battery development, automation and user experience. This infrastructure is continuously expanded and kept up to date with the latest technology while also serving as an integration and validation environment for complex technologies and systems. It enables the development, testing and implementation of new solutions under real-world and industry-relevant conditions.

OBJECTS YET TO BECOME #5

Nikolaus Gansterer

Start circling with your attention slowly. Like a spiral. Like a whirlwind. Delirious like a hurricane. Up till the space around you becomes a void. Filled with curiosity.

Photonics & Quantum Communication Laboratory

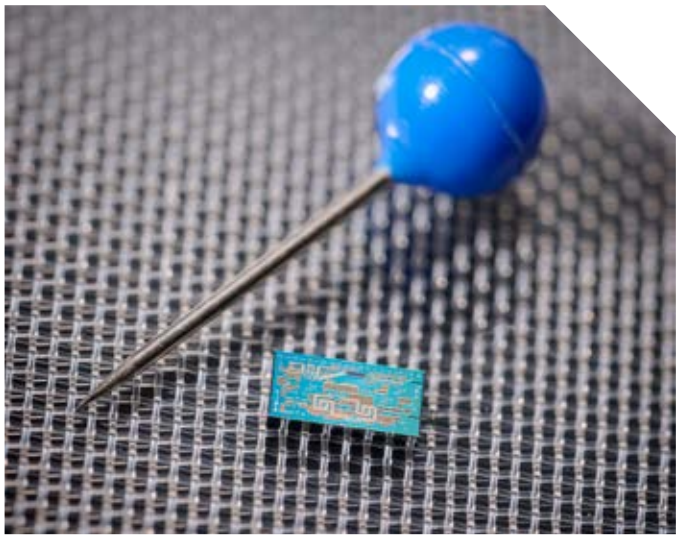
Optical Signal Processing and Highly Secure Communication

The advance of digitalization opens up new opportunities and applications, but at the same time, the threat of targeted system disruptions and data misuse is growing. The AIT's Photonics & Quantum Communication Laboratory is dedicated to the development and integration of photonic and quantum optical technologies that are essential not only for secure communication but also for innovative sensor technology and high-precision signal processing. A particular focus is on quantum communication technologies. These contribute to secure communication that is resistant to future quantum computer attacks.

The combination of experimental research and system integration makes the Photonics & Quantum Communication Laboratory a central European development platform for future quantum and photonic technologies. The laboratory offers comprehensive testing and validation capabilities.

The research facility is equipped with a state-of-the-art test station that enables detailed characterization of photonic chips. This allows for the control and measurement of photonic integrated circuits at the chip level, as well as the demonstration of new applications for optical and electronic components.

In addition, state-of-the-art instruments for optical and high-frequency signal generation and analysis are available, enabling measurements across the entire spectrum. Furthermore, research is being conducted on quantum random number generators and neuromorphic optical chips, which set new standards in the security of communication systems and optical data processing.



With its high-performance research infrastructure, the laboratory supports industrial innovation and strengthens Europe's leading position in the field of optical and quantum-based technologies.

The further development of photonic components supports industrial innovation and strengthens Europe's leading position

The combination of experimental research and system integration makes the Photonics & Quantum Communication Laboratory a key European testing and development platform for future quantum and photonics technologies.

Find out more:

Technology Experience Lab (TX.Lab)

Analysis of Human-Machine Interaction

With the ongoing advancement of automation, the interface between humans and technology is becoming increasingly important. The Technology Experience Lab (TX.Lab) is an innovative research infrastructure for analysing and optimising human-machine interactions, which makes a significant contribution to the further development of interactive technologies. The lab offers a versatile environment for experimental studies and prototyping, enabling comprehensive exploration of user experiences and the development of new technological solutions.

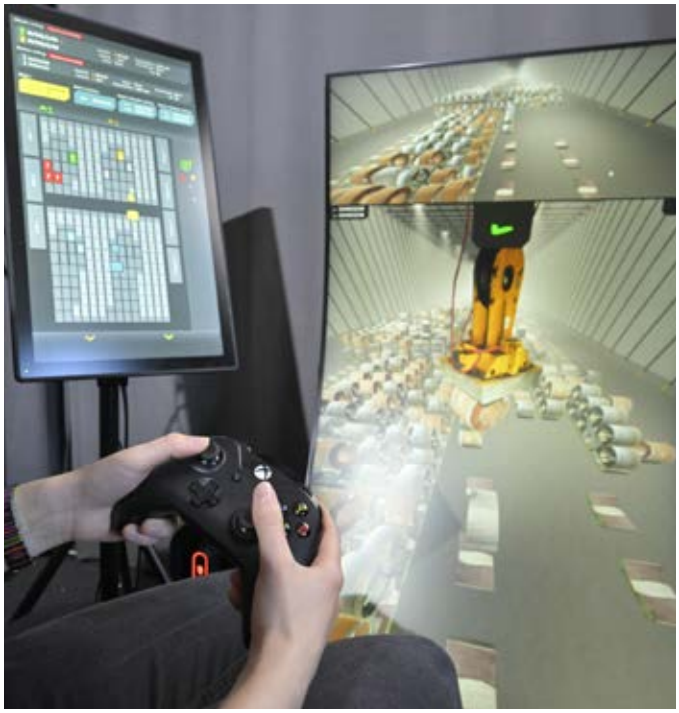
By integrating advanced methods such as biosignal measurements and eye tracking, the TX. Lab enables an in-depth investigation of cognitive processes, emotional reactions and ergonomic factors that are crucial for the design of intuitive and efficient technologies.

The lab encompasses various specialised research areas, including immersive environments for realistic simulations as well as flexible spaces adaptable to different usage scenarios. The XR (Extended Reality) infrastructure enables the testing and development of immersive training solutions using virtual and augmented reality technologies, supplemented by multisensory systems for haptic, olfactory, and tactile feedback. The biosignal equipment offers the ability to conduct detailed analysis of physiological reactions to various environmental influences and forms of interaction. A Maker.Lab and an Idea.Lab round out the infrastructure.

Through a user-centered research approach and interdisciplinary collaboration between scientists, developers and industry partners, TX.Lab creates an optimal environment for researching innovative interfaces and systems.

This is of particular importance for industries and thematic areas that rely on precise analyses of human behavior, such as the automotive industry, medical technology, industrial process control and digital educational technologies.

Interactive technologies make it possible to design products and applications that are more user-friendly, more powerful and safer.



The TX-Lab offers a versatile environment for experimental studies and prototyping to develop new technological solutions.

Find out more:

Machine Vision Lab

Optical Measurement and Inspection Systems

AIT's innovative technologies ensure reliable analysis of even complex object structures and surfaces.

The AIT Machine Vision Lab is a state-of-the-art research and development facility for optical measurement and inspection systems. It focuses on developing innovative technologies for non-contact, high-precision quality control and enables the precise measurement of both static and moving objects. With its high-performance inspection systems, the lab sets new standards in industrial image processing by ensuring reliable analysis of even complex object structures and surfaces.

A particular strength is the integration of AI-supported methods for data analysis, process control, and automation. This enables predictive quality control, allowing defects to be detected early and production processes to be optimized.

The lab offers a platform for the research and demonstration of cutting-edge optical inspection technologies that can be directly transferred to industrial applications. Thanks to its interdisciplinary expertise and close collaboration with partners from research and industry, the Machine Vision Lab makes a significant contribution to the development of high-precision, efficient, and resource-conserving production and inspection processes.

Through the continuous advancement of image processing technologies, the Machine Vision Lab supports a wide range of industries, including the electronics and metal industries, security printing, medical technology, and the automated inspection of infrastructure such as rail and road.

With its high-performance inspection systems, the lab sets new standards in industrial image processing.

Find out more:

City Intelligence Lab (CIL)

Research platform and planning tool for cities

It is becoming increasingly difficult for cities to adapt their infrastructure to future challenges such as climate change, urbanization, and sustainable energy supply, and to create sustainable urban living spaces. The City Intelligence Lab (CIL) is an innovative research platform focused on digital urban planning and resilient urban development. The lab offers state-of-the-art tools for interactive and data-driven urban design and has already gained international recognition.

A key advantage of the CIL is its combination of real-time simulations, AI-supported analytical methods, and parametric design, which enables urban planners, developers, and decision-makers to develop sustainable urban solutions. The interactive infrastructure includes projection walls, analog city models, and augmented reality technologies that allow for intuitive and collaborative planning processes. The AI-supported framework opens up extensive design possibilities through algorithmically supported simulations – such as the modeling of complex urban systems and their effects on various environmental, transportation, and energy parameters. This enables cities to address challenges in a targeted manner and make future-oriented decisions.

Through regular showcase events and collaborations with municipalities, planning firms, and the real estate industry, the Lab is actively involved in real-world urban development projects. This not only promotes the practical application of its new technologies but also strengthens its European position in the field of computer-aided urban planning.

With its unique combination of digital planning methods, AI, and interactive design, the City Intelligence Lab makes a decisive contribution to the development of livable, sustainable, and resilient cities.

The combination of projection walls, analog city models, and augmented reality technologies enables an intuitive and collaborative approach to planning processes.

Find out more:

Large-scale Robotics Lab

Automation of Industrial Machinery

The digitalization of the workplace and the automation of industrial machinery are intended to reduce the workload on employees, enhance the value of their tasks, and simultaneously increase productivity and safety in industrial processes. The AIT Large-Scale Robotics Lab is a specialized test facility on the Seibersdorf campus for testing and validating autonomous industrial machines in outdoor environments. With its unique test environment and interdisciplinary research approaches, the lab plays a key role in the development of autonomous systems under realistic operational scenarios.

Research focuses on the automation of industrial machines such as cranes and forklifts, which are intended to take over repetitive or hazardous tasks in the future. Numerous technological challenges must be overcome to achieve this automation. These include precise environmental recognition and interpretation, the development of intelligent control systems, and the optimization of human-machine interaction.

The test site in Seibersdorf offers ideal conditions for testing and further developing autonomous systems under realistic operational scenarios.

Research at the Large-Scale Robotics Lab helps alleviate the shortage of skilled workers in technical industries while simultaneously creating new, innovative solutions for the industrial deployment of autonomous machines.

Through close collaboration with companies and research institutions, the lab supports the development of safe and efficient automation technologies that are applied across various industrial sectors.

Find out more:

Solid State Battery Lab

Research and Development for the Batteries of the Future

State-of-the-art production processes, high-precision analysis and testing methods, and close collaboration with international research consortia enable innovations to be developed in a targeted manner toward market readiness.

High-performance energy storage systems are crucial to the energy transition. The European technology roadmap points to a clear trend toward fourth-generation solid-state batteries with energy densities exceeding 500 Wh/kg – a decisive breakthrough for high-performance, safe, and long-lasting energy storage systems. AIT plays a key role in driving these developments forward: The Solid State Battery Lab is a leading research and development infrastructure dedicated to the advancement of solid-state batteries as a key technology for energy storage. It serves as a major hub within European battery research.

The focus is on the processing of solid-state electrolytes that exhibit outstanding ionic conductivity and have the potential to significantly increase the performance of modern battery systems. A key objective of the lab is the development of new classes of materials that are both high-performance and scalable.

By improving the stability and safety of batteries, new application possibilities are opened up, particularly in electric mobility and stationary energy storage.

Through its high level of expertise, the Solid State Battery Lab supports industry in the implementation of sustainable and efficient energy storage solutions.

The research results are essential for the further development of electric mobility, renewable energy systems, and sustainable storage concepts, which are of crucial importance for the energy transition.

Find out more:

Heat Pump Laboratory

High-Tech Infrastructure for the Energy Transition

Heat pumps enable the highly efficient utilization of ambient heat and unused waste heat. They are therefore a central component of the energy transition. AIT supports this field not only with excellent research and development (see also pages 30 and 32), but also through a newly opened heat pump laboratory, whose test benches enable testing up to 100 kW of heating capacity under realistic conditions. With around 25 years of experience and more than 700 heat pump systems tested, AIT ranks among the leading European research institutions in this field.

"Facilities like AIT's new heat pump laboratory make an important contribution to promoting domestic innovation, strengthening industry, and positioning Austria internationally as a pioneer in sustainable energy technologies," emphasized Peter Hanke, Federal Minister for Innovation, Mobility and Infrastructure, at the laboratory's opening. According to Hanke, AIT acts as a strategic trailblazer, using its unique research infrastructure to enable cutting-edge development at an international level.

Specifically, the newly created laboratory infrastructure combines state-of-the-art test benches, simulations, and measurement methods, thereby enabling the development, quality assurance, and optimization of future generations of heat pumps. The facility also includes specialized equipment for acoustic optimisation. The focus is on air-source heat pumps – by far the dominant technology on the market – for all relevant refrigerant classes, including flammable refrigerants. The laboratory's scope of services specifically covers the growing market in the commercial and large-scale building sector.

Together with the Nordic countries, Austria plays a leading role in the heat pump sector in Europe and boasts a strong manufacturing and research landscape that holds its own in intense global competition. The new laboratory infrastructure is essential for industrial customers to develop and test innovative components and heat pumps.

AIT is thus strengthening Austria's role as a hub for innovation in climate-neutral heating technologies.

With this laboratory, AIT underscores its central role in the development of new technologies and strengthens the innovation ecosystem in Austria.

The new AIT heat pump laboratory is specifically designed to test systems for commercial and large-scale buildings.

Find out more:

SmartEST Lab and DC Lab

High-tech laboratories for sustainable power supply

The AIT DC Lab offers companies a state-of-the-art platform for the development, testing, and validation of DC components.

To develop and implement sustainable energy infrastructures, such as renewable energy grid integration and electromobility, AIT operates test environments that are one of a kind test environment.

AIT's SmartEST Lab is one of Europe's most advanced testing facilities for the development and validation of inverters, energy systems, and smart grid technologies. A key advantage is the ability to create realistic test conditions for various energy technologies.

The infrastructure enables, among other things, the testing and optimization of photovoltaic inverters, the validation of battery storage systems, and the simulation and testing of charging infrastructures for electric vehicles, including interoperability between vehicles, charging stations and power grids.

The SmartEST Lab is indispensable for manufacturers and developers aiming to bring innovative products to market faster, ensuring the energy infrastructure of tomorrow is both efficient and sustainable. Through close collaboration with industry partners, research institutions and grid operators, the lab makes a decisive contribution to the further development of smart grid technologies and decentralized energy systems.

Complementing this infrastructure, the AIT DC Labis a specialized research and testing environment for direct current (DC) technologies, which are becoming increasingly important in many areas, such as photovoltaics, electric mobility, vehicle electrical systems and industrial power supply systems. The lab enables the validation and optimization of DC components in high-performance test scenarios under real-world operating conditions. These comprehensive testing capabilities are crucial for ensuring the safety and reliability of DC switches, power converters and protection systems.

Industrial companies and research partners use the DC Lab to further develop their innovative products to market readiness. Through close collaboration with industry, energy suppliers, and research institutions, the AIT DC Lab is an essential component of the European innovation landscape in the field of direct current technologies and makes a decisive contribution to the safe, reliable, and sustainable power supply of the future.

Through close collaboration with industry partners, research institutions, and grid operators, AIT makes a decisive contribution to the further development of sustainable energy systems.

Find out more:

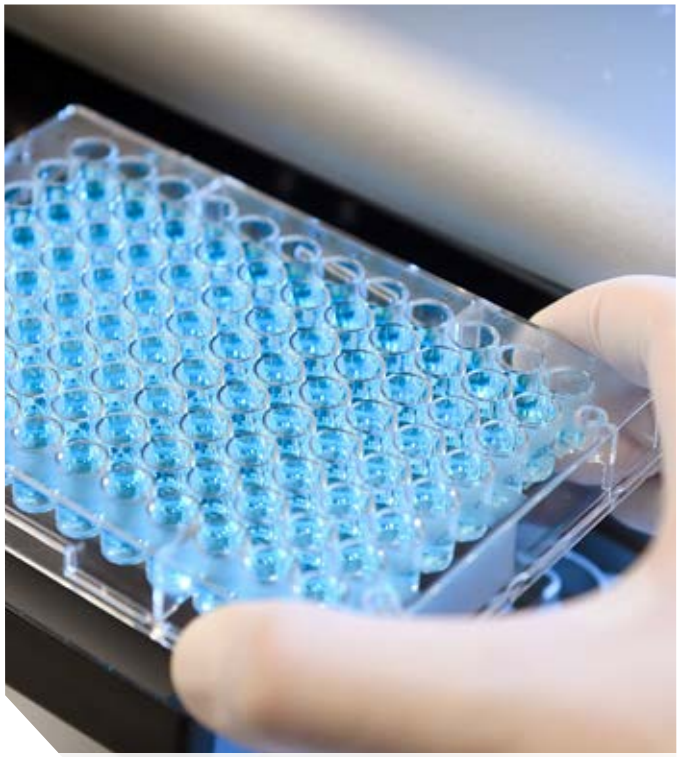
Find out more:

Laboratory Cluster for Biomarker and Assay Development

Precise Analysis of Biological Markers for Personalized Medicine

Precise analysis of biological markers is essential for the early detection of diseases, for future personalized medicine, and for biomedical research. With its modern infrastructure and interdisciplinary research, the AIT's Laboratory Cluster for Biomarkers and Assay Development makes a significant contribution to medical innovation, improved diagnostics, and patient-specific therapies.

The state-of-the-art research infrastructure, which is dedicated in particular to the discovery, validation, and development of innovative diagnostic assays, comprises several specialized laboratories: In the microarray laboratory, AIT experts focus on the production and analysis of high-resolution protein and DNA arrays for complex genetic studies. The sequencing laboratory enables the use of advanced sequencing technologies for targeted and genome-wide analyses. In the assay development and validation laboratory, real-time PCR and multiplex analysis systems are used to develop highly sensitive and parallel testing methods. And in the cell culture laboratory, biological barriers and cell interactions are studied using cell models under controlled conditions.



The state-of-the-art laboratory equipment combines high-throughput analyses, cell models, and bioinformatics data processing.

Thanks to a powerful IT infrastructure with high storage and computing capacities, large biomedical datasets can be efficiently analyzed and made available for research. This supports the integration of AI-based algorithms for the identification and validation of new biomarkers.

The precise characterization of biomarkers enables advances in medicine, pharmacology, and biotechnology research.

Find out more:

Climate Chambers in Tulln

Precision Research for Sustainable Agriculture

The state-of-the-art climate chambers at the AIT site in Tulln, incorporating advanced phenotyping capabilities, are used to study the effects of environmental conditions on crops. The research facility enables the precise simulation of various climatic stress factors, including drought, heat, flooding and cold, to develop solutions for adapting agriculture to climate change. With their unique combination of controlled environmental conditions, advanced phenotyping capabilities and AI-supported analysis, the Tulln Climate Chambers enable interdisciplinary research that makes an essential contribution to global food security, sustainable agriculture and adaptation to climate change.

Through the use of advanced multispectral sensors, imaging systems and AI-supported analyses, parameters such as plant growth, nutrient uptake and resistance to environmental stress can be recorded and evaluated in detail. This enables the identification of resilient plant varieties that deliver high yields even under extreme environmental conditions, as well as the optimization of agricultural cultivation methods for more efficient use of resources. Furthermore, new agricultural strategies can be developed that promote sustainable and climate-resilient production systems.

The climate chambers serve as a central platform for research and industry partners working to improve plant breeding as well as sustainable management and yield assurance. They offer the opportunity to directly translate new agricultural science findings into practice, enabling farms to benefit from the latest research results.

The climate chambers enable the precise simulation of various climatic stress factors, including drought, heat, flooding, and cold, to develop solutions for adapting agriculture to climate change.

Find out more:

The AIT climate chambers are unique in their combination of controlled environmental conditions, AI-supported analysis, and interdisciplinary research.

ORGANIZATION AS THE FOUNDATION FOR EXCELLENCE AND IMPLEMENTATION

Behind the successful technology development at AIT lie high-performing organizational and management structures that are specifically geared toward scientific excellence and technological implementation. In times of intense international competition, it is crucial to attract talent and experts from around the world and offer them attractive career prospects so they can effectively contribute their expertise to research and innovation.

Forward-looking and sustainable solutions emerge where a collaborative corporate culture and principles such as sustainability and diversity are consistently implemented.

OBJECTS YET TO BECOME #3

Nikolaus Gansterer

Find yourself a distinctive corner. Observe the shadows passing by. Carefully fill the corner with a gentle murmur. Stop before it spills over and head off.

People, Culture & Values at AIT

People as the Foundation for Excellence and Implementation

AIT's performance is built on the people who conduct research and translate technologies into practical applications. In the global competition for highly qualified professionals, the targeted recruitment, development and integration of talent are essential prerequisites for scientific excellence and sustainable impact.

Attracting and Effectively Integrating Talent

AIT relies on an internationally oriented and highly specialized recruitment strategy to bring together expertise from science and industry in a targeted manner. The focus is on filling key positions across the entire innovation chain – from early-career researcher and doctoral students to principal scientists and experienced industry experts.

A particular emphasis is placed on attracting international talent. Structured onboarding and integration processes support new employees even before they start work – for example with visa procedures and organizational matters – and enable a rapid transition into research and project work.

Structured Development and Competency Building

Clear career models and targeted development programmes create transparent and predictable career prospects. The institute's own career system comprises progressive levels and enables individual development paths aligned with scientific, technological, infrastructural and administrative profiles. Targeted training opportunities support systematic skill development – with a focus on scientific excellence, international networking and the ability to translate research results into innovation and application. In addition, entrepreneurial initiatives are promoted, for example through coaching programmes for spin-offs.

Excellence in Supporting Young Researchers

AIT's structured PhD programme provides targeted support to early-career researchers in their scientific and personal development. In cooperation with national and international universities, it combines in-depth specialized training with hands-on research in ongoing projects. Continuing education offerings in scientific writing, presentation and project work complement the training. At the same time, initiatives such as Young AIT promote institute-wide exchange and networking.

A special focus is placed on scientific integrity and entrepreneurship to systematically combine research expertise with innovation and application skills.

Culture, Values and Collaboration

AIT's corporate culture is based on clearly defined values that support collaboration, excellence and innovation:

- Courage & Curiosity
- Trust & Integrity
- Commitment & Impact
- Excellence & Foresight
- Appreciation & Collaboration

These values form the foundation for a performance-oriented and internationally focused work environment. They enable effective collaboration in interdisciplinary teams and support the implementation of complex research and innovation projects.

The continuous development of the organizational culture is regularly evaluated. In the 2025 employee survey, 85 percent of employees rated AIT overall as a "Great Place to Work". This result is an indicator of AIT's attractiveness as a work environment and the organization's performance.

Diversity as a Factor in Innovation

AIT views diversity as a key factor for innovation and excellence. The goal is to create a work environment in which diverse perspectives can be leveraged in a targeted and effective manner.

A comprehensive gender and diversity strategy ensures that fair, transparent and non-discriminatory conditions are implemented throughout the entire employee lifecycle. The approach is based on data-driven monitoring, clearly defined responsibilities and continuous improvement.

A particular focus is placed on increasing the proportion of women in top scientific positions and leadership roles. Measures such as targeted career development, unconscious bias training for managers and active networks contribute to strengthening an inclusive and high-performing organization.

Diverse teams make an important contribution to scientific performance, particularly when addressing complex and interdisciplinary issues. Different perspectives broaden the range of possible solutions and support the development of robust and application-oriented solutions at the interface between science and practice.

Find out more:

Sustainability Management at AIT

Technology as a Lever for Sustainable Development

AIT views sustainability as an integral part of its strategic direction. As an applied research institution, its core contribution lies in developing technological solutions that address environmental, economic and social needs. The goal is to enable scientifically grounded innovations for a resilient, competitive and sustainable economy.

The strategic orientation is guided by international and national frameworks, including the United Nations Sustainable Development Goals (SDGs) as well as relevant European and Austrian strategies. These are translated into concrete research programmes and roadmaps and form the basis for the further development of the AIT portfolio.

Research as a Key Lever for Impact

AIT's greatest lever for sustainable development lies in research. The portfolio addresses key challenges at the intersection of energy, industry, mobility, health and digitalization. In these areas, AIT collaborates with partners to develop solutions that can be deployed under real-world conditions and make measurable contributions to decarbonization, resource efficiency, security of supply and competitiveness.

Integration into Organization and Operations Sustainability is also systematically embedded in AIT's internal processes. These include sustainable procurement, energy-efficient infrastructure, climate-friendly mobility and clear governance structures within the management system and compliance guidelines.

In day-to-day operations, the focus is on reducing greenhouse gas emissions, particularly in the areas of buildings, mobility and procurement. Measures include improving energy efficiency, the gradual replacement of fossil fuels and the integration of sustainability criteria into decision-making processes.

Regular greenhouse gas accounting forms the basis for the further development of climate protection measures and the long-term path toward net-zero emissions. Sustainable measures are also evaluated along the supply chain in collaboration with partners.

Sustainability as an Organizational Principle

In addition to research and operations, sustainability is also an integral part of organizational development. AIT creates framework conditions that support responsible action, long-term thinking and the development of sustainable solutions.

These include transparent processes, clear responsibilities and the embedding of sustainability principles in management systems, the code of conduct and internal guidelines. The goal is not to view sustainability in isolation, but to systematically integrate it into research, operations and the organization.

In-depth analysis and transparency

Further information, key figures and detailed measures are documented in the AIT Sustainability Report.

At the AIT Campus Seibersdorf, around eight hectares of green space have been converted into natural meadows, providing a habitat for many native plant and insect species.

Find out more:

artloop – Art as a Space for Insight and Innovation at AIT

Artistic Perspectives and Methods as an Extension of Research and Innovation

> The arts must be taken no less seriously than the sciences as modes of discovery, creation and the expansion of knowledge in the broad sense of advancing understanding.
>
> Nelson Goodman

Goodman's understanding is evident in the drawings by Nikolaus Gansterer presented in this report. Starting from scientific diagrams, they develop independent visual thought processes that do not merely illustrate the report's themes but carry them forward. In conjunction with the artist's accompanying instructions, open, experimental spaces emerge that enable alternative approaches to complex issues. The works reflect the artloop approach, in which artistic methods at AIT function as an independent form of thinking and research.

With the artloop programme, AIT specifically anchors artistic perspectives and methods in research, communication and organizational development. Art is understood not merely as a supplement, but as an independent pathway to knowledge and innovation. Artistic approaches open up new perspectives on complex issues and expand the methodological scope of research and development to include experimental and reflective processes. They support interdisciplinary collaboration and help to challenge established ways of thinking and enrich innovation processes.

As a platform, artloop brings together existing art-related approaches at AIT, makes them visible and develops them further. This includes artistic interventions, workshops and training sessions on art-based methods – for example in the areas of research, presentation and storytelling. A particular focus is on internal impact: artloop creates spaces for exchange, reflection and new forms of collaboration. The programme further positions AIT as a partner for projects in the arts and culture sector and for the use of art-based methods in other projects.

ARTLOOP
BY AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

Flagship Project

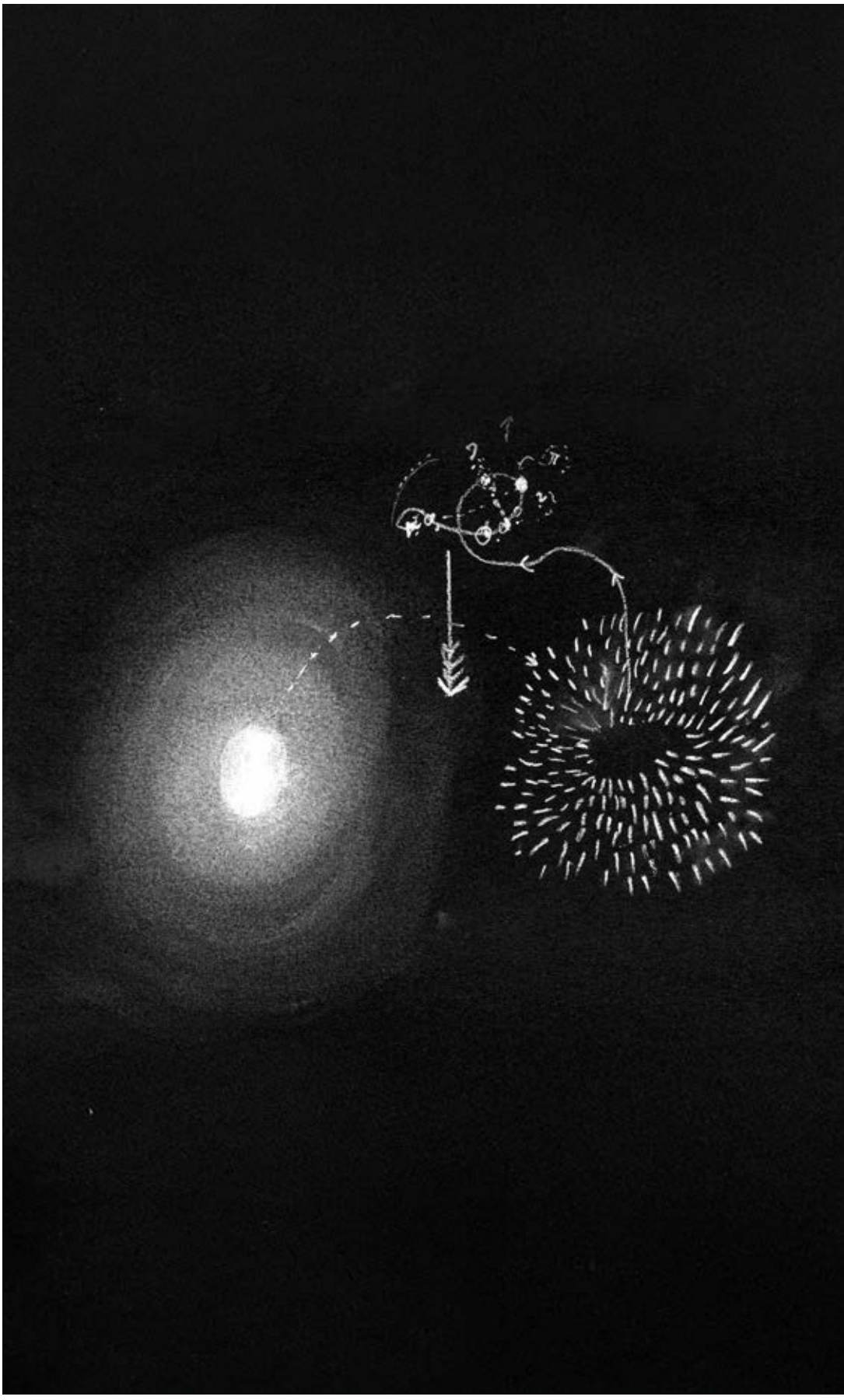
The large-scale work in the AIT foyer at Giefinggasse 4 by Chiara de Eccher translates AIT's vision and purpose into an artistic perspective on the future of industry and society. The work was created with the involvement of employees and reflects the institute's core values and directions of development. The mural is also accessible digitally and interactively at www.ait.ac.at

© esel.at

The mural in the foyer of the AIT headquarters (Vienna, Giefinggasse 4) makes the AIT's key areas of activity tangible.

Artist talk:

Find out more:



OBJECTS YET TO BECOME #7

Nikolaus Gansterer

Choose a strong light source (flame, bulb, sun ...). Stare at it for one minute. Close your eyes to see the afterimage. Formulate a question. Whilst blinking widly place it gently on your blind spot.

AIT by the Numbers (2025)

Performance, Impact and Position at a Glance

Economy & Market

Strong demand from industry and the public sector

€ 230 m
operating revenue

€ 141 m
in research contracts with partners

€ 78.9 m
contract research from industry and the public sector

Leading role in European research programmes

€ 93.2 m
EU funding from Horizon Europe[1]

159
Horizon Europe projects[2]

Continuous expansion of infrastructure and state-of-the-art laboratories

€ 15.7 m in investments in infrastructure and laboratories

Research & Quality

Excellent research with strong international and industrial networks

685
scientific publications[3]

65.5 %
of publications with international research partners

47 %
of publications with industry and practice partners

267
publications in leading international journals[4]

82.8 % of journal publications in leading journals[5]

Innovation & Transfer

Consistent translation of research into applications and business start-ups

9
successful spin-offs[6]

10
patents granted

53 invention and intellectual property applications[7]

1 3rd place in Austria by funding volume
2 2nd place in Austria by number of projects
3 Full-paper peer-reviewed publications, of which 369 in scientific journals and 316 in conferences
4 Indexed journal publications in SCIE, SSCI and AHCI – Web of Science
5 Percentage of indexed journal publications in the top 25 % (Q1 according to CiteScore)
6 Start-ups based on AIT technologies in recent years

Systemic Impact & Visibility

High international visibility and active contribution to standards and committees

238 positions in international standardization committees

21
leadership roles in standardization committees

371
expert roles in national and international committees

Active knowledge transfer to academia, industry, and the public

342 invited presentations in academia and industry[8]

People & Organization

International and diverse teams as the foundation for excellent research

1,678
employees at AIT

57
nationalities represented

33 %
percentage of women in the organization

Close cooperation with universities and industry in academic training

165
doctoral students

50 %
of whom are international

56 % in cooperation with industry and practice partners

Culture & Work Environment

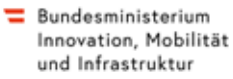
A trusting work culture and equal treatment in practice

85 %
view AIT as a great place to work[9]

90 %
experience fair and equal treatment[10]

7 Employee inventions and intellectual property filings, including quality-assured open-source contributions
8 Of these, 165 at scientific conferences and institutions and 177 for industry and public organizations
9 Results of an anonymous employee survey conducted as part of the international Great Place to Work® certification, based on trust, fairness and work culture
10 Percentage of employees who confirm that the AIT Code of Conduct regarding fairness and equal treatment is adhered to regardless of origin, gender, age or working hours

We would like to thank the following sponsors in particular for the projects listed in this report:



The project descriptions in this Impact Report explicitly name those funding organisations that can be clearly assigned to the respective projects. In addition, numerous other funding organisations and partners from business, industry and science make an important contribution to the further development of the research topics.

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