
HUNGARY

Artificial intelligence-driven research for society and the economy

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Key takeaways

- The Hungarian research community has recognized the strategic importance of AI and is actively engaging in international scientific and industrial collaborations, achieving significant results in both theoretical and applied research.
- One of the objectives of Hungary's AI strategy for 2025–2030 is to make the country a regional leader in AI development and application.
- Universities have adopted measures to address the challenges posed by AI and machine learning in higher education and research. Institutional strategies and internal regulatory frameworks governing the responsible use of AI have been developed.
- The Hungarian Research Network (HUN-REN) plays a central role in coordinating and advancing AI research in Hungary.
- The National Laboratory system plays a pivotal role in coordinating and funding Hungary's AI research, as well as in promoting the economic and societal utilization of its outcomes.

Hungary's AI strategy 2025–2030 aims to provide a research and innovation environment that will enable Hungary to become one of the leading AI hubs in the region over the next decade. The government places special emphasis on ensuring that the benefits of AI are accessible to all citizens. The strategy identifies three key priority areas: AI for society, AI for technology and AI for business (Hungarian Government, 2025).

In recent years, the government has implemented a comprehensive transformation of the national system of scientific research and higher education institutions. These reforms have, in many instances, redefined the legal status, governance structures, organizational frameworks, operational models, management mechanisms and funding arrangements of institutions. They have also had a considerable impact on both domestic and international cooperation. Parallel to these structural changes, the government has introduced significant

adjustments in state funding and grant support schemes for research, development and innovation. The Government's John von Neumann Programme aims to enable universities and research institutions to harness the potential of AI and machine learning, while fostering stronger synergies with economic actors.

AI in higher education

Universities have adopted a wide range of measures to address the challenges posed by AI and machine learning in higher education and research. Institutional strategies and internal regulatory frameworks governing the responsible use of AI have been developed, in line with a 2024 amendment to higher education legislation. Through the revision of curricula and examination procedures, universities seek to embed AI applications into teaching and learning processes, maintaining a strong emphasis on critical thinking, academic integrity and personal accountability.

All universities, within their respective capacities, are investing in the development of AI-related infrastructure. This includes enhancing internal computational resources, participating in national infrastructure programmes and joining European initiatives aimed at facilitating access to large-scale computing and data resources.

Leading universities play a key role in advancing AI-related research ecosystems. There are also notable examples of collaboration between universities and industrial partners, including the BOSCH Department at Eötvös Loránd University and the Richter Department at Semmelweis University. These efforts are supported by various national laboratories, which provide dedicated funding and institutional frameworks for research. Some universities have successfully extended their AI ecosystems to the European level; for instance, Eötvös Loránd University acts as the consortium leader of the AI-EDIH (European Digital Innovation Hub for Artificial Intelligence). In terms of technology transfer and applied innovation, universities are establishing advisory and consultation centres to ensure that small and medium-sized enterprises have access to the necessary scientific expertise and support services.

AI and educational innovation

Universities are introducing multi-layered educational innovation programmes to systematically address the implications of AI for teaching and learning. Most universities have also established comprehensive institutional regulations that define the ethical, data protection and compliance frameworks for AI use in education.

AI-related courses and modules have become increasingly widespread across degree programmes. A dynamic and constructive competition has emerged among universities and faculties to be the first to introduce specialized AI-related curricula. For example, the Budapest University of Technology and Economics currently has 148 courses that either use AI-based tools or focus on AI research. The university has also co-developed a Human-Centred AI programme in partnership with 14 European universities.

The integration of AI into university life has also driven organizational and institutional innovation. AI applications are used to optimize university governance, management and decision-making processes, often supported by targeted research and development

projects. The inherently interdisciplinary nature of AI fosters more horizontal collaboration across disciplines, complementing traditional vertical academic structures. As a result, AI-specialized departments and research centres have been established, and under the national AI strategy, several university-based AI knowledge centres have been established. In parallel, continuing education and lifelong learning programmes now offer a growing number of AI-focused qualifications and professional development pathways.

AI in university research

At major Hungarian universities, research themes and outputs have become increasingly diverse and multidisciplinary. The expanding range and intensity of AI-related research – conducted within universities, research networks and industrial innovation ecosystems – illustrate the growing strategic importance of AI in the national research, development and innovation landscape. These activities are closely linked to doctoral training and the development of early career researchers, both of which have experienced substantial growth in recent years (Benczúr et al., 2025).

Researchers and doctoral candidates working outside the core AI disciplines are also increasingly integrating AI-based tools, analytical methods and data-driven approaches into their research. This trend raises significant regulatory, ethical, methodological and organizational challenges for the broader research ecosystem, including funding agencies, evaluation bodies and science–policy organizations.

National laboratories

Distinct components of the national AI research landscape are national laboratories operating in a consortium format. These thematic research structures, which bring together multiple research institutions, often designate universities as lead partners or consortium coordinators (Benczúr et al., 2025).

All universities and research centres participating in AI-related national laboratories maintain close cooperation with the Artificial Intelligence National Laboratory (MILAB), which holds a central coordinating role in Hungary’s AI ecosystem. They are also active members of the Hungarian AI Coalition (MI Koalíció). Several universities additionally chair working groups within the Coalition or act as subproject leaders within MILAB, thereby contributing directly to the implementation of Hungary’s national AI strategy.

AI research at HUN-REN: Integrating ‘science for AI’ and ‘AI for science’

Hungarian Research Network (HUN-REN) plays a central role in coordinating and advancing AI research in Hungary. Through its institutes and strategic programmes, HUN-REN contributes significantly to theoretical AI foundations, applied AI solutions and cross-disciplinary research (HUN-REN, no date).

HUN-REN’s approach to AI in research is built on the dual principle of advancing ‘science for AI’ – developing new AI methods through fundamental research, and ‘AI for science’ – applying AI to accelerate discovery across disciplines. This integrated philosophy ensures that AI research is not an isolated technological field but is well-embedded in the

scientific ecosystem of HUN-REN. The connection between these two directions is realized through HUN-REN's three-level Intelligence Framework: Augmented intelligence: AI enhancing scientific capability; Automated intelligence: AI scaling scientific workflows; and Autonomous intelligence: AI as a partner in discovery.

Research at HUN-REN plays a significant role in pushing the boundaries of AI as a scientific discipline. Launched in 2023, the AI4Impact programme is HUN-REN's flagship initiative designed to accelerate AI adoption across scientific disciplines and strengthen Hungary's position in AI-enabled research. It aims to create a structured approach to integrating AI, from education and awareness to applied problem-solving and frontier experimentation.

Research for AI applications

In recent years, the Hungarian research community has made extensive contributions to the scientific and industrial advancement of AI. The application spectrum is remarkably broad, encompassing medicine, manufacturing, transportation, telecommunications, agriculture, energy, chemical and pharmaceutical development, construction, public administration, customer service, cybersecurity and AI for science (Benczúr et al., 2025).

In health care, AI-based systems support the early detection and treatment of cardiovascular and oncological diseases, improving diagnostic accuracy, enhancing care efficiency and reducing costs. In ageing research, Hungarian scientists have uncovered connections between the microbiome and ageing processes and developed epigenetic models to measure biological age – supporting medical innovations aimed at slowing ageing.

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In manufacturing and industry, intelligent, machine-learning-based solutions are used for production optimization, predictive maintenance and automated quality control. In transportation, AI-driven traffic management and autonomous vehicle technologies improve safety and reduce environmental impact.

In telecommunications, AI supports network traffic prediction, fault detection and resource optimization, enhancing both efficiency and service quality. In agriculture, precision farming applications – such as yield estimation, early detection of plant diseases and soil monitoring – increase sustainability and productivity.

In energy research, AI contributes to energy consumption forecasting, renewable energy integration and smart grid management, promoting sustainable energy use. In the chemical and pharmaceutical industries, AI facilitates molecule design, quality assurance and accelerated development processes.

In construction, AI-supported project management and structural analysis technologies enhance design and execution efficiency. In customer service and public administration, natural language processing chatbots, speech recognition systems and automated document processing improve service quality and reduce administrative burdens.

In cybersecurity and data protection, Hungarian researchers are developing trustworthy, transparent and auditable AI systems that enhance algorithmic safety and reduce technological risks.

Looking ahead, Hungary aims to advance computer vision, speech-to-text, text-to-speech and natural language processing research towards generative AI, building on strong foundations in mathematics and learning theory.

References

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