

The Use of Artificial Intelligence in Healthcare



Co-funded by
the European Union

What is AI?

Artificial Intelligence (AI) emerged in the 1960s at Stanford University. In 1972, the MYCIN software was developed here, which diagnosed likely diseases based on symptoms and test results. Today, AI represents computer technology that simulates human intelligence and helps perform various tasks.

How does AI work?

AI evolves through the use of large amounts of quality data. In the process of training a neural network, AI takes on various mathematical constraints and strives to closely approximate real data.

Machine Learning – Training the Neural Network

The process by which the network of “virtual” neurons learns based on provided input data to assign weights to individual connections, so that the calculated probable data differ as little as possible from the actual output values obtained.

Why Should We Use AI in Healthcare?

AI simplifies administrative processes, increases the efficiency of resource use, addresses the partial shortage of healthcare workers, and reduces healthcare costs. It also improves diagnostic accuracy, optimizes therapeutic solutions, and enables predictive analysis of disease progression and treatment response. Thanks to AI, we are moving towards personalized medicine and improving the availability of healthcare.

What are the risks of using AI?

There are legal constraints (e.g., GDPR), the risk of bias in algorithms, issues with so-called „Black box“ systems where it is unclear what is happening inside the AI, and the risk of undue reliance on AI, which can lead to a reduction in the qualification of healthcare personnel. Other challenges include integration with existing IT systems and the costs of implementing and maintaining AI systems

EU Legislation Governing the Use of AI

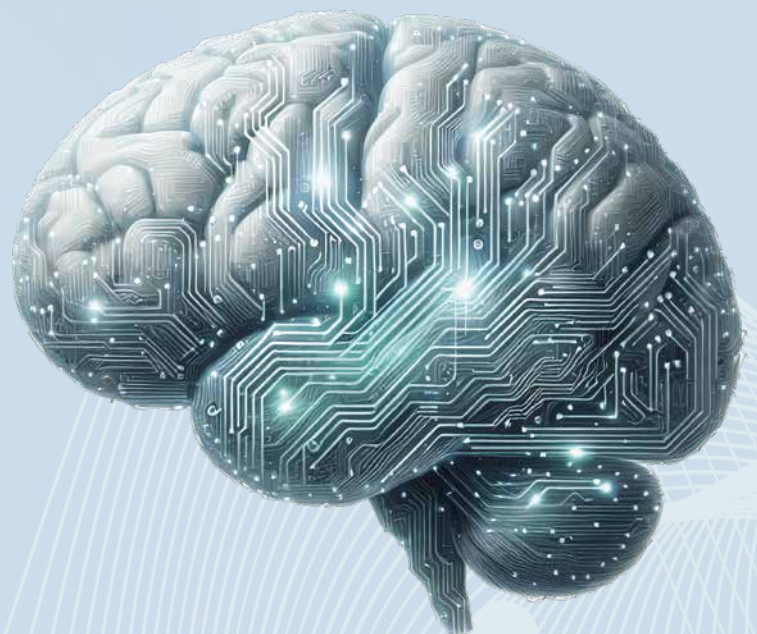
From May 2024, artificial intelligence tools are categorized into four risk groups. The use of AI tools in medicine falls into the third group.

AI Tools in Healthcare

In healthcare, artificial intelligence is a key tool that helps improve diagnostics, treatment, and care efficiency. Important ways it is used include:

[*EU AI Act: first regulation on artificial intelligence*](#)

- 1. Diagnostic AI algorithms** - AI can analyze medical images (such as MRI, CT, and ultrasounds) and other health data to quickly and accurately identify diseases, allowing doctors to make faster and more accurate diagnoses.
- 2. AI in treatment planning** - Based on the diagnosis, AI assists in creating personalized treatment plans, analyzes clinical data and previous treatment outcomes, which leads to more effective resource use and increases the chances of treatment success.
- 3. Robotic surgery** - AI-assisted robotic systems increase the precision of surgical procedures, enable the performance of less invasive operations, shorten patient recovery time, and reduce the risk of complications.



Example of AI Use in Various Medical Specialties

SURGERY

The use of AI in surgical fields brings several significant benefits. One of the key applications is the recording of tool trajectories in space and time during operations, which, together with haptic feedback, allows for precise monitoring of tool movements and their interaction with tissues in real time. This technology increases the accuracy of surgical procedures and reduces their invasiveness, contributing to faster patient recovery and reducing the risks associated with surgery.

During operations, AI systems enhance patient safety by providing timely warnings and recommendations based on the results of perioperative imaging studies. This information helps surgeons make informed decisions at critical moments. Another area where AI plays an important role is in preoperative preparation and training of operators. Thanks to simulated scenarios, surgeons can share experiences and develop surgical skills.

RADIOLOGY

Radiology was one of the first disciplines where AI found its place, thanks to its enormous capacity for processing imaging data, such as X-rays, MRIs, or CT scans. AI in radiology helps distinguish between different medical conditions, identify abnormalities, and even predict the likelihood of future health issues. Algorithms significantly improve the accuracy of diagnoses and reduce the time needed to establish them, contributing to faster and more effective patient treatment.

SONOGRAPHY

In sonography, examinations navigated by artificial intelligence are possible, where AI provides visual guidance on how to handle the probe and at what angle to hold it. The entire examination process is recorded and thoroughly analyzed, which increases the accuracy of examinations and allows doctors to better understand the patient's condition. AI also makes it possible to automatically identify and classify various tissue structures, making the diagnostic process more effective.

ENDOSCOPY

During endoscopy or colonoscopy, AI helps highlight potentially problematic lesions. The use of AI increases the overall accuracy of diagnostics and assists in the rapid identification of potential risks, thus enhancing the effectiveness of prevention and treatment.

PATHOLOGY

Digitalized pathology transforms traditional pathology by digitizing tissue samples into high-resolution images for computer analysis. This process enables faster and more accurate diagnostics, improves collaboration among pathologists, and introduces advanced technologies, such as artificial intelligence, to enhance diagnostics.

OPHTHALMOLOGY

In ophthalmology, AI is primarily used for diagnostics. Through the analysis of imaging data, it can diagnose diseases such as diabetic retinopathy or age-related degeneration.

