

APPLICATION SCENARIOS FOR AI

With Artificial Intelligence against Cancer

Starting Point

Cancer is the second leading cause of death in Germany after cardiovascular diseases. A tumour in the lung is one of the most common types of cancer, with only around one in five patients surviving the first five years after diagnosis.

In the future, doctors will be able to draw upon Artificial Intelligence (AI) to combat lung cancer – from the initial screening and diagnosis to treatments and follow-up care. For patients, this will open up new, personalised and highly effective treatment options that will significantly improve their prognosis.

Application scenario

It's 2024 and Anton Merk (65) has developed lung cancer. He is one of the first patients to be treated using a medical AI assistance system. In the future, all attending physicians will be able to use this technology – for screening, diagnosis, treatment and even follow-up care. Mr. Merk and other patients will therefore have a much greater chance of survival and recovery.

Screening

Mr. Merk has an appointment with his family doctor. She has access to his digital patient records, which – as consented to by Mr. Merk – contain information about previous illnesses and other matters such as his past smoking habits. The AI-based assistance system she is using to access this data recommends a medical check-up by a lung specialist.

Diagnosis

Mr. Merk goes to see a lung specialist, who performs a computerised tomography (CT) scan on his lungs. The AI assistance system also helps the lung specialist, this time in assessing the CT images. After the scan and further examinations in a lung clinic, the doctors have reached a diagnosis – he has lung cancer.

Treatment

The AI assistance system reviews the findings and recommends surgery to remove the tumour. Lung specialists, oncologists, radiation therapists and surgeons set up for a consultation team – known as a tumour board – and recommend that Mr. Merk should undergo the operation. An AI-based navigation system assists the surgeons

during the procedure. Everything goes well and afterwards Mr. Merk discusses with the lung specialist looking after him what medication he should take. The specialist consults the AI assistance system, which predicts how successful different treatments would be based on comprehensive guidelines, the genetic characteristics of the tumour and study results from across the globe. Together, Mr. Merk and the specialist opt for the form of chemotherapy expected to strike the optimum balance between effectiveness and side effects.

Donating Data

The treatment is a success. Mr. Merk would like the data collected over the past few months to be added to his digital patient records. This will ensure his illness and the treatment he received are documented in full, enabling doctors to detect potential abnormalities early on in the future. As he has also agreed to make a voluntarily data donation, his information will be anonymised and provided to researchers in compliance with data protection laws, which will help increase the chances of recovery for future lung cancer patients.

Benefits

Self-learning systems such as this AI assistance system designed to fight cancer will revolutionise patients' treatment and significantly improve their prognosis.

- **Successful treatment:** Early diagnosis and more personalised treatments ensure better outcomes.
- **Safety:** Doctors can make better decisions by accessing additional information about the patient concerned together with globally available medical data.
- **Gaining knowledge:** Artificial Intelligence gives doctors access to rapidly expanding medical knowledge, ensuring that the latest findings are shared more quickly throughout the professional community.
- **Efficiency:** Access to electronic patient records and support during diagnosis and treatment enables doctors to make the right decisions faster.

Challenges

The following questions need to be answered before comprehensive use can be made of AI-based assistance systems to help treat cancer patients:

- **Data protection:** How is personal data to be treated and protected?
- **Transparency:** How can predictions by AI systems be made transparent and comprehensible?
- **Acceptance:** How can trust in AI assistance systems be built among patients and doctors?
- **Liability:** Who is liable if the systems were ever to make an incorrect assessment?

What needs to be done?

The following steps are necessary if this application scenario is to become a reality within a few years:

- Introduction of a secure database as a central access point for physicians and patients
- Competence building for physicians, medical staff and service providers on medical AI technologies
- Creation of a regulatory framework for the approval of AI-based medical devices

The application scenario "With Artificial Intelligence against Cancer" was developed by the Health Care, Medical Technology, Care Working Group of Plattform Lernende Systeme. You can find multimedia reports about this application scenario at www.plattform-lernende-systeme.de



Legal notice

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