1000 DIAGNOSES PER SECOND: FASTER THAN ANY DOCTOR!

Will or should AI systems eventually replace doctors? They are certainly already able to detect certain diseases.

This learning station is a simplified example of how AI systems can detect certain diseases in MRI scans. Such systems have been in use in Germany for several years.

Here is how AI systems for the analysis of MRIs work:

1. The system is trained with MRI scans of a particular disease.
2. After extensive training, it recognizes the key features of a disease.
3. and provides appropriate hints or suggestions to the doctors.

MRI

= Magnetic Resonance Imaging

An MRI produces high-resolution, detailed cross-sectional images of, for example, the brain or internal organs. This is done using strong magnetic fields.

The advantage: The system can process thousands of MRI images much faster than any human, in a very short time. This relieves radiologists of routine tasks and improves diagnostic capabilities.

The use of AI systems in medicine is increasing. The benefits to humans are obvious. However, if AI systems take over more and more work, then doctors will have less practice and may lose important skills that are important for their profession (e.g., recognizing skin cancer).

What do you think?
What are the reasons for using AI systems in medicine?
What are the risks? Discuss with other students.

AI Systems & Medicine - A Love Story?!

More and more diseases can be diagnosed with the help of algorithms - not only through MRIs but also in other ways - including Multiple Sclerosis, vascular diseases, or brain tumors.

The use of AI systems in medicine is one of the major research topics at the University of Erlangen-Nuremberg. Numerous interdisciplinary projects between the Technical and Medical Faculties, together with Siemens Healthineers and other industry partners, are developing new applications. MRI systems are also part of this research. So, we can expect to see many new ideas and applications of AI systems in medicine in the future, improving medicine for us all!

Which diseases are depicted on the MRI sans at this learning station? Here is the solution:

a: Disease of blood vessels in the brain
b: Metastasis (cancer)
c: Brain disease which, e.g., can trigger epilepsy
d: Multiple Sclerosis (MS)
e: Disease of blood vessels coating in the brain
f: Stroke

If you want to know more about the diseases depicted on the MRI images at this learning station, check out the next page.

Attention: Medical jargon!

a: Confluent Microangiopathic Lesions

A pathogenic alteration and dysfunction of the small blood vessels in the brain, where the exchange of substances with the surrounding body cells occurs.

In summary: a disease of the blood vessels in the brain.

b: Metastasis

When a tumor spreads cancer cells to other parts of the body forming new cancerous tissue, these tissues are referred to as metastasis in oncology (cancer medicine).

c: Tuberous Sclerosis

This autosomal dominant hereditary disease is associated with malformations and tumors of the brain, skin changes, and usually benign tumors in other organ systems. It often frequently triggers epileptic seizures and cognitive disabilities.
In summary: Hereditary disease in the brain which, among other things, trigger epilepsy.

d: Multiple Sclerosis (MS)

This chronic inflammatory neurological autoimmune disease attacks the myelin sheaths that cover nerve fibers in the central nervous system (CNS). Numerous inflammatory foci develop in the white matter of the brain and spinal cord. The disease has very different progressions. Some patients suffer from visual impairment, while others experience progressive loss of the ability to walk.

e: Enlarged perivascular spaces

These spaces, also known as Virchow-Robin spaces (VRS), are perivascular, fluid-filled cavities around perforating arteries and veins in the brain parenchyma. They typically are about 5 mm in diameter in healthy individuals. These spaces may have an immunological function but broadly play a dispersal role for neural and blood-derived messengers.
In summary: Disease of blood vessels coatings in the brain.

f: Cadasil

This autosomal dominant cerebral arteriopathy with subcortical infarcts and leukoencephalopathy is a genetic disorder. It can lead to familial strokes in middle age. In contrast, a classic stroke is usually caused by arteriosclerosis.
In summary: Stroke caused by a genetic mutation.

SOURCE

Research at University Erlangen-Nuremberg to AI Systemen in Medicine

https://www.ki.fau.de/ki-in-der-medizin/

AI-MRI-Project of Universitätsklinik Dresden

https://www.uniklinikum-dresden.de/de/presse/aktuelle-medien-informationen/mit-kuenstlicher-intelligenz-mrt-verlaufs-und-therapiekontrolle-der-multiplen-sklerose-optimieren

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https://healthcare-in-europe.com/de/news/selbstlernende-ki-analysiert-mrt-daten.html

Informations for diseases

https://medlexi.de/Mikroangiopathie

https://de.wikipedia.org/wiki/Metastase

https://de.wikipedia.org/wiki/Tuber%C3%B6se_Sklerose

https://de.wikipedia.org/wiki/Multiple_Sklerose

https://de.abcdef.wiki/wiki/Perivascular_space

https://de.wikipedia.org/wiki/CADASIL