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ELNET

GIHF-AI STUDY 2.0

Artificial Intelligence and Digital Health: Applications and Framework Conditions

An overview of AI-based areas of application for citizen-centered solutions and their current opportunities and challenges

SCAN FOR MORE INFORMATION

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1. Background

In global business news, the technological innovation “artificial intelligence” (AI) is already being described as one of the most significant achievements since the invention of the steam engine. What specific and foreseeable approaches are emerging for digital solutions for citizens and patients? The number of scientific publications on the subject of AI has been growing exponentially in recent years. First AI-based applications in the health context for citizens are finding their way into healthcare at different speeds in a growing number of countries. Nevertheless, AI in medicine is still in the phase of testing, evaluation, regulation, and approval.

Against this background, the German Israeli Health Forum for Artificial Intelligence (GIHF-AI) publishes this AI digital health mapping, a compact overview of functional application areas of AI within citizen- and patient-centered solutions, and provides an exemplary overview of the numerous challenges still present in evaluation and integration.

2. Methodology

The investigation of the status quo of leading AI-based solutions in Europe and Israel was carried out in two steps:

1. Filtering of population applications based on an expanded market database of digital healthcare solutions from EPatient Analytics (n=410) since 2014.

2. Trend assessments and exemplary AI use cases were created by 31 experts from Germany, Israel, Belgium, Switzerland, Denmark, France, Finland, and Spain. This expertise was collected through direct or telephone interviews between April and June 2024.

3. The market situation

The status quo of digital health applications for citizens and patients indicates that a paradigm shift is necessary. Three global health-tech trends already perfectly align today and offer numerous application possibilities in healthcare. These include: devices for vital data measurement, data and AI, specific applications like ChatGPT.

Chatbots, which are easy to use and accessible worldwide, have seen rapid adoption. Wearable health monitors that measure current vital data and communicate with these chatbots provide well-informed recommendations. These technologies can significantly enhance the efficiency of health systems, especially considering the aging population and the shortage of skilled professionals.

ChatGPT, which is also used for health-related queries, reached approximately 1,8 billion users worldwide just a year and a half after its launch in 2022. By comparison, Facebook took about 13 years to achieve similar user numbers.

These developments highlight the significant advancements and potential of AI and digital solutions in healthcare. The following sections outline the most promising application areas for AI-based solutions for citizens and patients.

4. The fields of application

INFORMATION AND EDUCATION

This field encompasses diverse offerings, which are either proactively used by users for information retrieval on health-related questions or include campaigns for health education and competence building. AI-based solutions can, for example, support the national scaling of content understandability and personalization as well as quality assurance in multiple languages.

Sundhed (DK): *Due to an increase in inquiries from the Danish population during the COVID-19 pandemic, the Danish eHealth portal sundhed.dk implemented the live chat and chatbot from SupWiz to provide faster and qualified answers nationwide and to relieve staff by handling standardized questions.*

SUPWIZ

EXAMPLE

PREVENTION

The areas of vaccination and prevention, early detection of diseases, and screening for common illnesses, as well as lifestyle optimizations, are exemplary measures from primary or secondary prevention. These concrete strategies and solutions are increasingly supported and redesigned by AI. For example, the development of increasingly accurate wearable technologies for vital data measurement combined with personalized recommendations via chatbots enables new approaches in these fields. Particularly, the integration of these solutions with health insurance companies and local service providers – as opposed to stand-alone solutions – is being observed in initial steps in an increasing number of countries.

Preventicus (D): *Preventicus seeks and detects undiagnosed atrial fibrillation and identifies significant major risk factors for strokes solely using a smartphone and subsequent telemedical care.*

PREVENTICUS
RHYTHM IS LIFE

EXAMPLE

SYMPTOMS AND SYMPTOM CHECKER

The increasing development of mostly digitally freely accessible symptom checkers using Large Language Models (LLMs) is one of the most notable developments in this field worldwide. Solutions are to be distinguished here between those that are freely accessible and not automatically medically certified, and those that are certified or integrated into the healthcare system (payers, providers).

Leumit (ISR): *The Israeli Health Maintenance Organization Leumit has been using the FeelBetter solution to offer smartphone-based assessment of poly-pharmacy and suggest drug therapy changes. Here, AI-based solutions are linked with data from scientific publications and patient data from electronic health records.*

feelbetter

EXAMPLE

DIGITAL NAVIGATOR AND CARE COORDINATION

The basic idea in this broadly adaptable application is the situation-independent control, education, and interaction possibility for and with patients from the request for a doctor's appointment through the entire treatment to follow-up care (care coordination). This can encompass many use cases: digital anamnesis, triage, prioritization of appointments, or the education and adjustment of prescribed analog and digital therapies based on digital patient data from healthcare providers. Worldwide, this increasingly takes shape as "copiloting": Chatbots collect data from patients and provide feedback, while healthcare professionals are involved in therapy decisions in parallel.

docyet (D): *The chatbot navigator software connects medical practices, clinics, and insurance companies to guide patients through complex care processes and efficiently offer services and communication based on partner data.*

DOCYET

EXAMPLE

DIAGNOSIS

AI in diagnostics currently represents one of the broadest and most frequently discussed fields. Pure human factual knowledge increasingly reaches a critical limitation within the constantly growing number of approximately 60,000 ICD diagnoses (incl. codes and synonyms). With AI-supported structured data collection and classification of patient data combined with international expertise and treating physicians, not only can diagnoses be made more accurately in the future, but medical research can also be evaluated more quickly and integrated into care.

Idoven (ESP): *Cardiovascular patients can be treated more accurately and efficiently with wearable-based remote monitoring approaches and AI in diagnostic and therapeutic decision support. In case of any changes in values, they can be appropriately referred to the optimal provider (outpatient, inpatient).*

IDOVEN

EXAMPLE

THERAPY

In two fields, AI-based therapy applications are particularly shaping up: certified chatbots in the field of mental health and decision-making and support for medically prescribed therapy (often medications and the avoidance of adverse drug interactions, which currently account for approximately one-fifth of hospital admissions in Germany). For example, the AI application, by linking with the electronic health record as well as current vital data from wearables, can provide patients with instructions for dosage adjustments or potential medication interactions, also focusing on self-medication.

Clalit (ISR): *The Israeli Health Maintenance Organization Clalit enables faster and individually tailored therapy recommendations for specific patients by linking patient data in the digital record with current medical guidelines and AI-based analyses in coordination with treating physicians.*

CLALIT HEALTH

EXAMPLE

CARE AND AFTERCARE

The caregiving sector is both the most personnel-intensive and one of the sectors most affected by the shortage of skilled workers in terms of quantity and demand. AI support can be found in areas such as caregiving administration, digital assistants for family caregivers, and even robotics in residential care. Especially for those who are still independently active, digital navigators, sensors (also in the Home-Care Connected Home segment), and chatbots offer good use cases.

Caspar Health (D): *Sensor-supported digital rehabilitation coaching together with medical personnel in inpatient rehabilitation and care facilities is the core approach of Caspar Health. Following a surgical procedure, patients are guided by rehabilitation specialists on-site to continue their rehabilitation program digitally, regardless of location and time, even after their rehabilitation stay.*

CASPAR

EXAMPLE

POTENTIAL

The potential for AI is extremely diverse and growing almost daily. The following two dimensions illustrate the obvious potential indicators:

Dimension 1: Economic investments
In 2023, the healthcare industry worldwide invested $13 billion in AI technologies. According to forecasts, this amount will quadruple by 2028. Nvidia, one of the global leaders in AI chip technologies, has quadrupled its market value since the launch of ChatGPT. Financial and tech metrics clearly indicate where the future of AI is headed.

Dimension 2: Public Health and Social Security Systems
Given the global challenge of 10 million missing healthcare professionals, increasing international migration, and the resulting strain on national social and healthcare systems, multilingual, certified chatbots represent one of the most cost-effective and pragmatic solution scenarios at the national level.

NO GOOD AI WITHOUT GOOD DATA

Whether the data needed for AI models in the near future are based on an open or closed data paradigm is currently uncertain, although increasingly important. In principle, publications on this topic demonstrate the benefits for science and research of open and unbiased data paradigms. For example, the Human Genome Project is an open data project. However, politics and regulation currently show occasionally contradictory trends. While patients should have access to the European Health Data Space, providers of AI-based medical products certify their applications with partially closed data paradigms.

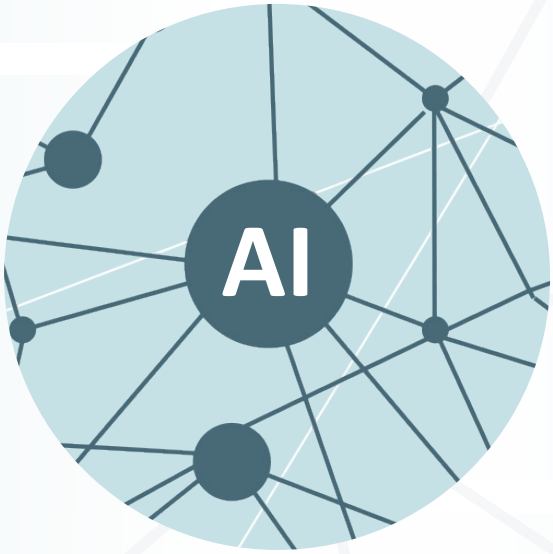
5. Framework conditions

AI COMPETENCE

”Elements of AI“ is an online course on Artificial Intelligence that was launched in Finland in 2018. Since its launch, one out of every hundred Finns, and approximately 1 million users worldwide, have completed this course. Finnish employers systematically train their employees with this course offering. Examples like these illustrate the need as well as the prerequisites for promoting AI in the medical work environment, as well as its diffusion in the general population and among particularly vulnerable groups, where greatest need arises in the future .

RESEARCH AND INNOVATION

Factual knowledge is increasingly reaching a critical human limitation, especially with the constantly growing number of known ICD-10 diagnoses (incl. codes and synonyms: approximately 60,000). AI applications can evaluate innovations and scientific questions more quickly and advance medical innovations. An AI expert on this: ”AI is not a compensation for lacking professionals but a logical evolution and decision support.“.



INTEGRATION INTO THE HEALTH SYSTEM

The FDA (Food and Drug Administration, USA) has so far approved 882 AI-based medical products. AI-supported medicine enables less device-intensive, earlier, and more accurate diagnoses, saving both technology usage and the time of healthcare professionals. This is particularly important in underserved regions. Nevertheless, integrating AI-based applications into a heavily regulated healthcare system is not easy. The economic incentive system is often focused on curative rather than preventive measures, although data-based AI globally tends towards prevention. The benefits of AI-based solutions increase exponentially with broader data access. The AI-supported therapy scenarios in Israel demonstrate how linking Public Health Record (PHR) and Electronic Health Record (EHR) data with AI solutions can lead to measurable improvements in outcomes. However, different data standards are often encountered, and their integration is not automatically guaranteed.

REGULATION AND POLICY

The hurdles for integrating AI in medicine are extremely complex. Decision-makers may have concerns regarding a new paradigm that ”does not exclusively involve humans in therapy decisions.“ Additionally, actor interests within a specific healthcare system and its incentive structures can present barriers to the integration of AI into care, especially if they contradict existing incentives. In short: Is AI compatible with our healthcare system? State-centralized or privately operated systems may have fewer difficulties in this regard than social insurance-based systems, as predominant in Germany.

6. Recommendations for action

The presented examples demonstrate how diverse and beneficial AI-based solutions are in medicine. To ensure the trust of the population and medical personnel in the use of AI, innovation-promoting regulation is necessary. The expert panel of this project agrees that the EU AI Act is heading in the right direction, but is far from sufficient to meet the scope of AI. For example, there is a lack of concrete action perspectives for the interaction of electronic health records, patient data, and artificial intelligence, as well as their effects on interoperability and collaboration between the numerous providers of health IT. Adjustments should be made at the European and national levels in this regard.

Furthermore, politics and industry associations welcome opportunities to reduce bureaucracy for medical professional groups through the use of AI, especially against the backdrop of the increasing shortage of skilled professionals and the unfavorable ratio of administrative time to patient time. This assessment is clearly shared.

The creation of spaces for exchange, learning, and design is considered particularly relevant to foster sustainable interdisciplinary dialogue (for example, as an economic or innovation hub in Germany). In the healthcare sector, various stakeholders such as business (especially SMEs), research, politics, regulators on one hand, and AI entrepreneurs/innovators on the other hand can collaboratively exchange ways for implementation and feasibility sustainably. An example of this could be the new agency paradigm of gematik. The often complex mutual dependencies in healthcare, especially in Germany, should be collectively, on an equal footing, yet decisively and agilely shaped in the context of AI in health.

Moreover, increased communication about application examples of AI-based digital health solutions is recommended to further trust and deepen health literacy of the population and decision-makers.

About

GIHF-AI, a multi-year program funded by the German Federal Ministry of Health, aims to advance the digitalization of the German healthcare system, with a special focus on the application of Artificial Intelligence (AI) and Machine Learning (ML). Networks are established, and policy recommendations are developed for this purpose.

The European Leadership Network (ELNET) serves as a think tank and network organization in the context of European-Israeli relations. ELNET was founded in 2007, operates independently and across party lines, and has offices in Berlin, Brussels, London, Rome, Tel Aviv, and Warsaw. Its focus areas include foreign and security policy, antisemitism, and innovation.

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Sources

Bundesministerium für Gesundheit (D), Similarweb, The Economist (digital archive, full access: search terms: health + ai, 2023-2024), World Health Organisation, The World Bank