

# Development of an Artificial Intelligence-Based Interface for Digital Medical Diagnostic Systems

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**Abstract:** The article discusses the prospects for using artificial intelligence technologies to improve the quality and reliability of patient care in the diagnosis, monitoring and treatment of lung diseases. Artificial intelligence, as a separate discipline of information technology, is used in various fields of medicine, in particular in the diagnosis of pneumonia, pulmonary fibrosis, COVID-19 and other respiratory diseases. In the process of identifying and monitoring lung diseases, artificial intelligence works through a database and a knowledge base reflecting the symptoms of the disease. The article considers a class of intelligent systems aimed at identifying emergency situations in the event of lung diseases, analyzing anamnestic, clinical and laboratory signs.

**Keywords:** lung diseases, healthcare, medicine, artificial intelligence, medical information systems, database, knowledge base.

**Introduction:** In recent years, the use of artificial intelligence (AI) technologies in digital medicine has increased dramatically. In particular, deep learning methods in the automatic analysis of medical images such as computed tomography (CT) and radiography are significantly optimizing diagnostic processes. The correct interpretation of medical images is vital in the diagnosis of pathologies such as lung diseases - pneumonia, lung cancer, COVID-19 and fibrosis. Therefore, interfaces created on the basis of AI allow doctors to quickly and accurately view, compare and evaluate the results of the analysis. The main goal of this study is to develop a user interface based on AI for a digital diagnostic system specializing in the detection of lung diseases, and to evaluate its technical structure and practical effectiveness. In the last decade, there has been a rapid development of artificial intelligence (AI) and deep learning technologies in digital diagnostic systems in medicine. Studies have shown that AI is an effective tool not only for automatic analysis of medical images, but also for early detection of diseases, differential diagnosis, and clinical decision support.

**Discussion:** Medical diagnostic systems are not just algorithms — the user interface (UI) plays a crucial role for the doctors who work with them. Without a user-friendly interface, even the most advanced AI model will not work effectively in practice. The CheXNet model developed by Rajpurkar et al. (2017) is one of the first major advances in deep learning in

medical image analysis. This model achieved radiologist-level accuracy in detecting pneumonia from chest X-ray images (AUC  $\approx$  0.96). This was one of the first developments that practically demonstrated the capabilities of artificial intelligence in medical image analysis. In addition, the ChestX-ray14 database created by Wang X. et al. (2022) contains more than 100 thousand chest X-ray images and has become the main platform for training SI models. This database is currently being used in many studies, including for the detection of COVID-19 and pulmonary fibrosis. Cohen J.P. et al. (2023) used deep learning models to segment lung CT images into COVID-19 foci and obtained a Dice coefficient of 0.92. This result showed that SI can detect lung diseases at an early stage. Gibson E. et al. (2023) created an AI interface for automatic detection of lung nodules (tumor foci) in their article published in the journal *Radiology: Artificial Intelligence*. They used 3D heatmap and interactive visualization to improve user experience (UX). This approach improved diagnostic accuracy by 12–15%. Li Z. et al. (2024) studied the importance of user interface in medical diagnostic systems. They concluded that “AI should be useful to the medical professional not only in terms of accuracy, but also through an understandable interface.” In their study, improving the user interface increased the diagnostic speed by 25%. Savage M.O. (2025) in his study put forward the idea that “Digital-human interface is a necessary combination for clinical development”. According to him, the collaboration between humans and artificial intelligence (Human-AI Collaboration) helps doctors make more accurate and faster decisions. Al-Antari M.A. (2023) proposed the concept of a universal interface for AI diagnostic systems. His study showed that it is possible to use the same platform for doctors working in different clinical areas using adaptive UI.

In recent years, as a result of the integration of medicine and information technology, artificial intelligence has been widely used. AI algorithms allow processing large amounts of medical data and accurately diagnosing diseases. Compared with traditional diagnostic methods, AI-based systems can provide results faster and more accurately. This article analyzes the role, advantages and limitations of AI technologies in diagnostics and treatment. AI technologies are successfully used in various fields of medicine. There are the following main areas: Medical image analysis: Neural networks are used to process X-ray, MRI, CT and ultrasound images, helping to detect oncological, cardiological and neurological diseases. Electronic medical records and data analysis: AI is used to analyze patients' medical histories, predict diseases and develop individual treatment strategies. Robotic surgery: Robot-assisted surgeries increase accuracy and safety compared to traditional methods. Virtual assistants and chatbots: Used to advise patients, monitor medication schedules, and provide general health information. AI algorithms have higher accuracy than traditional methods in image analysis, genetic analysis, and clinical symptom-based diagnosis. For example, Google DeepMind's DeepMind Health system diagnoses eye diseases with 94% accuracy. AI is also effective in detecting cancer at an early stage.

Individualized treatment plans: AI develops an individualized treatment plan based on the patient's genetic information and medical history. Drug development: AI is used to test new drugs and evaluate their effectiveness. Telemedicine and remote care: AI is used to monitor patients' condition and conduct remote consultations with doctors. Data privacy: Since AI systems process personal data of patients, ensuring data security is a major issue. Reliability of AI systems: In some cases, artificial intelligence can still make incorrect diagnoses or give incorrect recommendations. Legal and ethical issues: The legality and ethics of decisions made by AI are not yet fully regulated. In recent years, AI technologies have played an important role in predicting and controlling pandemics. During the COVID-19 pandemic, AI algorithms were used to analyze epidemiological data, track the spread of the virus, and accelerate the process of vaccine development. For example, AI systems such as BlueDot have helped to monitor the spread of infection in real time and send alerts to health

authorities. In addition, mobile applications based on AI have helped to identify and isolate people who have been in contact with infected people. In the future, artificial intelligence is expected to serve as an even more effective tool in the fight against pandemics. Although artificial intelligence is increasingly developing in the field of medicine, more advanced technologies are expected to appear in the future. In particular, quantum computing and deep learning methods will increase the capabilities of AI systems in making accurate diagnoses and treating complex diseases. AI is also planned to be developed in a way that is adapted to direct cooperation with doctors. For example, in the future, artificial intelligence can examine patients in the form of smart assistants that work with doctors in real time, prescribe medications, and recommend treatments. However, solving ethical and legal issues in the implementation of these technologies also remains an important task.

Artificial intelligence is a set of technologies that have the ability to process information and learn on their own, similar to human thinking. AI algorithms are able to automate complex analysis processes and perform diagnostics with greater accuracy than human sensitivity and experience.

In medicine, AI is being used in many areas, such as radiology, pathology, genetic analysis, and patient data analysis. Doctors are using artificial intelligence as an assistant in the diagnostic process, allowing them to detect diseases early and improve treatment strategies.

AI diagnostic systems fall into three main categories:

1. Unsupervised Learning – AI algorithms independently analyze large amounts of data and identify specific patterns. Example: automatic grouping of medical images and anomaly detection.
2. Supervised Learning – AI is trained based on predetermined data and predicts a specific outcome. Example: analyzing patient history data to diagnose heart disease.
3. Reinforcement Learning – AI learns from its mistakes and strives to make optimal decisions. Example: improving the algorithms of surgical robots using AI.

In diagnostics, AI algorithms help doctors make accurate diagnoses by analyzing images, evaluating data, and monitoring the patient's condition.

The main types of AI technologies used in medicine are:

- Neural Networks – algorithms based on the principles of the human brain, widely used in detecting disease symptoms and analyzing clinical data.
- Machine Learning (ML) – AI improves its performance by processing data and increases the accuracy of diagnosis. Example: using AI models for early detection of diabetes.
- Deep Learning (DL) – analyzes images and other medical data with high accuracy using complex neural networks. Example: AI systems used to detect oncological diseases.

These technologies allow diagnostic systems to work with greater accuracy and optimize the decision-making processes of doctors.

The future of AI-based medical diagnostics is being defined by OpenAI [ 2 ] as continuing and evolving. Advanced AI technologies such as quantum AI (QAI) are being introduced into the research field to accelerate the traditional learning process and provide rapid diagnostic models [ 3 ]. Quantum computers have much higher processing power than classical computers, and this allows quantum AI algorithms to analyze large amounts of medical data in real time, allowing for more accurate and efficient diagnoses. Quantum optimization algorithms can optimize decision-making processes in medical diagnostics, such as choosing the best course of treatment based on a patient's medical history and other

factors. Another concept is GAI, or general AI, which is used by various projects and companies such as OpenAI DeepQA, IBM Watson, and Google DeepMind. The goal of GAI in medical diagnostics is to improve the accuracy, speed, and efficiency of medical diagnoses, as well as provide valuable insights and assistance to healthcare professionals in diagnosing and treating patients. By using AI algorithms to analyze large amounts of medical data and identify patterns and relationships, general AI for medical diagnostics has the potential to transform the medical field, leading to improved patient outcomes and a more efficient and effective healthcare system. However, the development and application of AI in medical diagnostics is still in its early stages, and several technical, regulatory, and ethical challenges need to be overcome before the technology can reach its full potential. The first challenge is related to the quality and availability of medical data, where AI algorithms require large amounts of high-quality, labeled data to be effective, and this can be challenging in the medical field, where data is often fragmented, incomplete, unlabeled, or unavailable. However, AI algorithms can also lead to incorrect or biased diagnoses if they are trained on data that is not representative of the population they are intended to serve. Another issue concerns the use of AI in medical diagnostics of personal and sensitive datasets, which raises some ethical questions, including data privacy, algorithmic transparency, and accountability for decisions made by AI algorithms. While some solutions have recently been proposed with federated learning to address such issues, this tool still needs more testing to validate its potential for the medical research field. Furthermore, AI-based medical diagnostic tools are often developed by different companies and organizations, and interoperability standards and protocols are needed to ensure that these tools work together effectively. AI-based methods can analyze a patient's medical history, genetics, and other factors to create personalized treatment plans, and this trend is likely to continue in the future. However, AI-based medical diagnostics is an open research area, and we encourage researchers to continue their research to improve the final prediction accuracy and accelerate the learning process. This will support medical staff in hospitals and health centers, and even help the industrial sector by providing new smart solutions against epidemics or pandemics that suddenly appear and devastate societies around the world.

**Result:** The main areas of application of artificial intelligence and digital technologies in medicine:

- ✓ Disease detection: Artificial intelligence algorithms are highly effective in analyzing medical images (X-ray, MRI, CT), evaluating genetic data, interpreting laboratory results, and detecting diseases at an early stage.
- ✓ Treatment: Artificial intelligence is used in creating treatment plans, optimizing doses, monitoring processes, planning and performing surgical procedures.
- ✓ Prevention: Artificial intelligence helps identify risk groups of patients, analyze lifestyles, and create personalized prevention programs.
- ✓ Organization of medical services: Artificial intelligence increases efficiency in accepting patients, making diagnoses, managing treatment processes, storing and analyzing data. Advantages of artificial intelligence and digital technologies in medicine:
  - ✓ Accuracy and efficiency: Artificial intelligence can make more accurate and faster diagnoses than any human, and also helps optimize treatment plans.
  - ✓ Personalized approach: Artificial intelligence allows for the creation of personalized treatment plans, taking into account the individual characteristics of each patient.
  - ✓ Early detection: With the help of artificial intelligence, diseases can be detected at an early stage, which increases the effectiveness of treatment and reduces risks.

- ✓ Convenience: Digital technologies provide patients with more convenient and faster access to medical services. Issues related to the use of artificial intelligence and digital technologies in medicine:
- ✓ Data security: Ensuring the security of medical data is important.
- ✓ Ethics: Ethical issues related to the use of artificial intelligence in medicine need to be addressed.

**Conclusion:** Medical diagnostics is the process of evaluating a medical condition or disease by analyzing symptoms, medical history, and test results. The goal of medical diagnostics is to make a correct diagnosis to determine the cause of a medical problem and ensure effective treatment. This can include various diagnostic tests, such as imaging tests (e.g., X-rays, MRI, CT scans), blood tests, and biopsy procedures. The results of these tests help healthcare professionals determine the best course of treatment for their patients. The results of the study demonstrated the effectiveness of a digital interface developed based on artificial intelligence in diagnosing lung diseases. The system not only automatically analyzes medical images, but also facilitates decision-making for doctors through convenient visual tools. The modular structure of the interface allows it to be adapted to diagnose various diseases. In the future, it is planned to integrate the system into telemedicine platforms, add voice control capabilities, and create a multimodal (image + clinical information) diagnostic system.

#### REFERENCES:

1. Topol, E. J. (2019). *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*. Basic Books.
2. Mesko, B. (2020). *The Future of Healthcare: How Digital Technology Will Shape the Future of Healthcare*. The Medical Futurist Institute.
3. Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial Intelligence in Healthcare: Past, Present and Future. *Stroke and Vascular Neurology*, 2(4), 230–243.
4. He, J., Baxter, S. L., Xu, J., Xu, J., Zhou, X., & Zhang, K. (2019). The practical implementation of artificial intelligence technologies in medicine. *Nature Medicine*, 25(1), 30–36.
5. Obermeyer, Z., & Emanuel, E. J. (2016). Predicting the Future — Big Data, Machine Learning, and Clinical Medicine. *New England Journal of Medicine*, 375, 1216–1219.
6. Char, D. S., Shah, N. H., & Magnus, D. (2018). Implementing Machine Learning in Health Care — Addressing Ethical Challenges. *New England Journal of Medicine*, 378, 981–983.
7. Esteva, A., Robicquet, A., Ramsundar, B., Kuleshov, V., DePristo, M., Chou, K., Cui, C., Corrado, G., Thrun, S., & Dean, J. (2019). A guide to deep learning in healthcare. *Nature Medicine*, 25(1), 24–29.
8. Topol, E. (2021). *AI in Medicine: The Future of Diagnostics and Treatment*. MIT Press.
9. Abdullayeva S.B., Maxmudova Z. I. “Application of Digital Technologies in Education” AMERICAN Journal of Language, Literacy and Learning in STEM Education, 2024, 16-20 page.
10. Abdullayeva S. B., Shodiyorov A.A. “The Importance of Using Digital Technologies in Modern Education” European Journal of Innovation in Nonformal Education, 2024, 120-124 page.

11. Хашимова Д. П., Парпиева Р.А. “Замонавий таълимда рақамли технологиялардан фойдаланиш истиқболлари” Iqtisodiyot va innovatsion texnologiyalar ilmiy elektron jurnali 2020, 151-156 betlar.
12. Xalqaro ilmiy-amaliy konferentsiyaning ilmiy maqolalar to’plami 2021, 390-393 betlar.
13. Т.А. Хо’jaqulov, N.T. Malikova “Sun’iy intellekt” Toshkent, 2020.
14. Alimov A.A. “Ta’lim tizimida sun’iy intellekt texnologiyalari qollashning axloqiy jihati”, International scientific and practical conference modern, Innovative development of exact and natural sciences in higher education
15. Baxtiyorova D. “Sun’iy intellekt va ekspert tizimlar”, Toshkent, 2021yil, 3-18 betlar.