

Chapter 17

AI and IoT Applications in Medical Domain Enhancing Healthcare Through Technology Integration


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ABSTRACT

The medical industry has undergone an upheaval because of AI and IoT-based technologies, which have substantially improved patient care, diagnosis, treatment, and healthcare administration. The accuracy, efficiency, and connectedness of medical processes have all improved as a result of the integration of AI and IoT devices, leading to better overall healthcare results. In the medical field, expanding the integration of AI and IoT technology has enormous potential for strengthening patient experiences, tailoring healthcare results, and simplifying healthcare procedures. In-depth information about the use of AI and IoT technologies in the medical field is presented in this chapter. It looks at how developments in AI and IoT technology are anticipated to influence healthcare in the future, opening the door for better patient care, improved diagnostics, and more potent treatment alternatives. Overall, this study gives readers a thorough knowledge of how AI and IoT are reshaping the medical industry and determining the direction of healthcare in the future.

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1. INTRODUCTION

Artificial intelligence (AI) and the Internet of Things (IoT) are two interconnected scientific topics that have had a big influence on a lot of organizations, including the healthcare industry (Mozumder MA et al 2022). Artificial intelligence (AI) refers to the development of computer systems that are capable of doing tasks that usually require human cognition, such as understanding natural language, seeing patterns, making decisions, and learning through experience (Castiglioni I et al 2021). Deep learning, machine learning, natural language processing, and computer vision are all included. The Internet of Things (IoT), on the other hand, is a network of networked items that are outfitted with connections, software, sensors, and other characteristics to enable data collection and sharing. These technologies may range from everyday products like smart home appliances, office equipment, and wearable technology to specialized medical gear used in healthcare institutions (Khang & Rana et al., 2023).

When AI and IoT come together, they forge a potent synergy that creates a wealth of opportunities across several sectors, including healthcare. AI and IoT technologies provide smart, associated systems in healthcare that enhance patient care, diagnosis, treatment, and healthcare administration (Lu ZX et al 2021). A few significant uses are:

- **Remote patient monitoring:** Wearable sensors and other IoT devices may gather real-time health data, allowing for remote monitoring of patients' vital signs, activity levels, and other health factors. By analyzing this data, AI systems enable healthcare professionals to spot abnormalities, foresee health hazards, and take prompt action.
- **Improved diagnosis:** AI algorithms examine medical pictures including X-rays, MRIs, and CT scans to help doctors make precise and effective diagnoses. This comprises picture segmentation algorithms that separate various anatomical features for examination and computer-aided diagnostic (CAD) systems that assist in abnormality detection.
- **Personalized medicine:** To provide personalized treatment choices, AI systems examine patient data, including genetic details, medical histories, and treatment results. This makes precision medicine possible, allowing for the customization of medicines to a patient's unique traits, improving efficacy and minimizing side effects.
- **Clinical decision support:** By examining patient data, medical literature, and clinical guidelines, AI-powered decision support systems help healthcare workers make well-informed judgements. These systems provide suggestions that are supported by data, which helps to decrease mistakes and increase patient safety.
- **Smart healthcare facilities and hospitals:** IoT technology improve resource allocation, asset monitoring, and energy management in healthcare environments. Workflows are streamlined, patient safety is increased, and operational efficiency is increased with connected systems. Real-time location systems for tracking medical equipment and sensors for keeping an eye on the surroundings are two examples.
- **Predictive analytics:** AI systems examine massive amounts of patient data to find patterns and trends that allow for the forecasting of disease outbreaks, patient deterioration, and healthcare resource requirements. This facilitates resource allocation, proactive interventions, and better planning and decision-making.

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