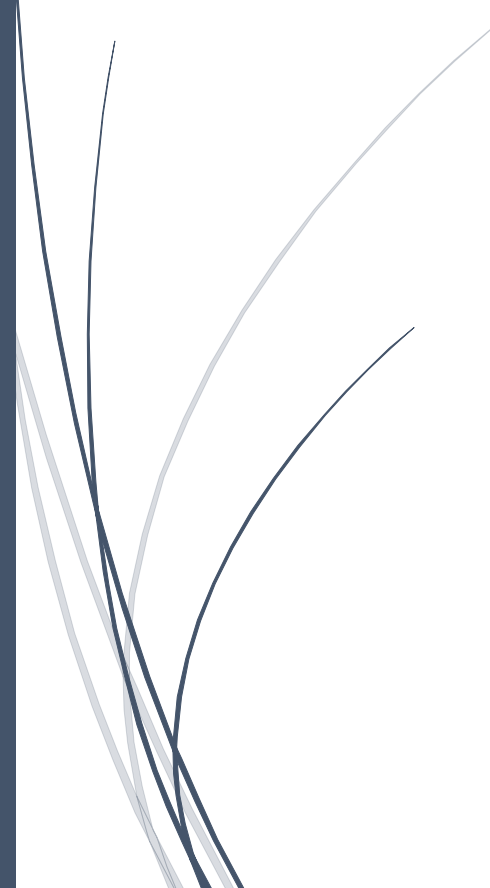


The logo for RADemics, featuring the text "RADemics" in white on a blue arrow-shaped background pointing to the right. The arrow is part of a larger blue horizontal bar that is attached to a dark blue vertical bar on the left side of the page.

RADemics

IoT and Cloud Infrastructure for Remote Health Monitoring with AI Based Decision Making

A decorative graphic consisting of several thin, curved lines in shades of blue and grey, originating from the bottom left and extending upwards and to the right, resembling stylized grass or reeds.

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IoT and Cloud Infrastructure for Remote Health Monitoring with AI Based Decision Making

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Abstract

The convergence of the Internet of Things (IoT), cloud infrastructure, and artificial intelligence (AI) has revolutionized remote health monitoring, enabling real-time, intelligent, and data-driven medical decision-making. This book chapter explores an integrated framework where IoT-enabled medical devices, sensor networks, and cloud-based analytics collaborate to deliver continuous patient monitoring and predictive healthcare solutions. The study emphasizes the role of advanced AI and machine learning algorithms in risk stratification, anomaly detection, and early warning systems that ensure timely clinical interventions and improved patient outcomes. Edge and fog computing architectures are discussed as critical components for reducing latency and enhancing real-time processing capabilities in distributed healthcare networks. The integration of energy-efficient medical IoT devices with cloud and AI platforms ensures sustainable and scalable health data management while maintaining data security and interoperability. Through detailed analysis of data analytics, predictive modeling, and real-time stream processing, this chapter highlights the transformative impact of digital intelligence on remote healthcare systems. The proposed framework supports precision medicine, adaptive clinical workflows, and proactive disease management, contributing to the evolution of resilient, accessible, and intelligent healthcare ecosystems for the future.

Keywords: Internet of Things (IoT), Cloud Computing, Artificial Intelligence (AI), Remote Health Monitoring, Predictive Analytics, Edge-Fog Integration.

Introduction

The integration of the Internet of Things (IoT), cloud infrastructure, and artificial intelligence (AI) has transformed healthcare into a dynamic, data-driven ecosystem capable of delivering continuous, real-time, and personalized medical care [1]. The growing prevalence of chronic diseases, the global demand for remote health services, and the increasing need for predictive clinical decision-making have accelerated the adoption of intelligent health monitoring systems [2]. IoT-enabled medical devices and sensors generate extensive physiological and behavioral data

that, when processed through cloud-based analytical frameworks, provide actionable insights for healthcare professionals [3]. The combination of AI algorithms with IoT-generated data enhances diagnostic accuracy, facilitates early disease detection, and supports proactive health interventions [4]. This transformation marks a paradigm shift from traditional, reactive healthcare models to intelligent, preventive, and patient-centric care systems [5].

The foundation of remote health monitoring lies in the seamless integration of IoT devices with cloud and edge computing platforms, enabling the continuous collection, transmission, and analysis of patient data [6]. Wearable sensors, biomedical implants, and remote diagnostic tools communicate with cloud-based servers that store and process large volumes of medical data in real time [7]. This interconnected network ensures that healthcare providers have constant access to accurate and up-to-date patient information, supporting timely decision-making and improving overall treatment outcomes [8]. AI-driven data analytics within these systems enhance the ability to detect anomalies, predict health risks [9], and recommend personalized interventions, thereby increasing the efficiency and precision of modern healthcare delivery [10].

The advancement of edge and fog computing technologies has further optimized the processing and analysis of health data by minimizing latency and improving response times [11]. By distributing computational capabilities closer to the data source, these architectures allow for immediate anomaly detection and alert generation in critical scenarios such as cardiac irregularities or respiratory distress [12,13]. This local processing capability ensures uninterrupted patient monitoring even in regions with limited network connectivity [14]. The integration of AI algorithms at the edge and fog layers empowers medical devices to operate autonomously, perform real-time decision-making, and contribute to intelligent healthcare infrastructures that prioritize patient safety and operational efficiency [15].