

# **IoT in COVID-19 Management with Focus on Diabetic Patients**

Submitted in fulfillment of the requirements for the  
degree

Master of Science in Artificial Intelligence

Midocean University, UAE

**1.1 Name:** Sami Lotfi Almaghrabi

**ID No.:** 251002918

**Email:** 251002918@st.midocean.edu.km

**1.2 Name:** Mohammed Ayidh Almalki

**ID No.:** 251002537

**Email:** 251002537@st.midocean.edu.km

**Supervisor:** Amjad Qataish

## Abstract

Since the COVID-19 pandemic exposed a number of flaws in healthcare systems around the world, digital adoption has accelerated, especially in the context of the Internet of Things (IoT), which has made it possible to meet the challenges it posed in a way never before possible through data-driven decision-making, touchless care, and real-time monitoring. The role of the Internet of Things (IoT) in managing the COVID-19 pandemic is examined in this review, particularly in relation to public health surveillance and the remote management of diabetes patients, who were found to be among the vulnerable groups disproportionately impacted by the COVID-19 disease. Two structured reviews and comparative reviews of more than 30 studies that examined how IoT technology has facilitated remote diagnosis, tracking contacts, managing chronic illnesses, and keeping an eye on patients were used for the analysis. The review also looked at obstacles to the successful deployment of IoT, such as issues with infrastructure, interoperability, and data privacy, especially in places with limited resources. The review also took into account the inclusion of blockchain, edge computing, and other AI technologies, which could help IoT create more robust systems. In order to improve functionality, scalability, persuasibility, and reactivity in the event of a future public health emergency, an integrated hybrid framework that combines cloud-based analysis and edge-level inference is then suggested.

## 1 Introduction

Rapid digital transformation is required to address resource shortages and care continuity, as the COVID-19 pandemic has exposed serious flaws in healthcare systems around the world [Nasajpour et al., 2020]. The Internet of Things (IoT) has demonstrated exceptional promise in real-time data sharing and remote patient monitoring among emerging solutions [Mansour et al., 2021]. In order to improve response times and reduce the spread of viruses, healthcare providers can use wearables, intelligent gateways, and interconnected devices to track physiological parameters in real-time [Nasajpour et al., 2020, Khan et al., 2022].

IoT-based monitoring greatly decreased the need for frequent hospital visits for high-risk groups, like diabetic patients, reducing exposure risk while preserving continuity of care [Singh and Verma, 2020, Alotaibi et al., 2021]. Mobile health dashboards and wearable glucose monitoring devices increased patient involvement and treatment plan adherence [Ahmad et al., 2022].

The complete adoption of IoT in healthcare is still hindered by a number of important issues, such as privacy issues, device incompatibilities, and inadequate infrastructure in

low-resource environments [Routh et al., 2020, López and Farooq, 2022].

## 1.1 Objective of the Introduction

The objectives are:

1. Highlighting the vital role of IoT in healthcare during the COVID-19 pandemic.
2. Stress the importance in chronic illness management, especially diabetes.
3. List the obstacles to IoT adoption and the need for better frameworks.
4. Prepare the ground for literature discussion and future research.

## 2 Related Work

The role of IoT technologies in managing the COVID-19 pandemic and assisting with chronic diseases, particularly diabetes, has been widely studied. Early uses of IoT in telemedicine, remote monitoring, and outbreak detection were described by Nasajpour et al. [2020]. Static threshold-based systems for simple physiological tracking were examined by Mansour et al. [2021]. Integration with AI has enhanced IoT capabilities. Chen et al. [2021] presented edge AI models for low-latency health data processing. Albahri et al. [2021] created predictive machine learning models for dynamic risk assessment in diabetic patients. Blockchain-based IoT frameworks for secure data sharing were suggested by Ghosh and et al. [2021]. Narrowband IoT (NB-IoT) was discussed by Raza et al. [2020] to address rural connectivity issues.

## 3 IoT in COVID-19 Management with Focus on Diabetic Patients

The COVID-19 pandemic emphasized the need for scalable healthcare solutions for chronic illnesses like diabetes. IoT provides telemedicine, AI-powered analytics, and real-time remote monitoring [Nasajpour et al., 2020].

IoT-enabled devices such as mobile health dashboards and continuous glucose monitors (CGMs) improved diabetic self-management. Patients could share real-time data, receive alerts, and get remote monitoring [Singh and Verma, 2020, Ahmad et al., 2022]. This reduced hospital visits and exposure risk while maintaining disease control.

## 4 Conclusion

The COVID-19 pandemic accelerated IoT adoption in healthcare, especially in chronic disease management and telemedicine. Applications are often enhanced with blockchain, edge computing, and AI for secure analytics. Challenges remain in privacy, device integration, and rural connectivity. A hybrid IoT-AI framework blending cloud-based federated learning with edge-level intelligence is suggested.

## 5 Future Work

Future research should focus on standardised IoT frameworks, privacy-preserving AI, and fair access in low-resource areas. The proposed hybrid IoT-AI framework includes:

1. Wearable IoT sensing devices
2. Edge computing for real-time detection
3. Cloud intelligence for predictive analytics
4. Federated learning for secure personalisation
5. Blockchain-based security for access control and data integrity

## References

- Jawad Ahmad, Mohammed A. Alqarni, Reem T. Alharbi, Farhan A. Khan, Abdulrahman S. Alghamdi, and Saad M. Alshahrani. Enhancing patient engagement in diabetes management via iot-based mobile health applications: A systematic review. *Journal of Personalized Medicine*, 12(11):1887, 2022. doi: 10.3390/jpm12111887.
- A. S. Albahri, R. A. Hamid, J. K. Alwan, et al. Predictive machine learning models for covid-19 diagnosis based on symptoms: A systematic review. *Journal of Infection and Public Health*, 14(10):1345–1354, 2021.
- Yousef Alotaibi, Badr Alotaibi, and Abdullah Alshanqiti. An iot-based health monitoring framework for diabetic patients. *Sensors*, 21(19):6527, 2021. doi: 10.3390/s21196527.
- Min Chen, Yue Ma, Yixue Li, Dong Wu, and Yunhao Zhang. Edge ai in smart healthcare: A review. *IEEE Internet of Things Journal*, 8(7):4899–4916, 2021.
- R. Ghosh and et al. Securing internet of things in healthcare using blockchain. *IEEE Internet of Things Magazine*, 4(2):24–31, 2021.
- Fazlullah Khan, Rakesh L. Kumar, Seifedine Kadry, and Yunyoung Nam. Iot-enabled smart health monitoring for pandemic management. *Journal of King Saud University - Computer and Information Sciences*, 34(10):Part B, 8563–8574, 2022. doi: 10.1016/j.jksuci.2022.08.020.
- Diego López and Bilal Farooq. A review of privacy and security challenges in the internet of medical things for connected healthcare. *IEEE Internet of Things Journal*, 9(12):9477–9492, 2022. doi: 10.1109/JIOT.2021.3121020.
- Romany F. Mansour, Ahmed El Amraoui, Issam Nouaouri, Vicente García Díaz, Deepak Gupta, and Sachin Kumar. Artificial intelligence and internet of things enabled disease diagnosis model for smart healthcare systems. *IEEE Access*, 9:45137–45146, 2021. doi: 10.1109/ACCESS.2021.3066363.
- Mohammad Nasajpour, Seyedamin Pouriyeh, Reza M. Parizi, Mohsen Dorodchi, Maria Valero, and Hamid R. Arabnia. Internet of things for current covid-19 and future pandemics: An exploratory study. *Journal of Healthcare Informatics Research*, 4(4):325–364, 2020. doi: 10.1007/s41666-020-00080-6.
- Usman Raza, Pravin Kulkarni, and Mahesh Sooriyabandara. Low power wide area networks: An overview of nb-iot and lora. *IEEE Communications Surveys & Tutorials*, 19(2):855–873, 2020.

Koushik Routh, Arijit Nath, and Sourav Roy. Challenges and future prospects of iot in healthcare. *International Journal of Engineering Research & Technology*, 9(09):818–822, 2020. URL <https://www.ijert.org/challenges-and-future-prospects-of-iot-in-healthcare>.

Rajesh Kumar Singh and Harsh Kumar Verma. Role of iot to avoid spreading of covid-19 for diabetes monitoring. *International Journal of Pervasive Computing and Communications*, 16(5):421–439, 2020. doi: 10.1108/IJPCC-07-2020-0080.