Chapter 8
IoT-Based Health Risk Prediction by Collecting and Analyzing HIIT Data in Real Time Using Edge Computing

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ABSTRACT

Increased awareness of the benefits of physical exercise has motivated people to improve physical fitness by doing high-intensity interval training (HIIT). HIIT (where one needs to work at 70-85% of one's maximum heart rate) and forceful exercise sessions can lead to health risks such as cardiac arrest, heat strokes, or lung diseases because people are unaware of their body health and endurance status. It is essential that the health parameters of people who exercise outside controlled environments like the gym be acquired and analyzed during workout sessions. This chapter aims to design an IoT-based timely warning system based on edge computing responsible for identifying unusual patterns in the monitored health parameters and alerting the person involved in an exercise about any deviation from expected behavior. The authors collect real-time data from individuals during the exercise sessions. The data analysis provides an assessment of the health parameters and predicts any health risks during the HIIT session.

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INTRODUCTION

It is essential to exercise to stay healthy and fit. It is observed that people who exercise regularly have lower mental stress and anxiety levels, increased immunity, and good bone and muscle strength. In addition, the requirement of at least 150 minutes of high-intensity physical exercise a day for safe and disease-free living by the World Health Organization (WHO) has driven people to devote time and wealth to this important physical activity (Pate et al., 2006).

Several recent studies have suggested that High-intensity interval training (HIIT) may result in improvement in physical fitness and cardiovascular health as compared to continuous moderate exercise (CME) (Kessler et al., 2012). HIIT involves short, intense workouts, alternating with recovery periods. Although high-intensity exercise provides many health benefits including building muscle power, improving oxygen and blood flow, reducing blood sugar, it also carries some risks. There is a high probability that physical health is significantly affected during high-intensity exercise sessions, particularly due to the prevalence of complex ambient environments (Kemmler & Stengel, 2013). High-intensity exercise can increase the risk of sudden heart attacks and cardiac deaths in people (Eijsvogels, Thompson, and Franklin, 2018). Many health conditions can be caused while exercising at hot temperatures, people are susceptible to heat exhaustion and heatstroke.

It is recommended that people go to the gym and perform such exercises under the guidance of experienced trainers in a controlled environment. However, it is not possible for everyone to go to the gym or train under experienced trainers due to constraints of time and cost.

It is essential that the health parameters of people who exercise outside controlled environments like the gym be acquired and analyzed during the workout sessions. The analysis can provide an assessment of the health parameters in real-time during an exercise session to determine and predict any health risks. Therefore, there is a need to develop an IoT-based system that can determine physical fitness and continuously monitor exercise intensity and provide early warning of a health risk so that the user can respond accordingly.

The objective of this work is to design a real-time IoT-based early warning system with the purpose of saving lives through timely analysis of the health parameters of a person while one is exercising. The proposed system monitors the well-being of the person and displays the sensed data to the person. It predicts the risk using a machine learning model to alert the person if needed.