

## CHAPTER I INTRODUCTION

### 1.1 Project Background

Falls are a major concern for wheelchair users, especially those who live alone or have limited mobility. Injuries from falls can be severe, and in some cases, life-threatening. There is a need for a fall detection system that can quickly alert caregivers to provide assistance to the user.

Internet of Things (IoT) is a rapidly growing technology that has potential applications in healthcare. IoT-based systems can collect data from various sensors and devices and process it in real-time to provide useful insights. Fall detection systems based on IoT can use sensors and machine learning algorithms to detect falls and alert caregivers.

The proposed project aims to develop an IoT-based fall detection system for wheelchair users. The system will use sensors placed on the wheelchair to detect sudden movements and changes in orientation. Machine learning algorithms will be used to analyze the sensor data and distinguish between normal movements and falls. In the event of a fall, the system will automatically send an alert to caregivers.

The proposed system has several advantages over existing fall detection systems. Firstly, it is non-intrusive and does not require the user to wear any additional devices. Secondly, it can detect falls in real-time and send alerts immediately, reducing the time taken to provide assistance to the user. Finally, the system can be integrated with other IoT-based healthcare systems to provide a complete healthcare solution for wheelchair users.

The proposed project will involve the design and development of the fall detection system, as well as testing and validation of the system's performance. The project will require expertise in IoT, machine learning, and healthcare. The system will be designed to be cost-effective and scalable, making it accessible to a large number of wheelchair users. The project has the potential to improve the quality of life and safety of wheelchair users by providing a reliable and efficient fall detection system.

## **1.2 Problem Statement**

- a. Existing fall detection systems for wheelchair users are intrusive and require the user to wear additional devices that can be uncomfortable and may deter users from using them regularly.
- b. Current fall detection systems for wheelchair users are limited in their accuracy, often generating false alarms or missing actual falls, leading to delayed or ineffective emergency response. Moreover, the lack of a reliable and efficient fall detection system for wheelchair users poses a significant risk to their safety and well-being, especially for those who live alone or have limited mobility.

## **1.3 Objective(s) of the Project**

- a. To design an IoT-based fall detection system for wheelchair users that is non-intrusive and does not require the user to wear additional devices.
- b. To design and test machine learning algorithms for accurately detecting falls and reducing false alarms, ensuring the reliability and efficiency of the fall detection system in sending alerts to caregivers.

## **1.4 Project Scope**

### **1.4.1 User Scope:**

- a. The fall detection system is designed for wheelchair users who have limited mobility or live alone, and are at a high risk of falls.
- b. The system is non-intrusive and does not require the user to wear additional devices.

### **1.4.2 System Scope:**

- a. The fall detection system will use sensors placed on the wheelchair to detect sudden movements and changes in orientation.
- b. Machine learning algorithms will be developed to analyze sensor data and distinguish between normal movements and falls.
- c. The system will be designed to send alerts to caregivers.

## **1.5 Assumption and Limitation**

### 1.5.1 Assumption:

- a. The sensors placed on the wheelchair will accurately detect sudden movements and changes in orientation related to falls.
- b. The machine learning algorithms developed will be able to accurately distinguish between normal movements and falls, reducing the number of false alarms.
- c. The fall detection system will be reliable and efficient in detecting falls and sending alerts to caregivers, providing timely assistance to users.
- d. The fall detection system will be cost-effective and scalable, making it accessible to a large number of wheelchair users.

### 1.5.2 Limitation:

- a. The fall detection system will only be effective if the sensors placed on the wheelchair are properly maintained and calibrated.
- b. The system may generate false alarms or miss actual falls in certain situations, such as when the user is performing sudden movements or when the sensors are unable to detect a fall due to a technical issue.
- c. The system will rely on the availability of caregivers to respond to alerts and provide assistance to the user.
- d. The fall detection system may not be suitable for all wheelchair users, as some users may require more specialized or personalized healthcare solutions.