HALF-TIME PAPPER

ML GROUP

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ABSTRACT

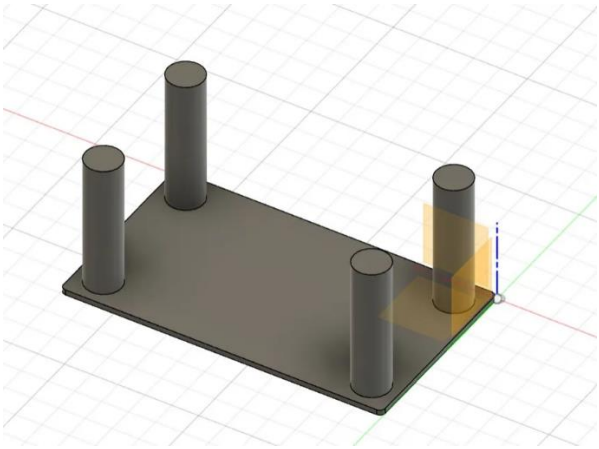
The elderly rely on technology for safety, especially in places where care resources are limited, and constant monitoring isn't possible. Traditional systems like cameras are often too expensive for companies. At the same time, schools need affordable kits to help students learn about technologies like sensors and machine learning. Industries also need cost-effective solutions to prevent accidents using sensors for vibration detection. This project explores using the nRF52840 microcontroller to build a machine learning model that tracks human movements, such as sitting, standing, running, or falling, and sends this data to a mobile device.

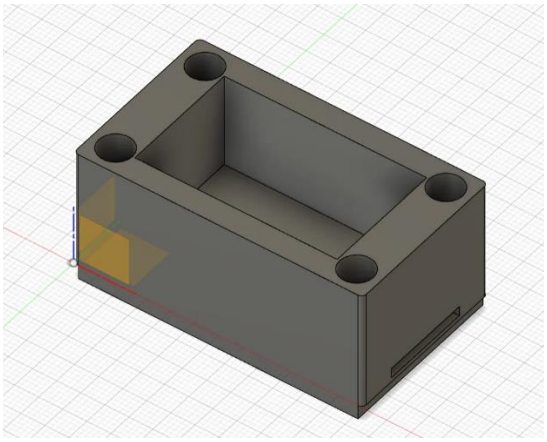
INTRODUCTION

As the global population ages, there is a growing need for technology to assist the elderly and those with mobility issues. Caregivers and healthcare workers often face limited resources, leaving vulnerable individuals at risk when unsupervised. While monitoring systems like cameras are effective, they are expensive and often inaccessible for smaller care facilities or homes. A cost-effective solution that provides real-time data on a person’s movements could help reduce risks like falls or inactivity. This project aims to fill this gap using embedded systems and machine learning to develop a sensor-based device.

The nRF52840 will detect actions like sitting, standing, walking, or falling, and send live-data to a mobile device. This system could also be used in education and industry.

DESIGN





The system’s key components are the nRF52840 microcontroller, with Bluetooth Low Energy (BLE) capability, and sensors like accelerometers and gyroscopes. These capture real-time movement data, which a pre-trained machine learning model processes to classify actions like sitting, standing, walking, running, or falling. The nRF52840 is ideal due to its low power use and compact design, allowing continuous tracking without draining the battery. Worn discreetly, the device sends data to a mobile app for easy monitoring and can send alerts in emergencies. Students can also experiment with the system by retraining the ML model and deploying their versions for hands-on learning.

RESULTS

Based on the initial testing and expected outcomes, the device should successfully categorize the user's actions into distinct movement types. For instance, the system might provide the following results based on collected sensor data:

- Sitting
- Standing
- Walking
- Running
- Falling

While these results are speculative, the aim is to achieve high accuracy, particularly in detecting falls, which is vital for elderly users.

Sources

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