

# Fall Detection Notification via SMS and Email

DGMD-14 | Tony Hua, Devin Anderson, A.J. Ikene, Luis Villa, Lou Zhiyuan

## Introduction

Aging is a fact of life. However, as we age, we become more vulnerable to injury and go through a vastly more extended healing cycle when we become injured. For example, according to the CDC, one out of five falls for individuals over 65 causes serious head injury or broken bones. This information is staggering since over 3 million patients over 65 are treated in emergency rooms every year for injuries from falls.

The nearly 800,000 patients who end up hospitalized due to a fall tend to have head and hip injuries so severe they end up in long-term hospice care. These falls are responsible for more than 50 billion in medical costs within the US alone. With Medicare and Medicaid covering around 37.5 billion of that total cost in 2020.

In some cases, it's not the fall itself but what happens after the fall that causes long-term damage to the patient. For example, being trapped on the floor for hours unable to get up can add to the injury leading to long-term disability. In addition, dehydration, blood loss, and other medical conditions can occur while trapped on the floor leading to life-threatening situations.

## Motivation and literature research

(inspiration on similar projects)

Look for journal articles, include the tutorials, the sections, any idea mentioned in ED discussion, YellowDig, or any other media.

## Project category/categories

## Description

The fall detection created by our team is a wearable device that can detect a fall and notify loved ones, medical staff, and first responders of the incident. The device is cheap and easy to use but has all the benefits of keeping caregivers in the loop if the elderly or disabled person they care for is in a fall situation. The device is worn on the wrist or upper arm to maximize comfort with heart attack, stroke, and palpitation detection and warning, coming with version 1.1.2.

## Objectives

## Implementation

To build our product, we utilized the sensorTile running the ALLMEMS1 firmware. The development was possible via the Cradle expansion board connected via USB. The information from the tile is sent to a local raspberry Pi4 via Bluetooth for monitoring the wearer's status. Once the algorithm detects the fall, the program uses the Twilio API via python to alert the predesignated parties.

Utilizing the Python SDK `blue_st_sdk.manager` module combined with Bluepy and Blue-st-SDK, we connected the sensorTile and the raspberry pi.

Equipment required and a diagram of the proposed architecture

Data (raw data being collected)

Data management (scrubbing the data?)

Model (ML models)

Testing the model (ML models)

## Proof of Concept or minimum value product

## Conclusions

## Future Work

The program's next iteration will be sampling the incoming information through a Machine learning classification using Edge Impulse. As the data gets more precise and unaddressed edge cases to come to light, the chance of false alerts lessens, providing a better overall user experience. In tandem with this fine-tuning, we'll be isolating the heart rate to alert a caregiver of any potential heart attack, stroke, or abnormal vibration. These machine learning algorithms will form the backbone of third-party technologies via Apple and Android-enabled devices and sensors as well as custom-built devices 3d printed by our team.

# Timeline / Workplan with a milestone for each week

## References

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## Appendix

### Rubric

#### Title

#### Team members

Motivation and literature research (inspiration on similar projects)

Look for journal articles, include the tutorials, the sections, any idea mentioned in ED discussion, YellowDig, or any other media.

Project category/categories (look at the checklist below)

#### Description

#### Objectives

Equipment required and a diagram of the proposed architecture

- Implementation

-Data

-Data management

-Model

-Testing the model

Proof of Concept or minimum value product

Final Project deliverable

- Conclusions

- Future Work

Workplan with a milestone for each week

References