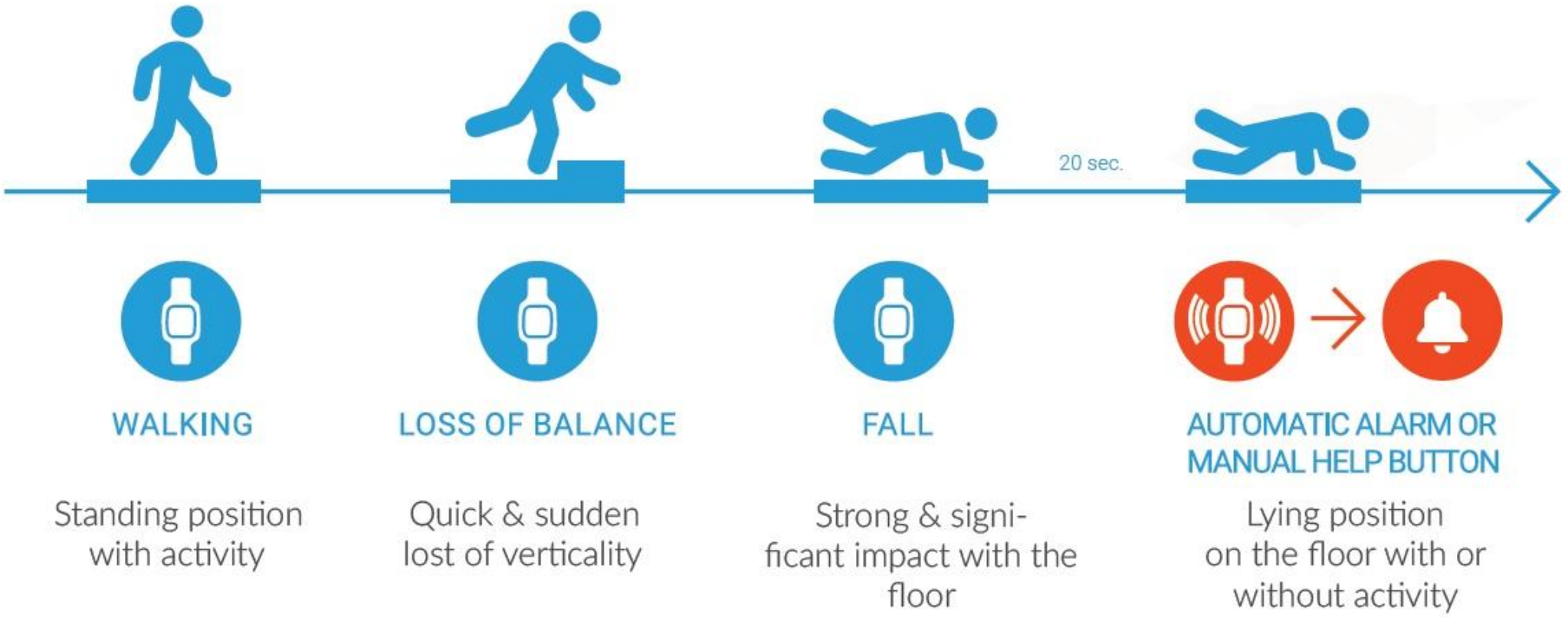
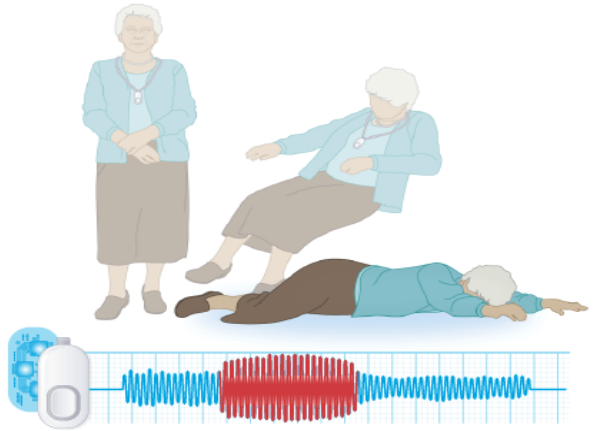
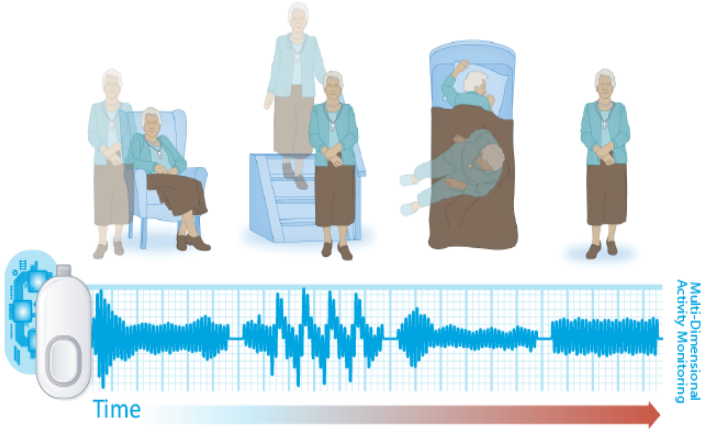


FALL DETECTION USING WEARABLE SENSOR DATA

Introduction

- This project is about detecting fall accurately in real-time by utilizing the machine learning classifier which would be trained using the simulated data in the Lab.
- Considerable amount of research was done in the past by using Threshold Based and Machine Learning models.
- “A comparison of accuracy of fall detection algorithms(threshold-based vs. machine learning) using waist-mounted tri-axial accelerometer signals from a comprehensive set of falls and non-fall trials” (Web-Link)





Motivation

- Accurate “Fall detection” is a very important problem which has a great significance especially in the old age people.
- It is the major cause of injury-related hospitalization along with the trauma of “long lie”, which is due to the inability of getting back up without any assistance.
- Over 90 % of hip and wrist fractures and 60 % of traumatic brain injuries in older adults are due to falls.
- Half of elderly people who experienced a long lie (for an hour or more) passed away within 6 months, even if no direct injury occurred from the fall.
- Given the current demographical dividend of the developed economies this becomes even highly crucial to have a system of this kind which can detect and alert the care providers if there is a fall.

Challenges

- Ideally, we want to achieve no false positive and still have acceptable true positive rate (at least 90%).
- Simulate real-life scenario in which sensor data is continuously generated and we need to find a way to handle the data streaming and apply a machine learning model to detect fall.
- The major goal of this project revolves around optimizing two requirements which are Sensitivity (ability to detect actual fall) and Specificity (ability to avoid False Positive which could desensitize the receiver) I.e. how to identify Optimal window size or data points corresponding to each trial.
- Utilize all the recorded body kinematics from multiple sensors mounted on different body parts.
- Apply advanced machine learning algorithms in order to achieve better sensitivity/specificity.

Progress Report

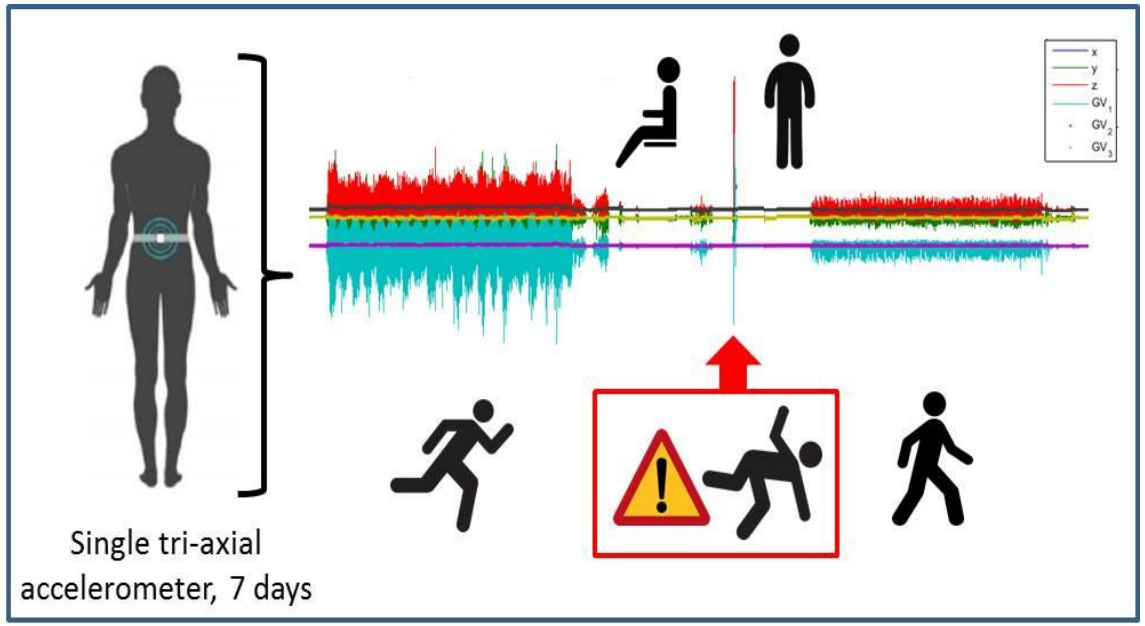
Understanding the Data

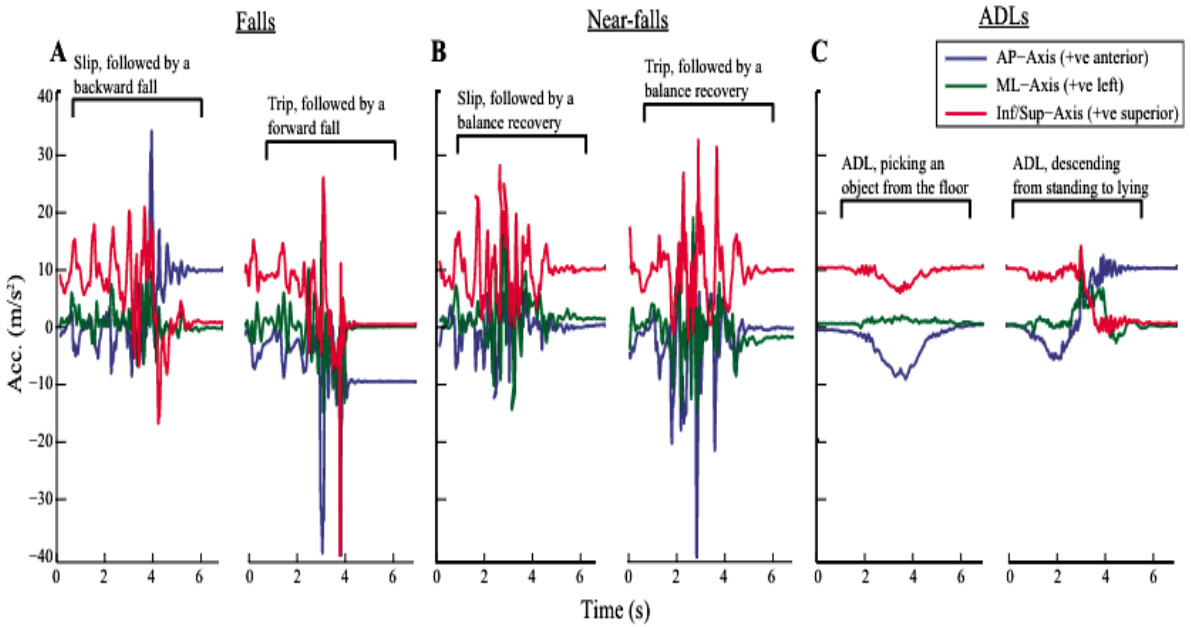
- The current trial data is taken from 10 subjects across 3 categories of Fall, Near Fall and Activity of Daily Living.
- Each of these categories was divided further in to subcategories and there are 3 trials for each of them.
- The data for each trial is collected for duration of 15 s. This was taken from the tri-axial accelerometer mounted at 5 different body part, recording body kinematics (acceleration, angular velocity, magnetic field.)

Identifying Methodologies

- Based upon our analysis and approach taken in the paper. In order to train the model we need to featurize the data that reflects the actual behavior of that trial.
- In simple terms this means that how to summarize the 2000 rows in each trial that reflects the event in that particular trial and feed the model.

How to Summarize?





Project Timeline

Task Description	Timeline
Understanding the project requirements	By 2/12
Domain Knowledge gathering from previous work	2/12 – 2/19
In-depth data analysis and understanding approach taken before	2/20 – 2/25
Defining high-level project pipeline	2/25 – 2/28
Designing the database structure for storing the collected data	3/1 – 3/2
Developing Machine Learning classifiers for Fall Detection	3/3 – 3/11
Integration real-time data from sensors by using Kafka	3/12 – 3/18
Designing a Web Application for representing the results	Parallel Task (3/10 – 3/20)

Future Scope

- Designing predictions algorithm using the data points prior to the events.