Helmo

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Outline

- Problem Definition & Motivation
- Related Work
- System Overview
- Development Process

Motivation

67 million

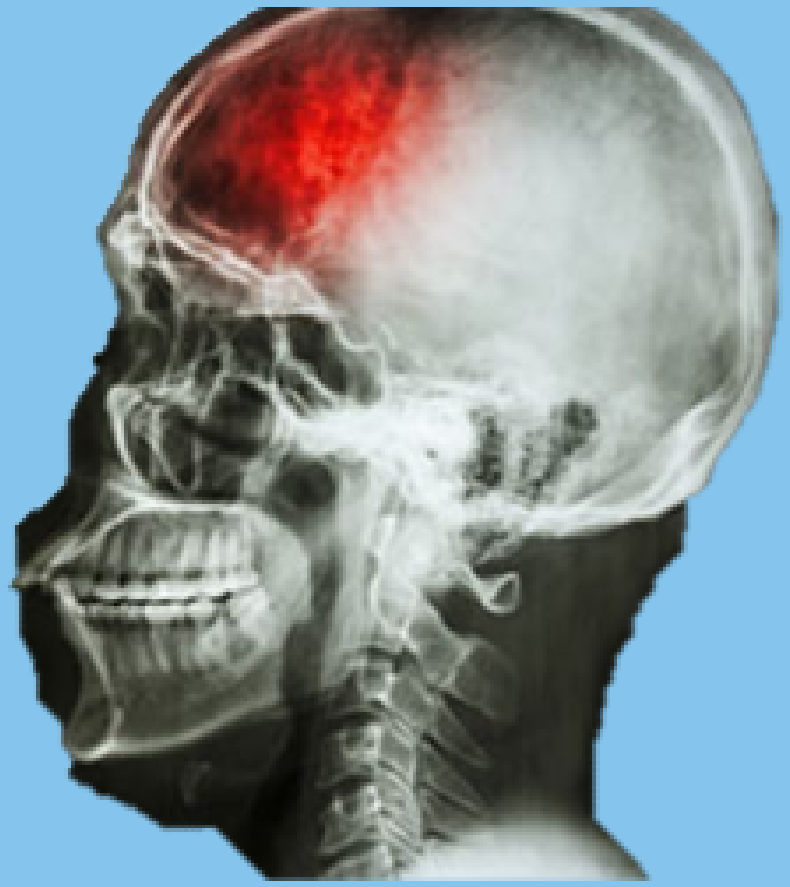
11 million Frequent cyclists

22 thousand injuries

Motivation

8,000

Head injuries

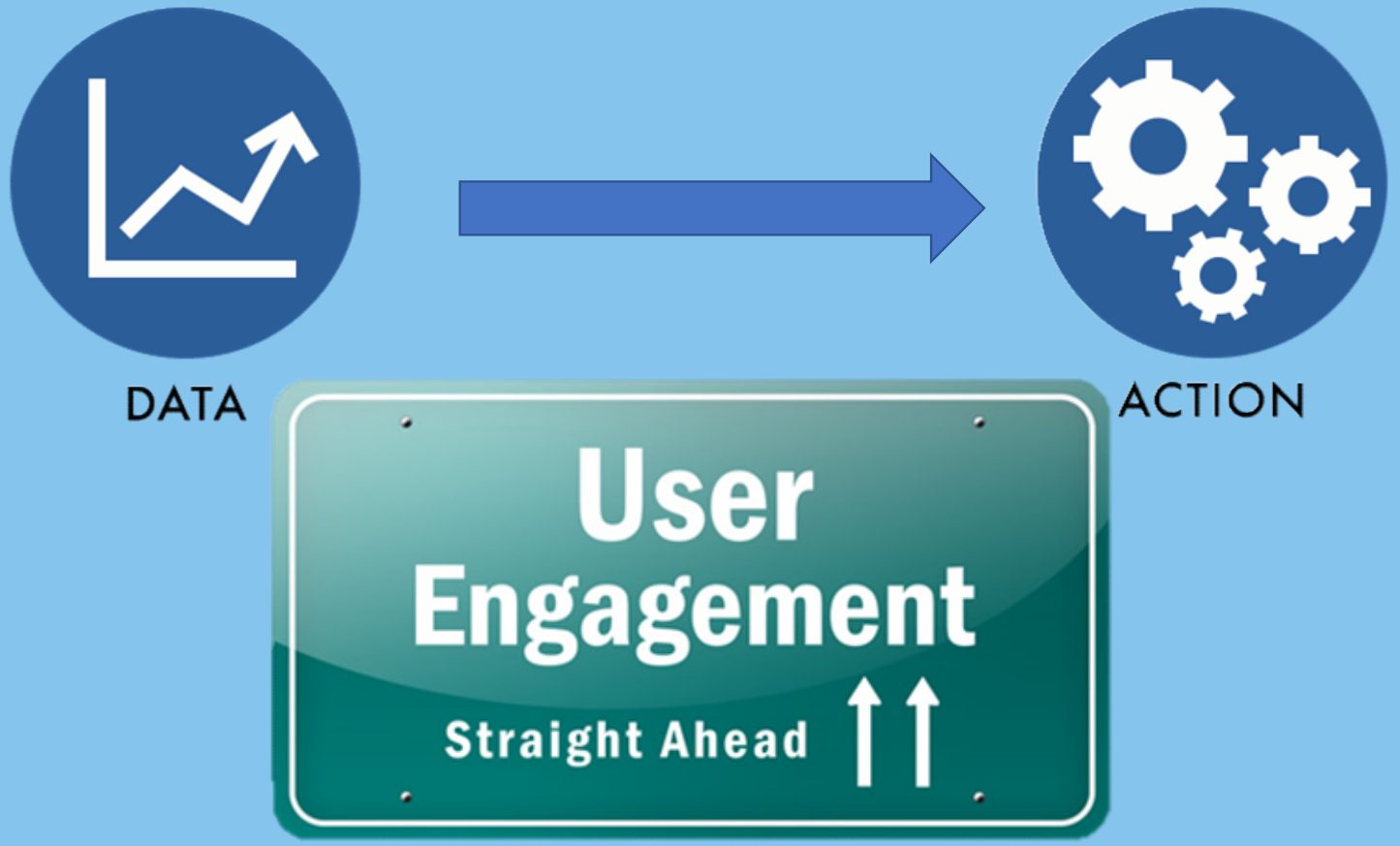


Challenges

Optima

Glasgow Coma Scale
Points:
1
2
3
4
5
6
Best motor response
No motor response
Extends to pain (decerebrate)
Flexes to pain (decorticate)
Withdraws from pain
Localize to pain
Obeys commands
Best verbal response
No verbal response
Incomprehensible sounds
Inappropriate words
Confused
Oriented
Eye opening
No opening
Pain
Verbal Command
Spontaneous
Remember, even a toaster has a GCS of 3!

Challenges



Related Work

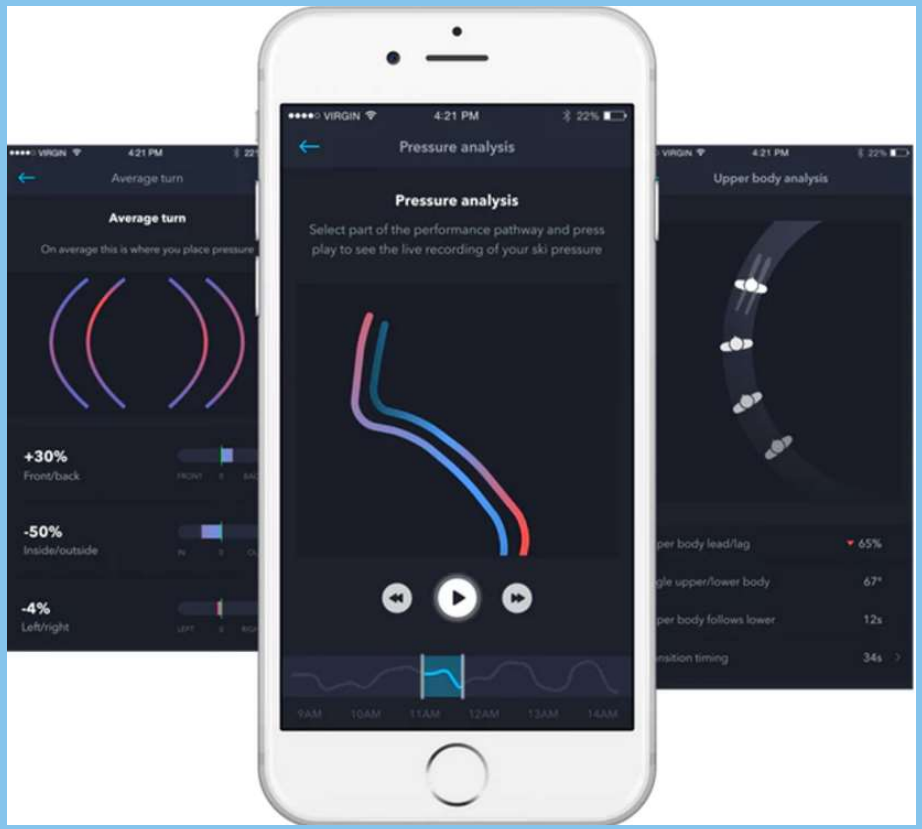
- Smart Helmets

Related Work

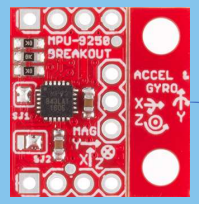
- Fall Detection Devices

Related Work

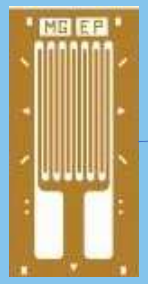
- Mobile Applications



System Overview



I2C

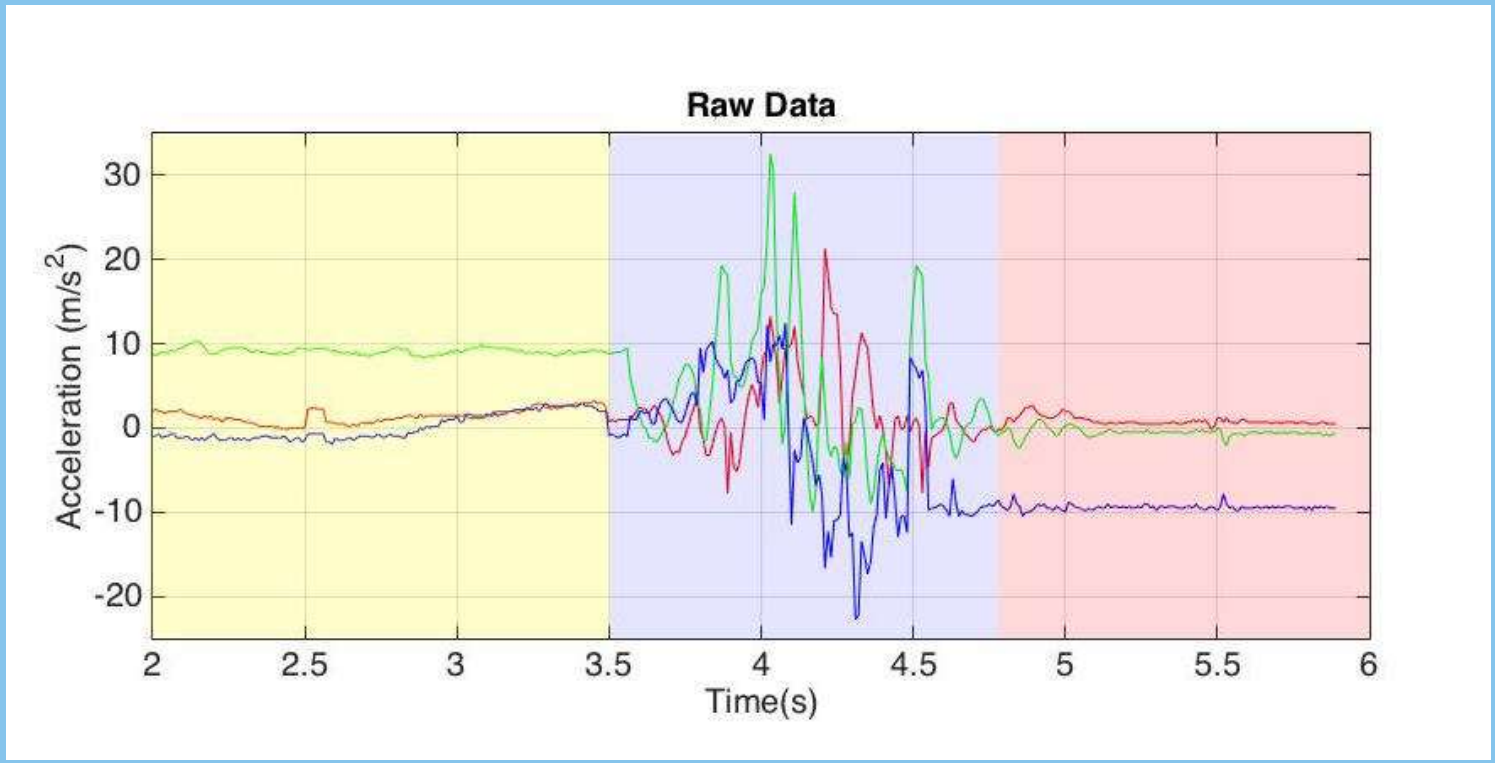


ADC

BLE

Wifi / Cellular

Machine Learning - Fall Detection



Machine Learning - Fall Detection

- Algorithm Development
  - Data Acquisition
  - Feature Extraction
  - Feature Selection
  - Training

Machine Learning - Fall Detection

- Algorithm Development
  - Data Acquisition
  - Feature Extraction
  - Feature Selection
  - Training
- Algorithm Implementation
  - Read Data Window
  - Extract Features
  - Decide on Fall

Mobile Application

DEMO

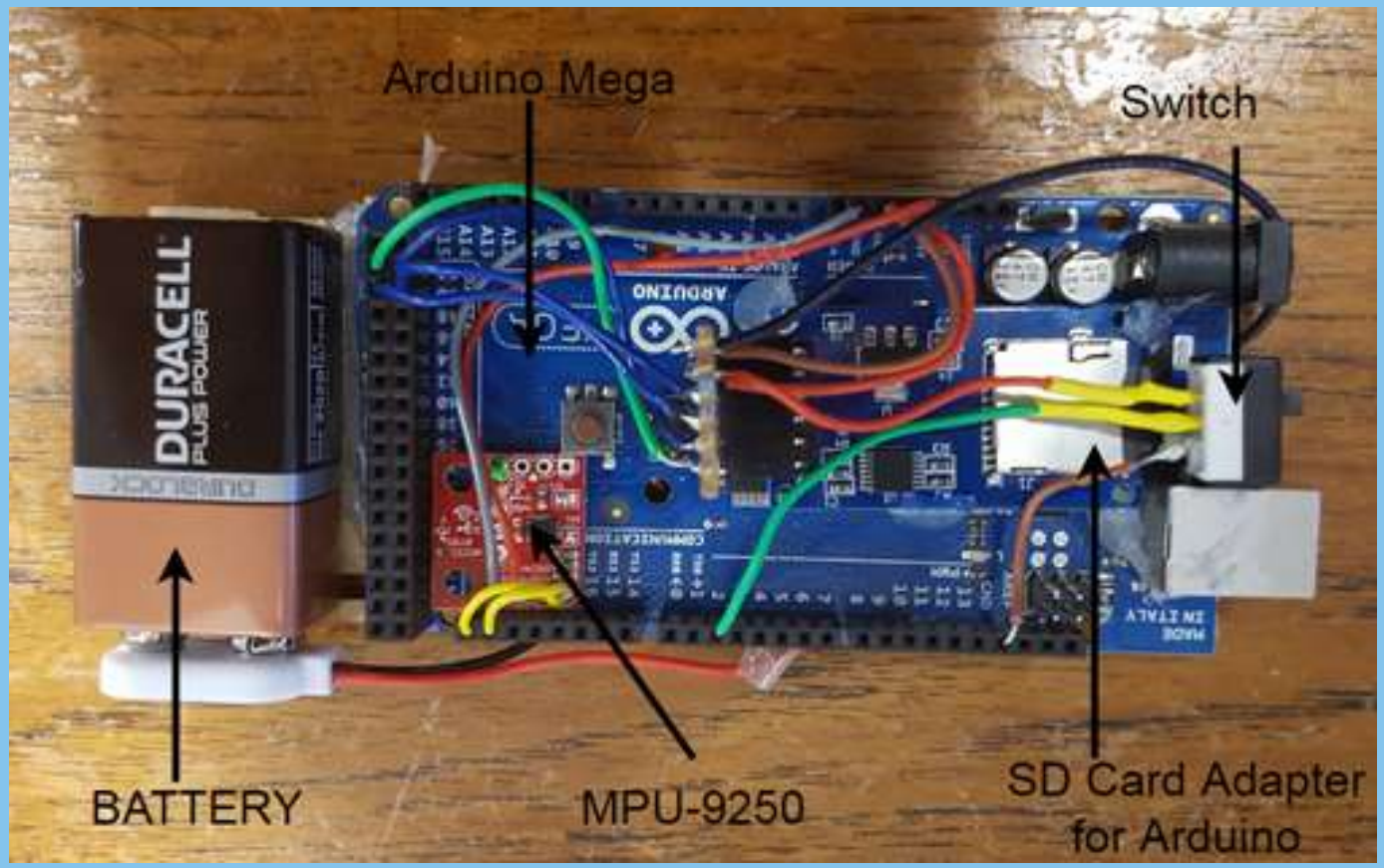
User Server

- Upload Data
- Hold Data
- Doctor Access Data

Development Process

- Prototype
- Data Acquisition
- Feature Selection
- 3D Printed Case

Prototype

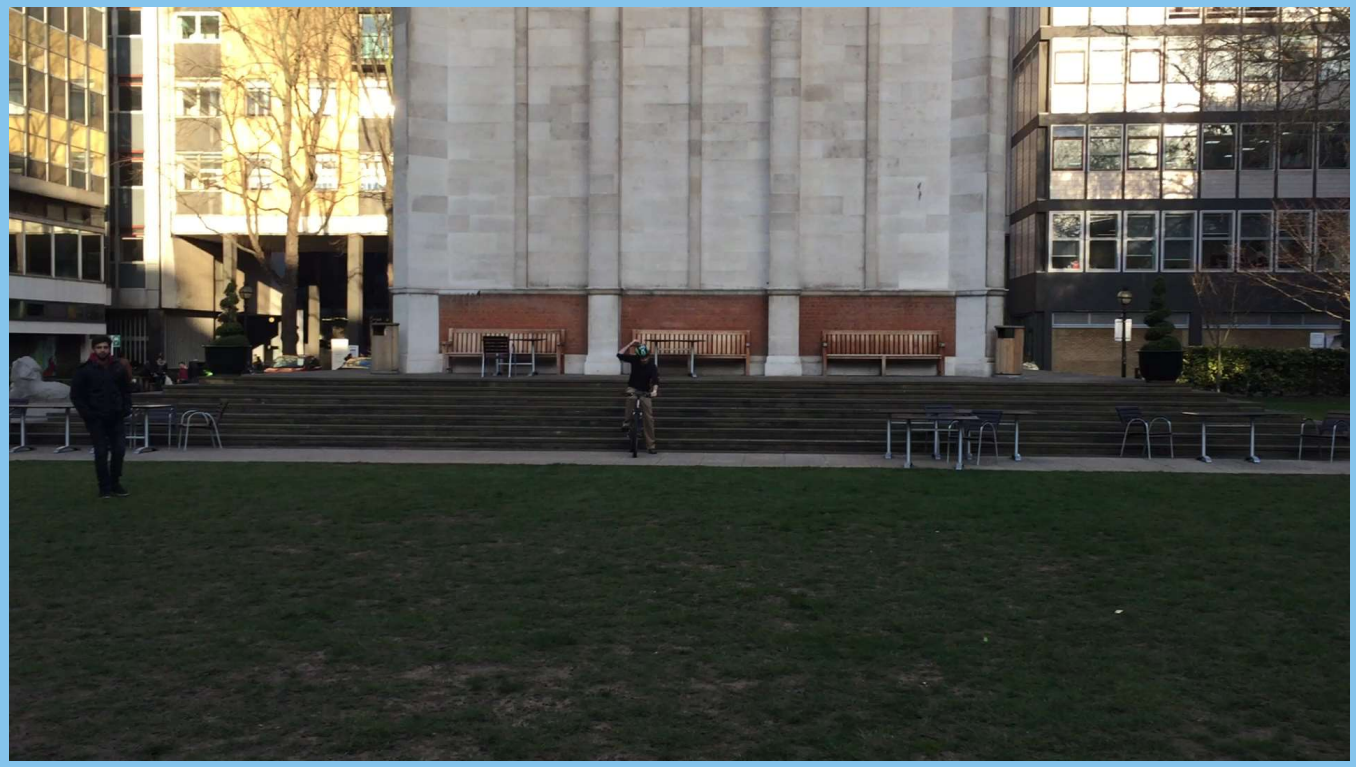

Arduino Mega
Switch
BATTERY
MPU-9250
SD Card Adapter
for Arduino

Prototype

Data Acquisition (CyFall)

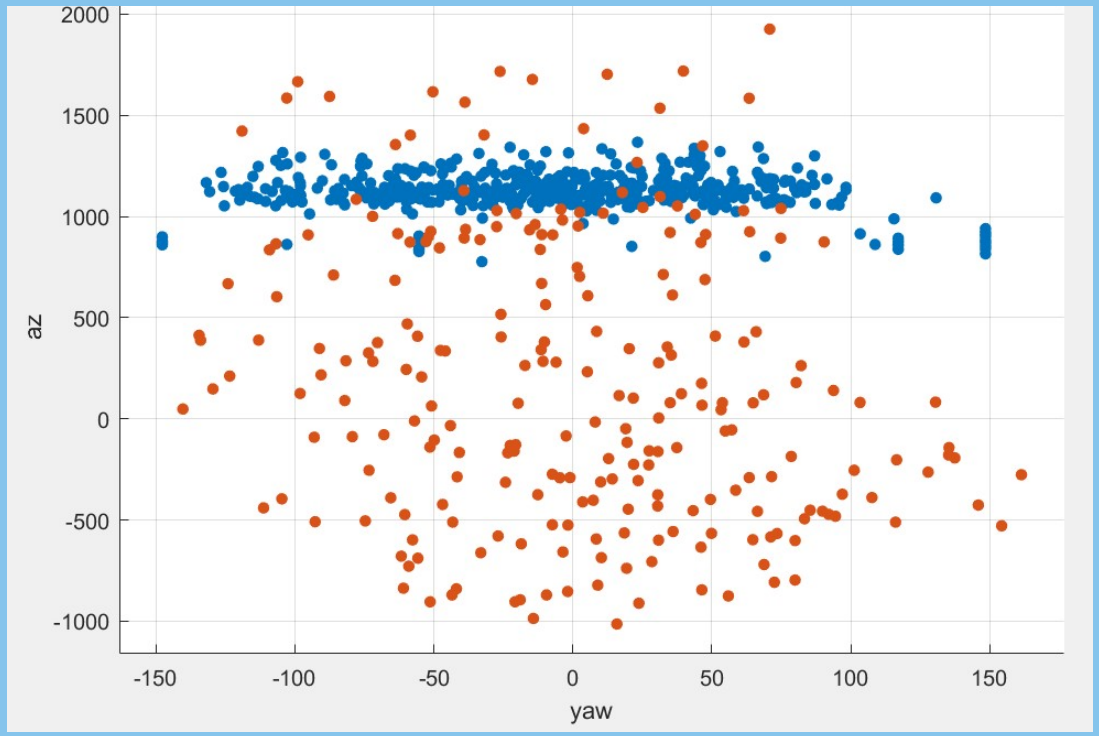
- Activities of Daily Life
  - Start / Stop
  - Mount / Dismount
  - Ride Straight / Turn
  - Pavements
  - Free Riding
- Falls
  - Dummy Falls
  - H&S

Activities of Daily Life



Falls

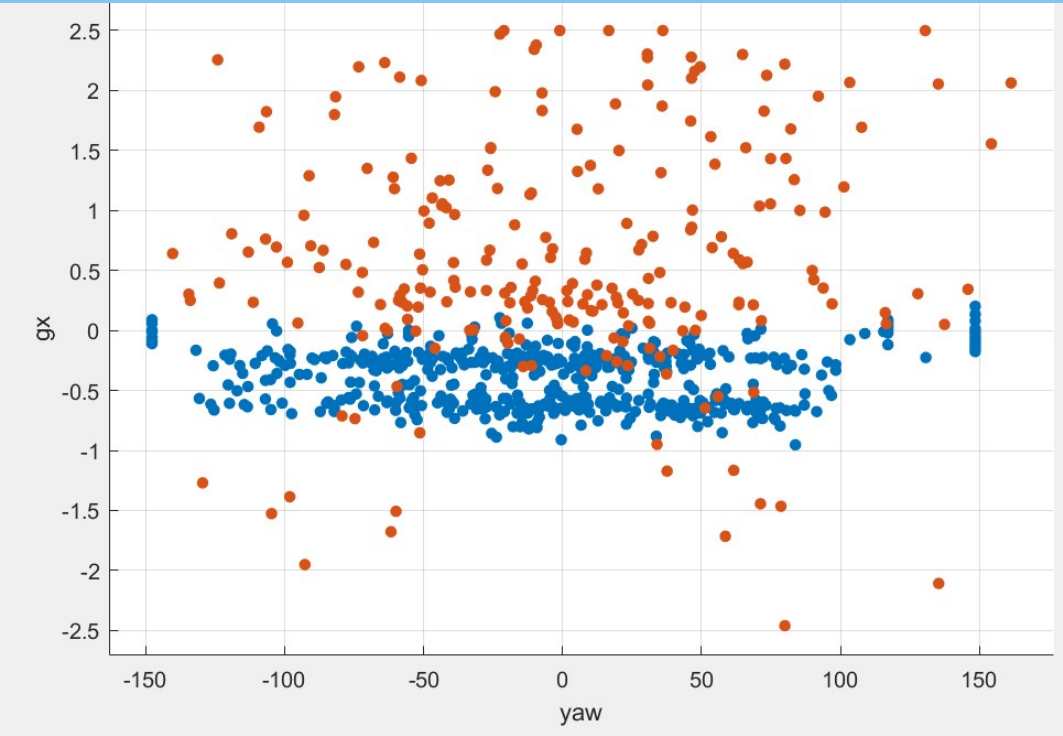
Feature Selection



No Fall

Fall

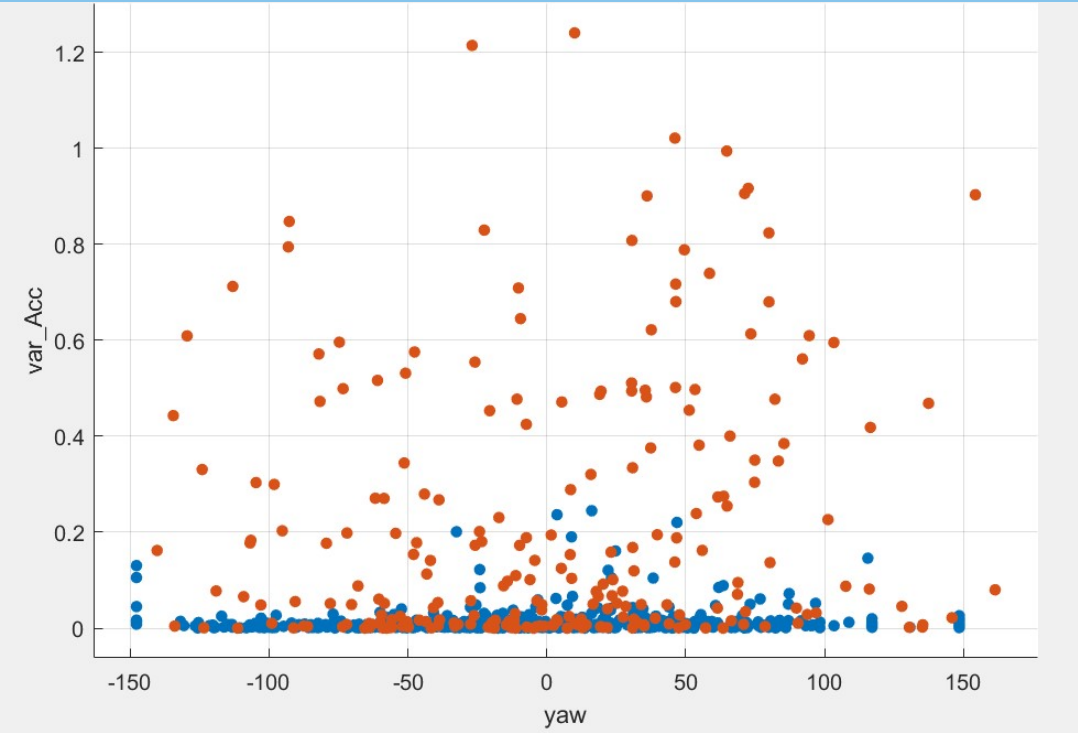
Feature Selection

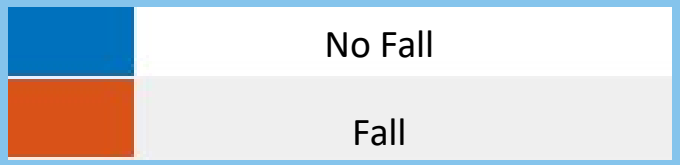


No Fall

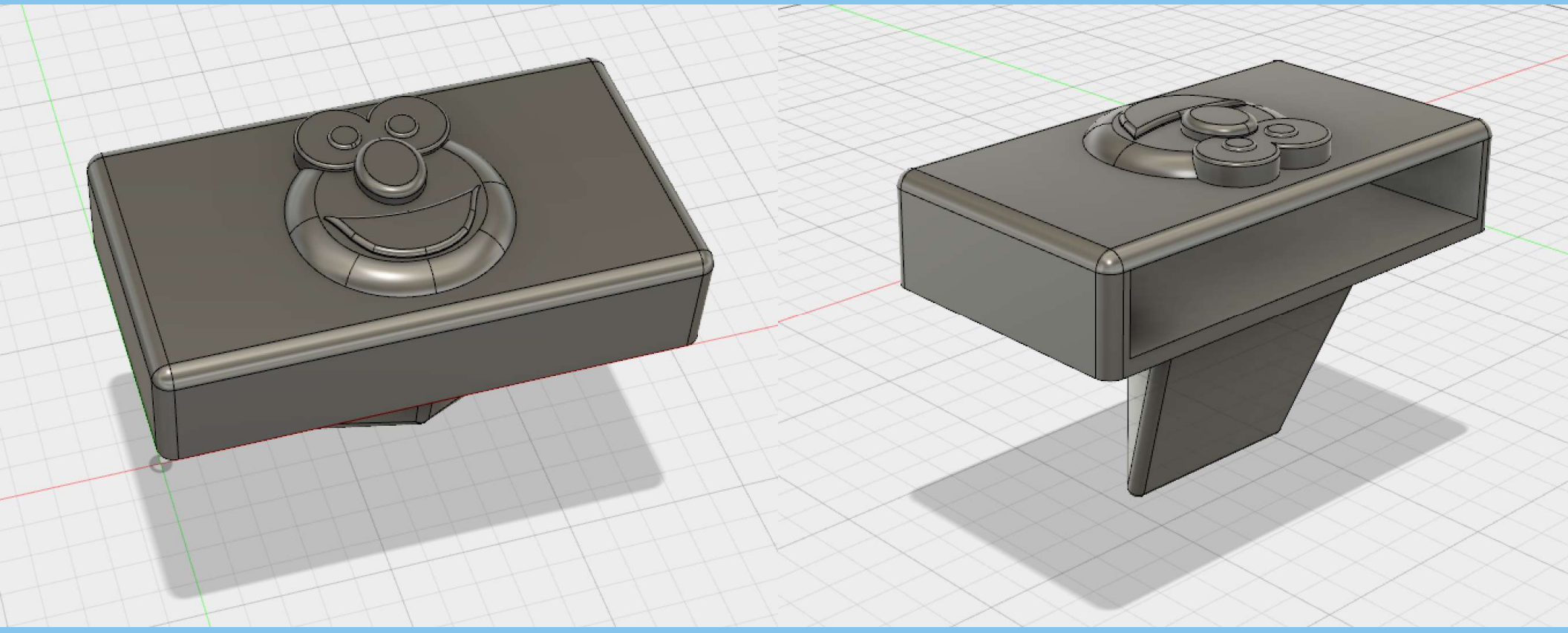
Fall

Feature Selection





3D Printed Case



Future Work

- Integration of Force Sensors
- PCB Design
- Add Statistics on App

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