Project Proposal

Wearable devices with health and safety alerts

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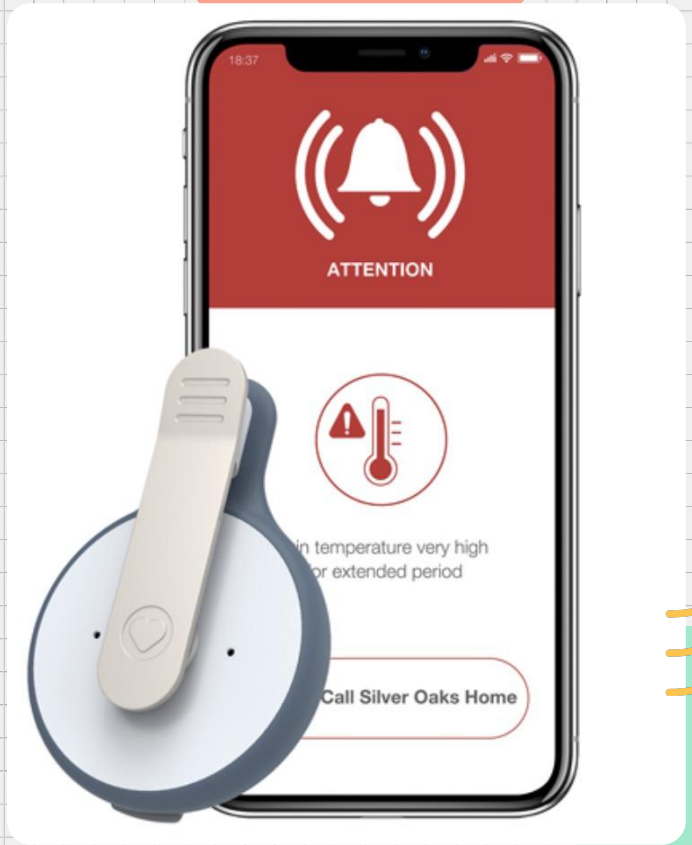
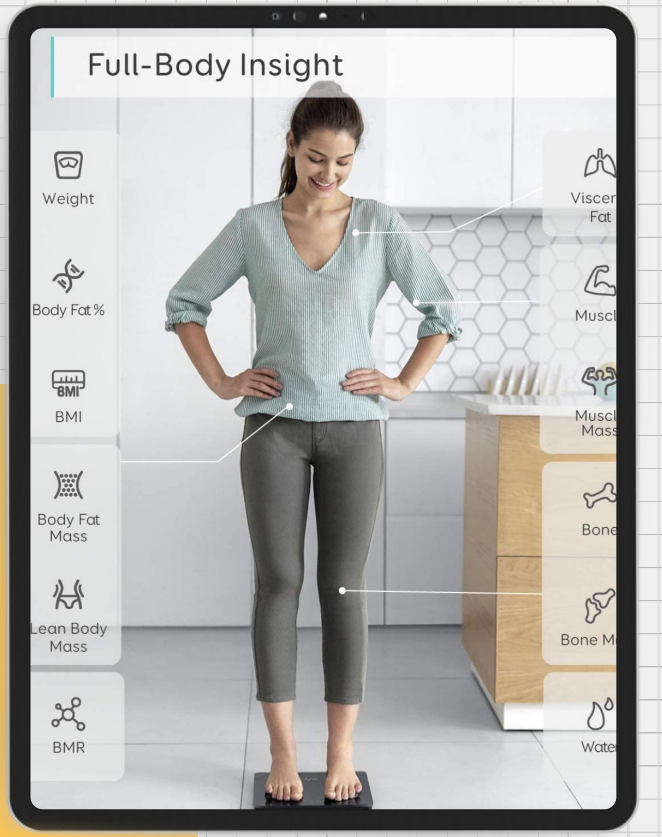
The “What”

This project is about :

Wearable devices with health and safety alarm system

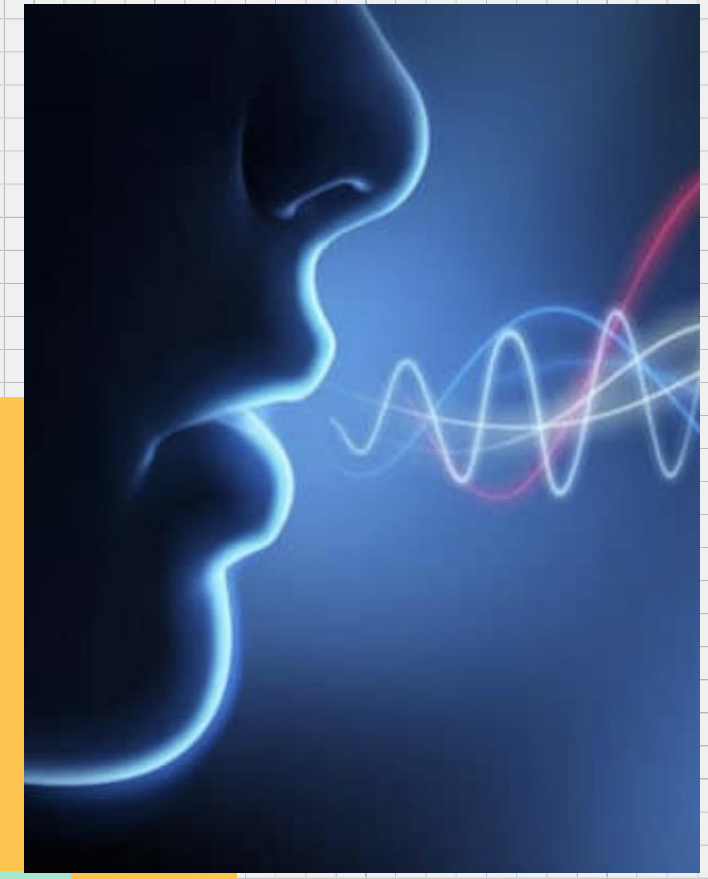
- Monitoring
- Warning
- Alert





Danger caused by abnormal body indicators

- body temperature
- heart rate
- blood oxygen concentration
- ...



Danger caused by physical injury

- falls
- accident
- ...

Deep learning

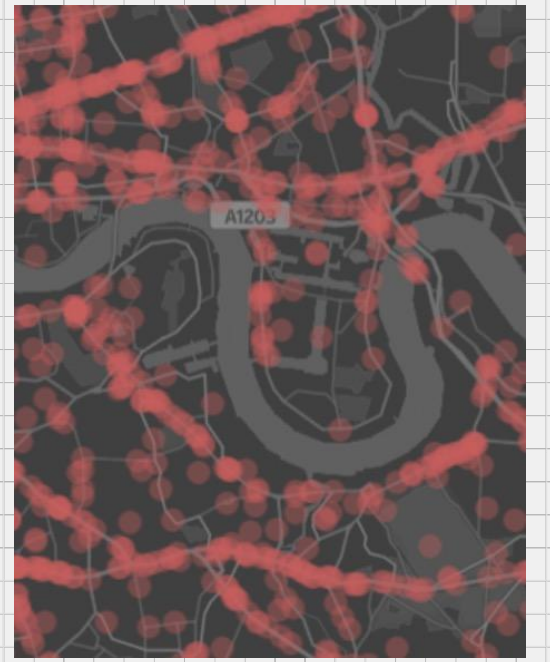
Speech recognition model

Optional:

- Warning when pass areas where accidents frequently occur
- Predict the risk of traffic accidents in real time and inform

Machine Learning

Google Map



Overall Solutions

a hospitalized patient

an elderly living along

Sensor Data Analysis

- Measure heart rate & blood oxygen levels
- Send and receive body indicators via RabbitMQ
- Make an emergency call and send SMS alert when an accident occurs
- Encrypt data for privacy

accidentally falling

call for help or hit the ground

Abnormal Sound Recognition

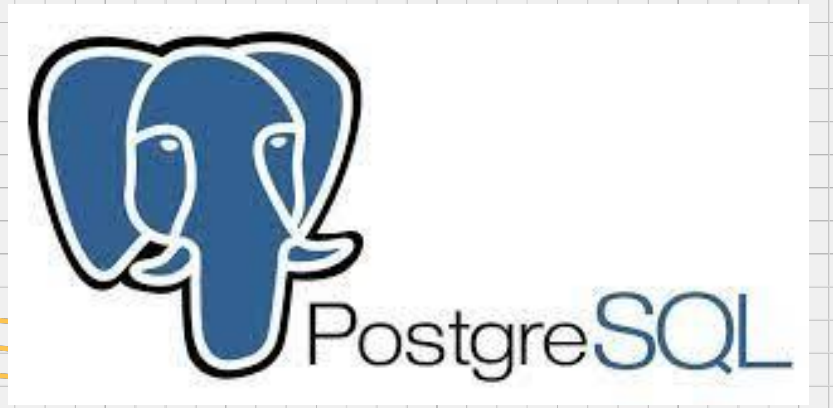
- Acquire the environmental sounds actively
- Offline ML model in the wearable device
- Set up a vocal order to prevent hijacking
- Open-source solution in the Github instead of native implementations

GitHub

RabbitMQ

python

Microsoft
Azure


PostgreSQL

Vue.js

Technical Implementation

- Abnormal Body indicator
- Speech Recognition
- Road Traffic Accident Prediction

Speech Recognition

- RNN

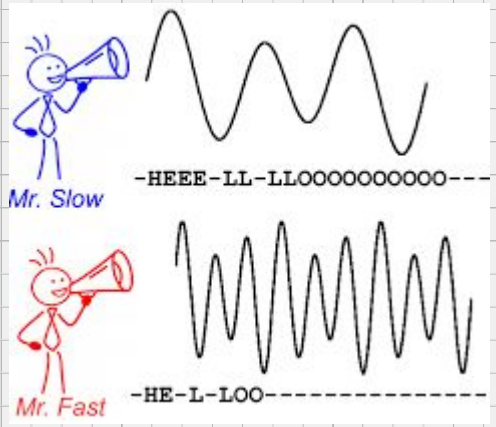
  A recurrent neural network (RNN) connections between nodes form a directed graph along a temporal sequence. This allows it to exhibit temporal dynamic behavior.

- LSTM

  LSTM is suitable for processing and predicting important events with very long intervals and delays in time series

- CTC

  Connectionist Temporal Classification (CTC) is a method widely used in speech recognition to solve the problem of voice frame alignment caused by different people speaking speeds.



Data set

- English:
  FreeSpokenDigits,
  VCTK corpus

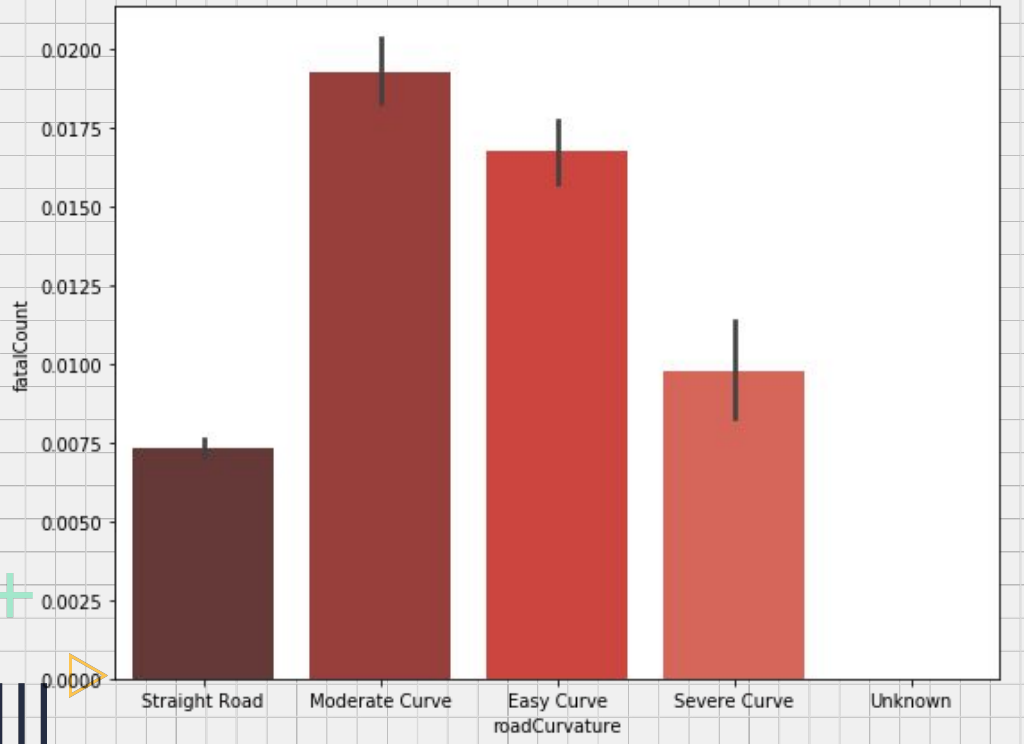
- Chinese:
  Free ST Chinese Mandarin
  Corpus

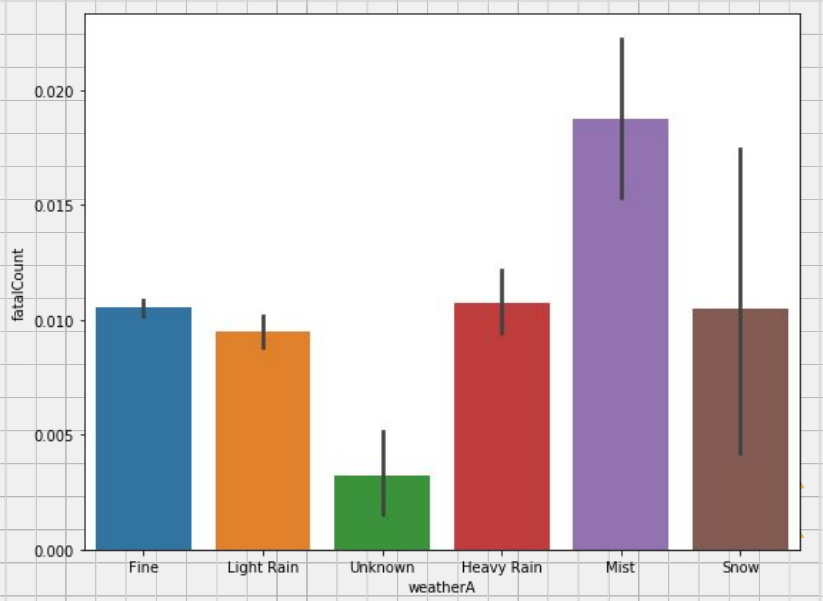
Road Traffic Accident Prediction

The World Health Organization(WHO) estimated that 1.25 million deaths were related to road traffic injuries in the year 2010.

Goal: Help users avoid potential dangers from the beginning

Use existing API to collect road curvature, speed limit, weather and a series of other data





Design Considerations

Step 1: Set Up

- Create a VM as a wearable device (IoT)
- Create a RabbitMQ Server (MQTT)
- Resources:
  https://github.com/singgel/mqtt_iot_push

Step 2: Sensor Simulation

- Datas collected by the sensor

- Python program

- Emergency or abnormal situation

- Command line

Step 3: Speech Recognition Model

- Build and train the speech recognition model（Deep learning）
- Upload to the Cloud. (SSH)
- Resources: https://github.com/Uberi/speech_recognition

Step 4: Speech Recognition Simulation

- Record the voices as the test case.

Backup Plan

- Azure API: Microsoft Azure Speech

Optional Steps:

- Use ML and data from Google Map to train the Traffic Accident Prediction model https://github.com/meraldoantonio/AccidentPredictor

- Use Vue.js to write a simple web front end

- Use Docker to deploy the whole project to the Cloud Server

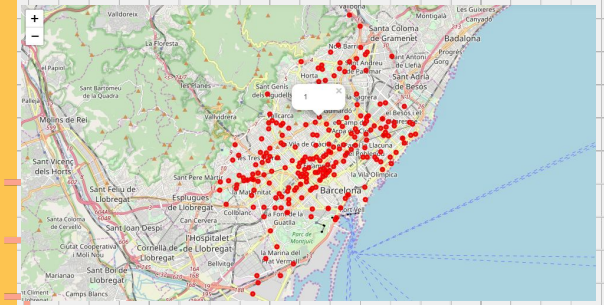
The “Why”

- Life is above all for any living creature including humans

- Health and safety means even more for elderly, children, and people with disabilities.

Intelligence

Machine learning & Data analysis



Innovation

Abnormal sound recognition
& Alert system

Real-life

Personal and scale application

Thanks !