

## Project Overview

### Mission

Aid people with limited mobility to navigate around easily and safely

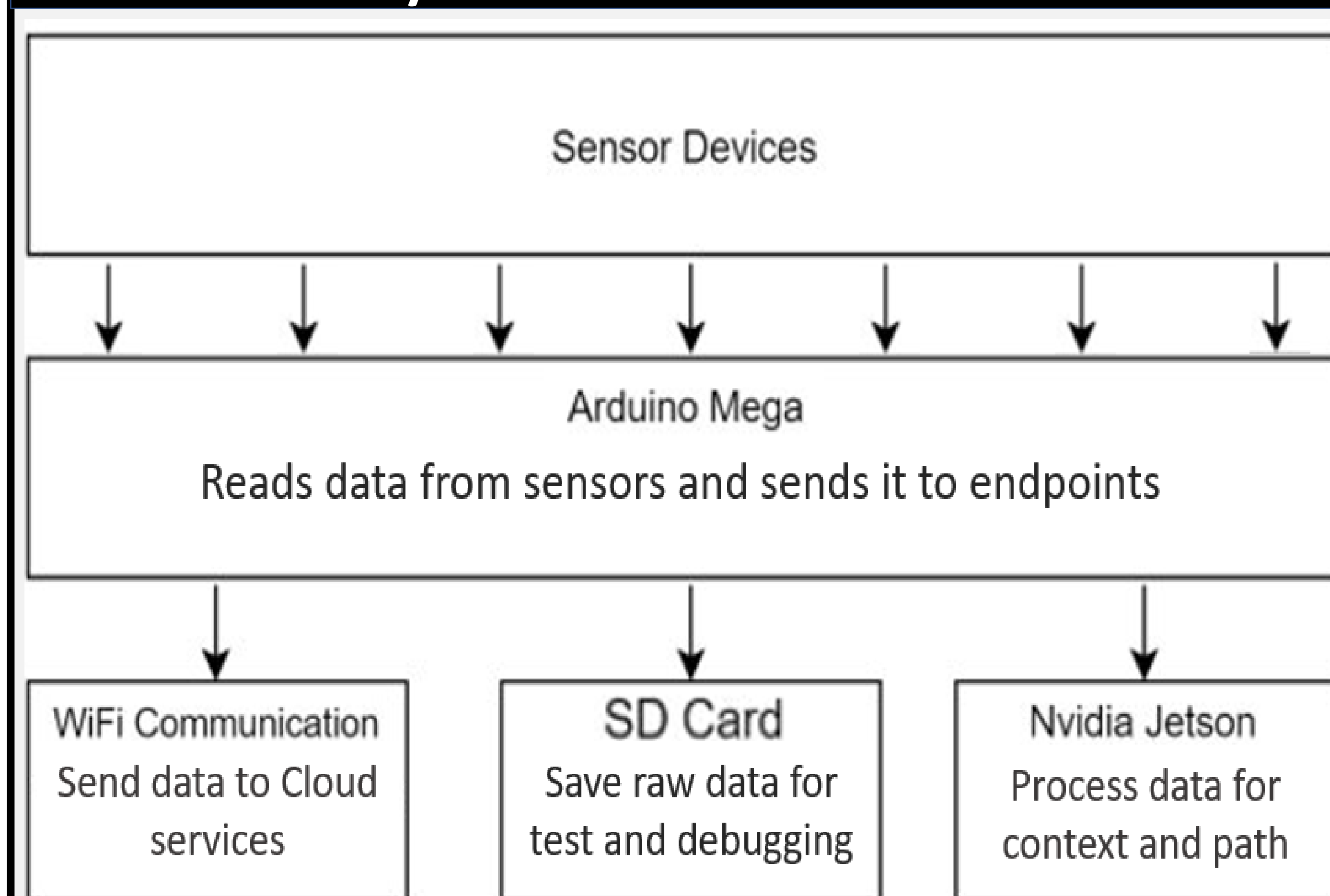
### Goal

Create a kit to allow the conversion of normal wheelchairs into smart self-driving ones.

### Scope

Create a sensor suite that can detect environmental context cues and calculate trajectory traveled. Be able to relay information from sensors to allow users better understanding of environment they are in.

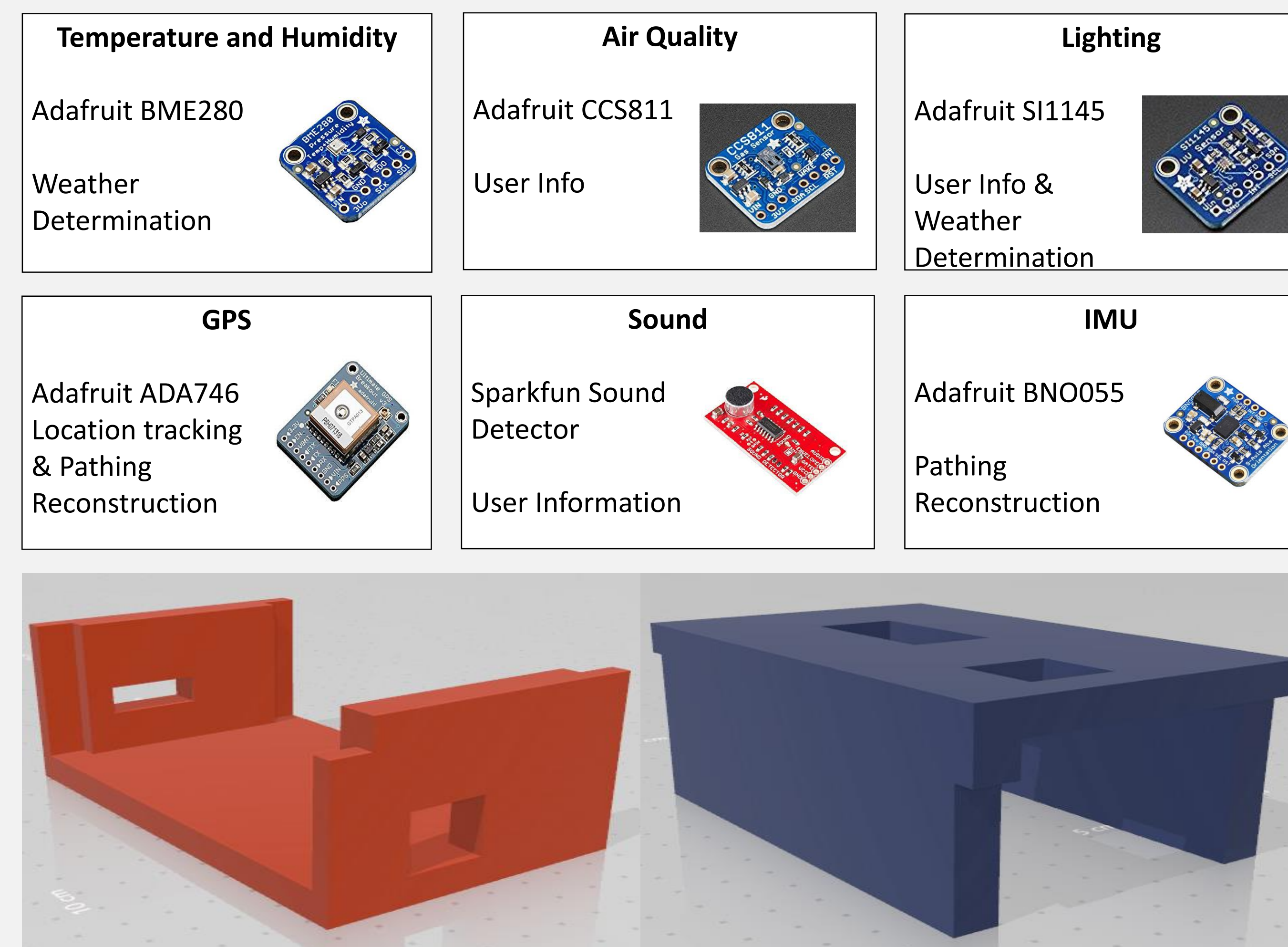
## System Overview



The sensors connected to the Arduino will be done with UART, I2C, or analog connections. Power will be needed for the Arduino and Jetson. The sensor devices, Wi-Fi chip, and SD card writer will power directly by the Arduino Mega.

## Development

### Part A. Sensor System and Enclosure



### Part B. Data Processing for Contextual Awareness

#### (1) Weather Classifier

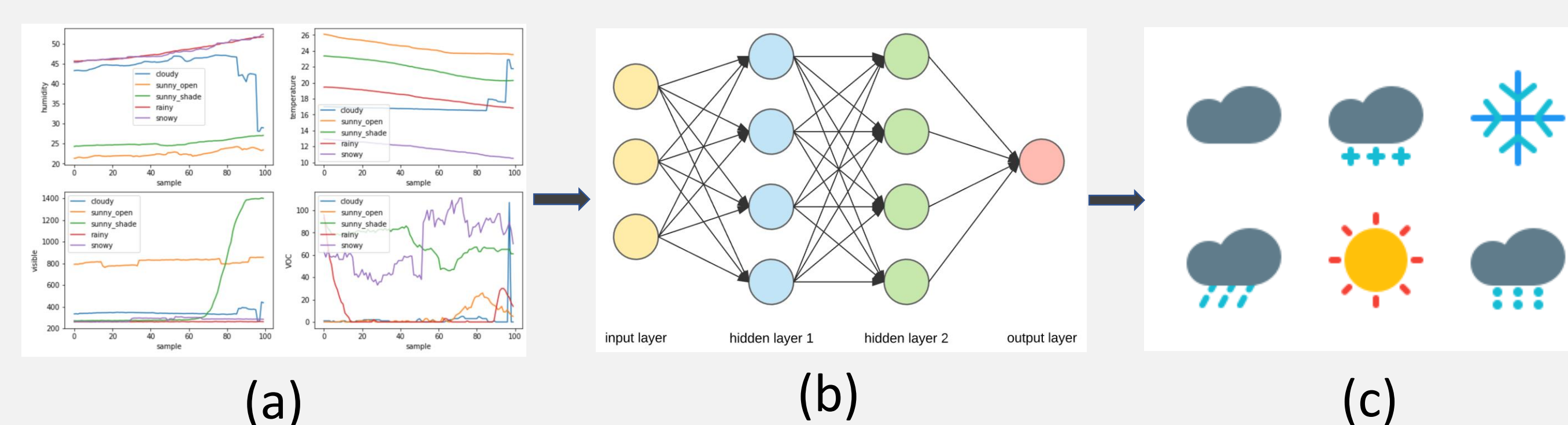


Figure 1. Weather Classifier Process (a) Collected data of 5 weather conditions (b) Neural network model (c) Weather classification

#### (2) Path Reconstruction

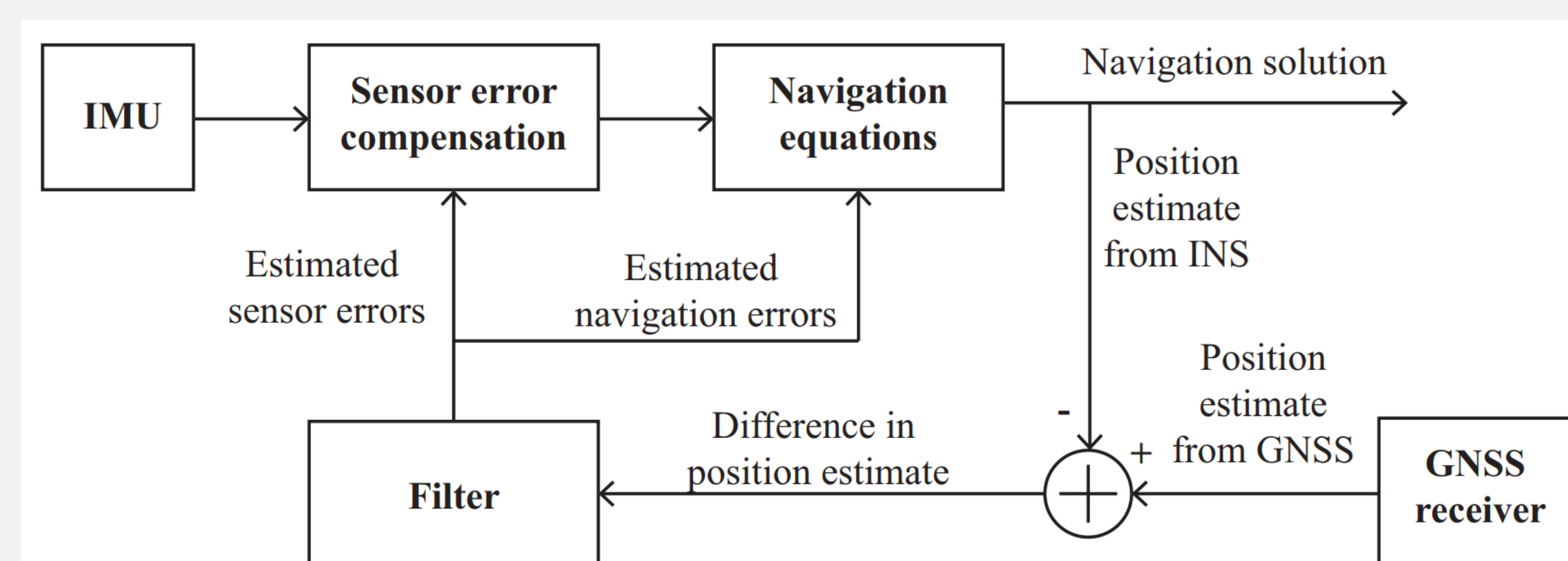
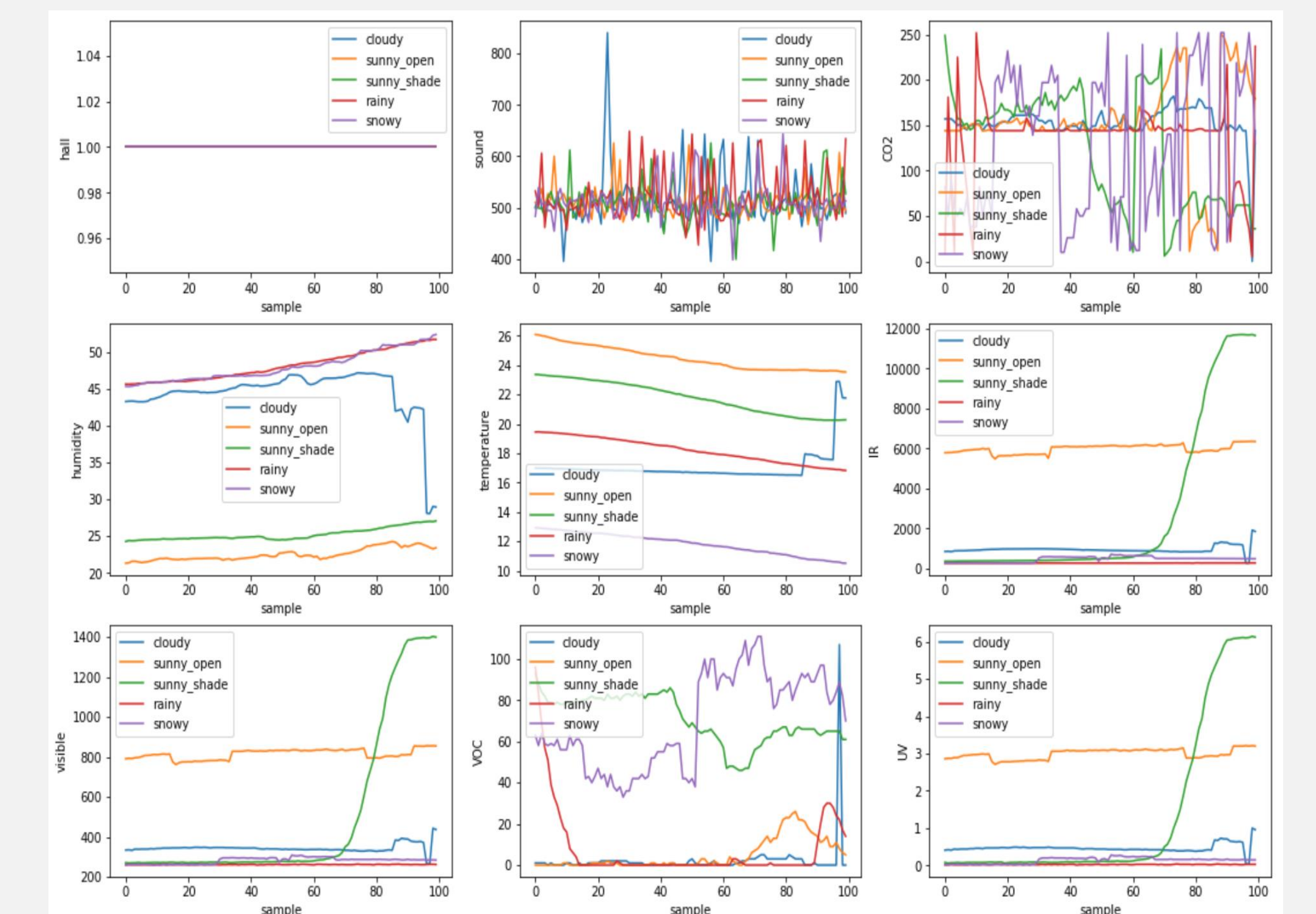


Figure 2. Kalman filter for path reconstruction using GPS + IMU

## Results

### Part A. Sample Sensor Data



### Part B. Weather Classification

	Neural Network (2 hidden layer)	Logistic Regression
Accuracy	94.4%	77%

### Part C. Reconstructed Path



Figure 3. (a) Trajectory using GPS sensor data (b) Trajectory based on Kalman filter using IMU data and few GPS sensor data

## Conclusions

In this project, we were able to get accurate weather classification and path reconstruction. Future work will involve automating some of the data processing into a single pipeline that will process everything from start to finish.