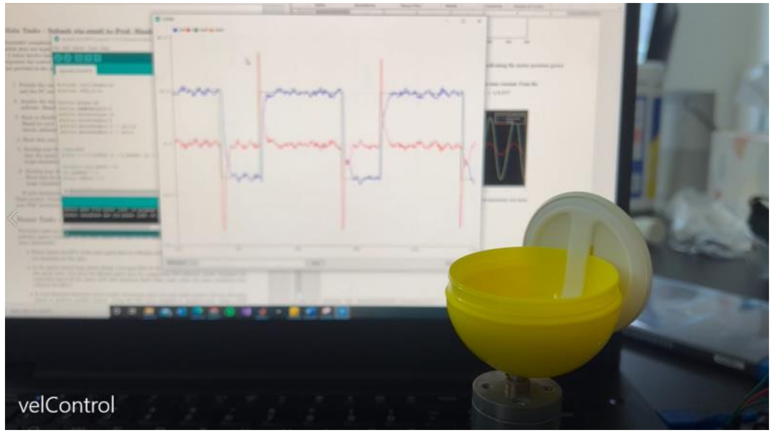
Hi! This Jing.

I put down some of my past projects, coursework and internship accomplishments here, involving controls, mechatronics, mechanics and data mining.

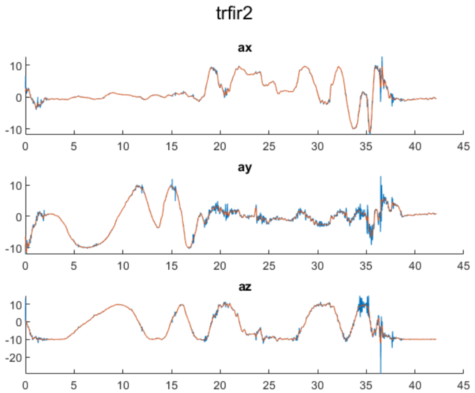
My portfolio GitHub Repo: https://github.com/wwtse/folioS

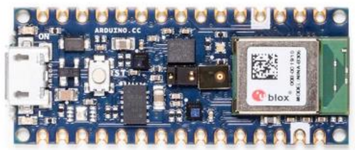
Projects



DCmotor control

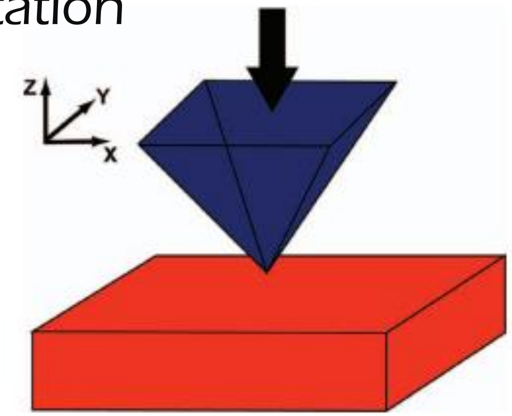
SLAM

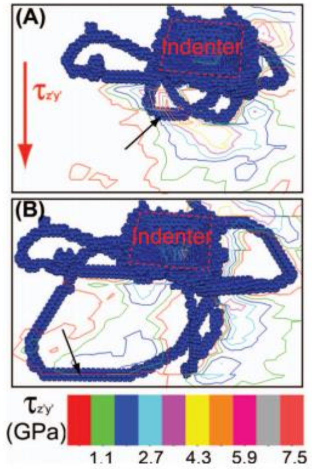




IMU filters

Nanoindentation Simulation





Coursework

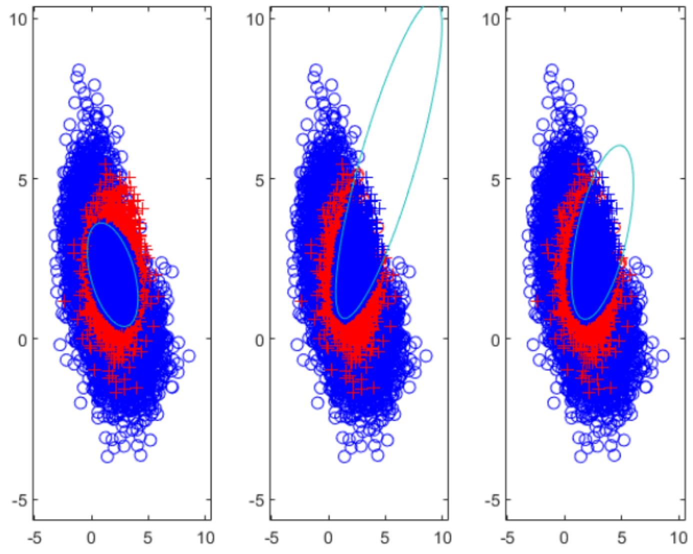
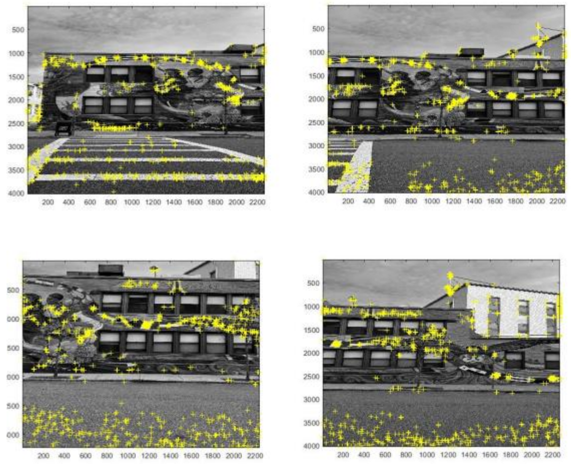


Figure 8: Validation Datasets with Decision Boundary by logistic-quadratic-function

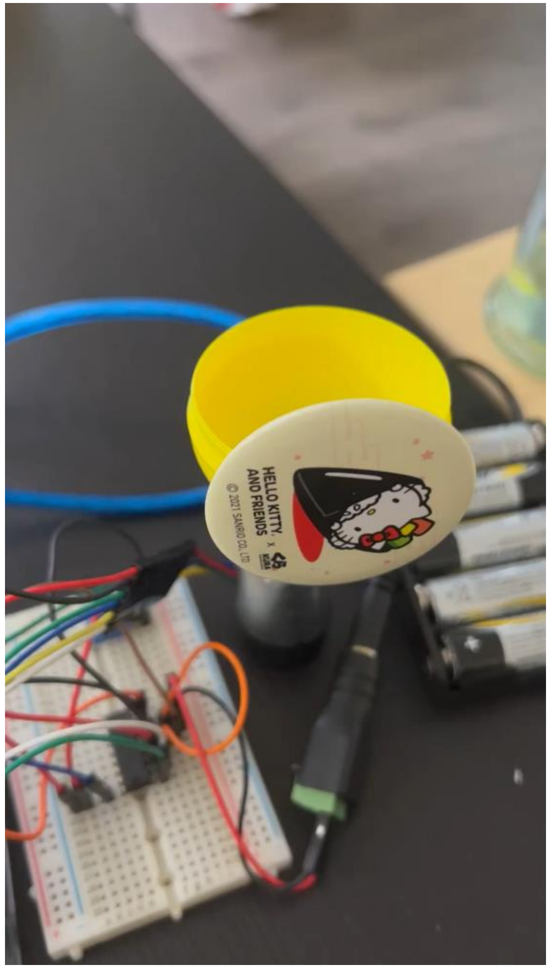
Machine Learning



Sensor and Navigation

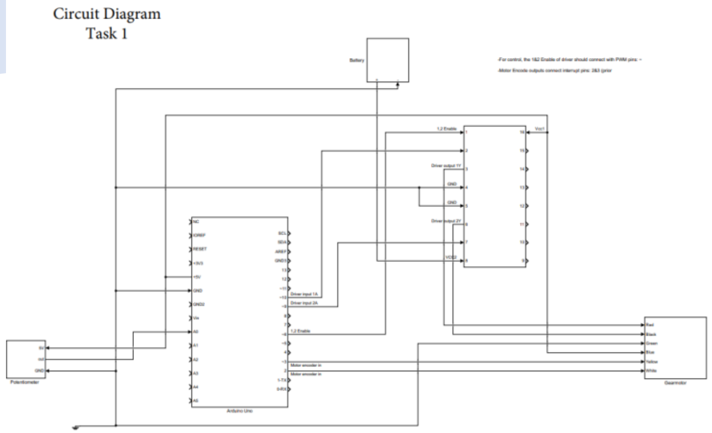
Figure 1: data present in Google Map

DCmotor Control

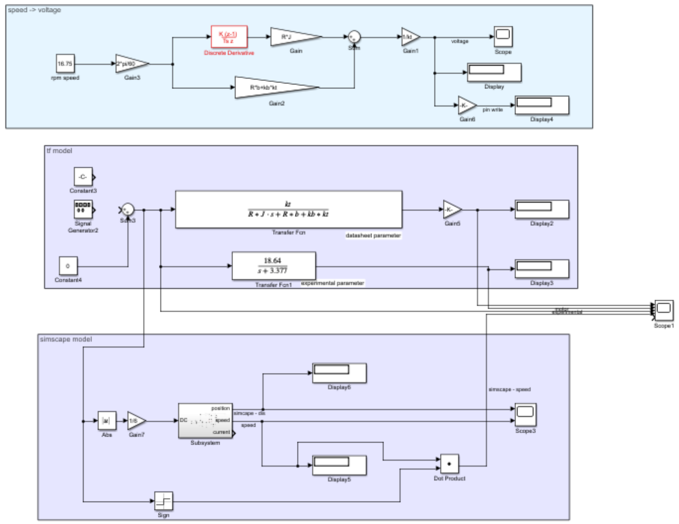


Video of DC motor position control

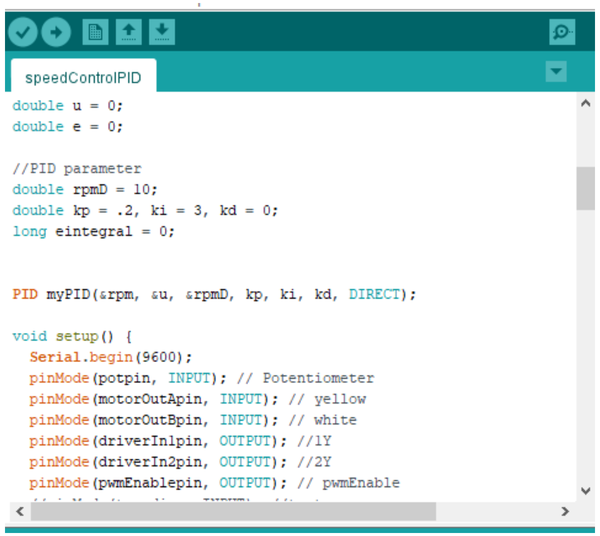
Demonstrate motor speed and position control with Arduino IDE and Simulink Real-Time Target.



1. Design the circuit diagram

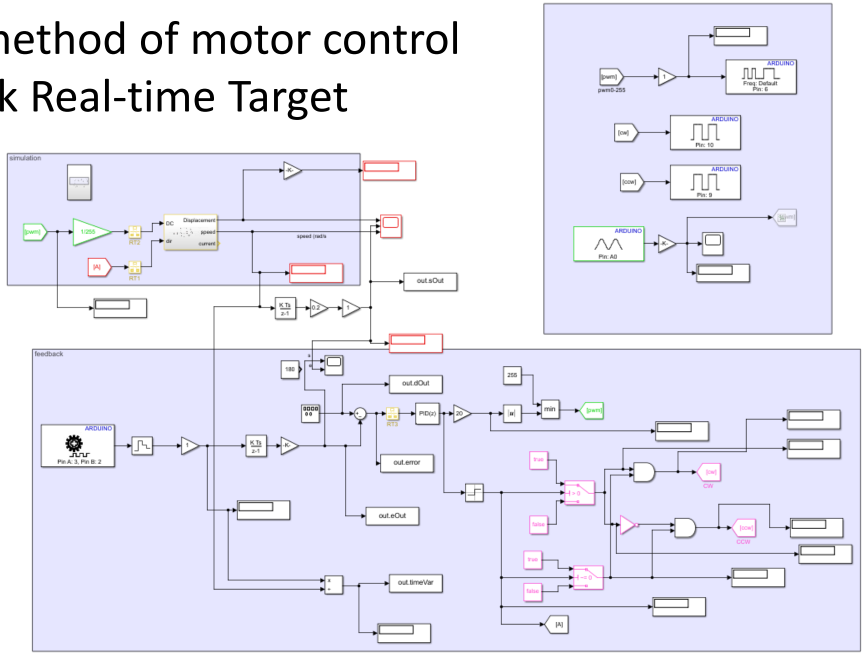


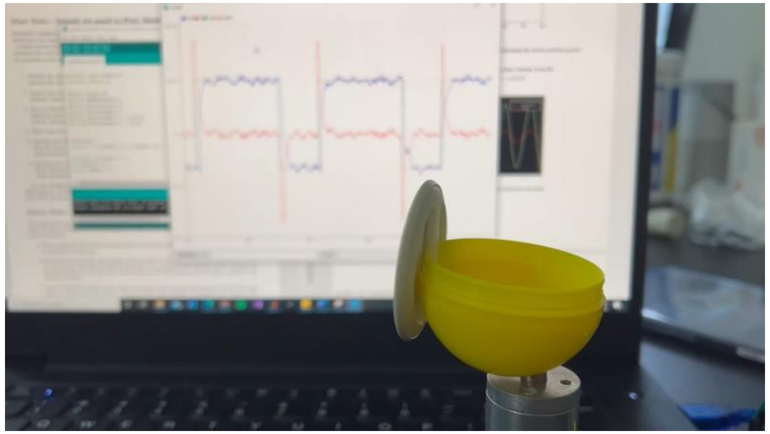
2. Simulation of DC motor with Simulink model



3. One method of motor control with Arduino IDE and C++

4. Another method of motor control with Simulink Real-time Target





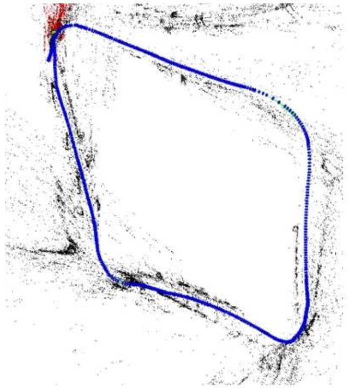
Video of DC motor speed control

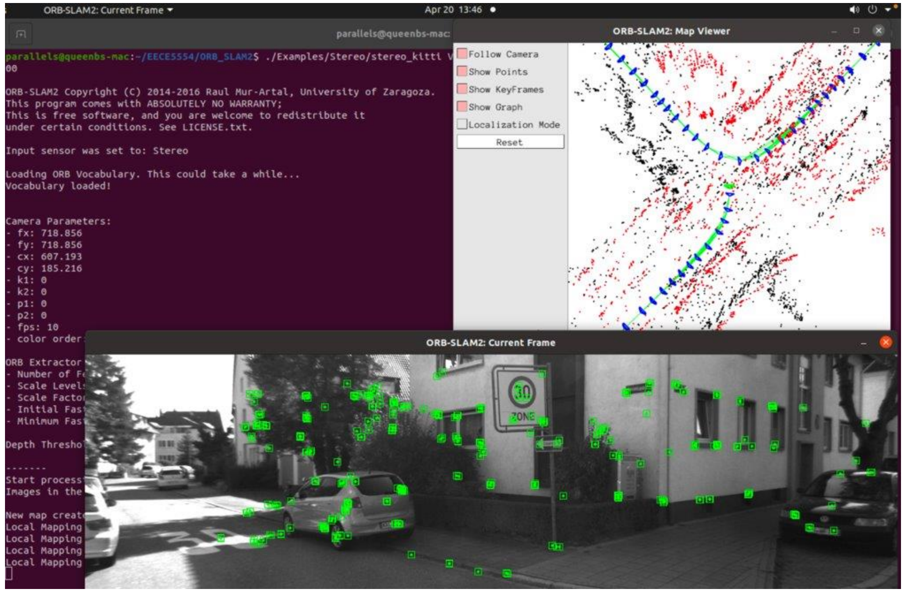
SLAM

Map of sequence 00 of kitti

GPS

Result

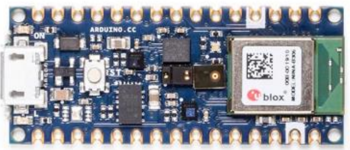


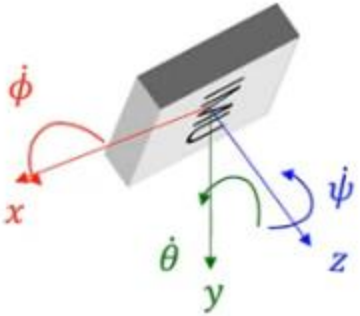


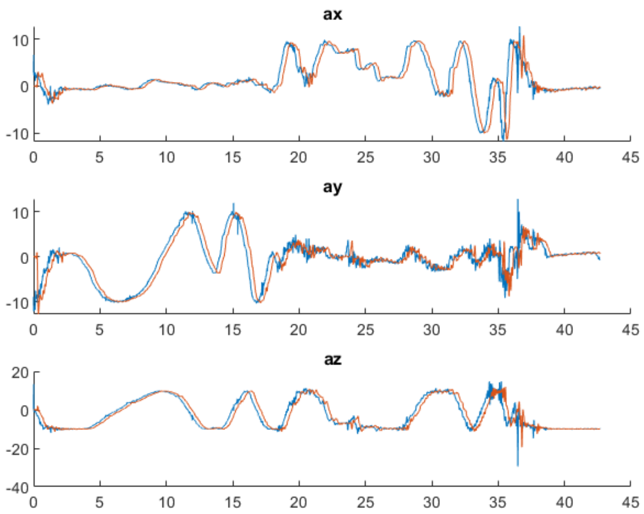
SLAM using stereo cameras dataset (kitti and NUance) with ORB-SLAM2 and ROS in Linux system.

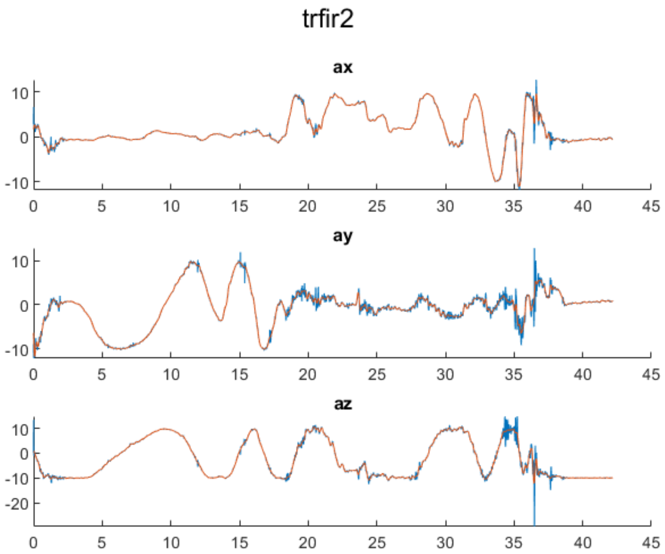
[The Group Presentation Slides]

IMU Filters

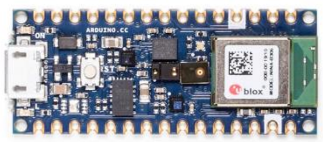








Filter IMU raw data with the combination of FIR, IIR and complementary filters.



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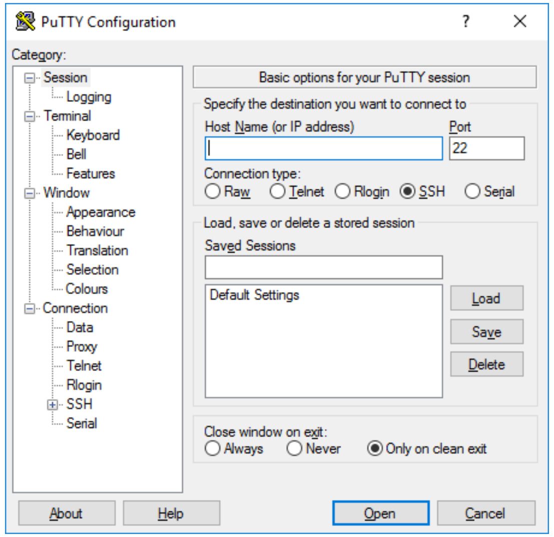
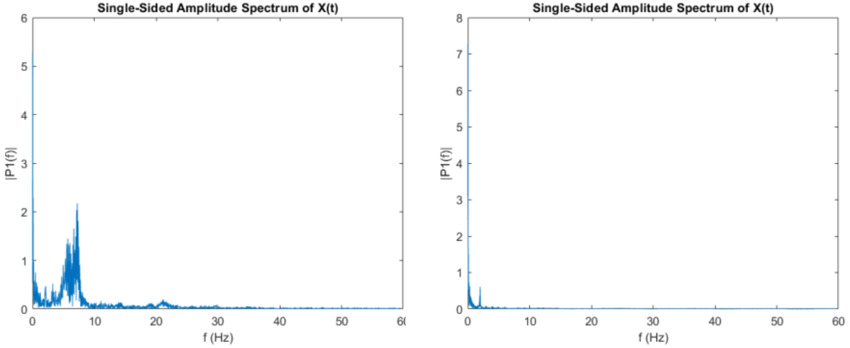
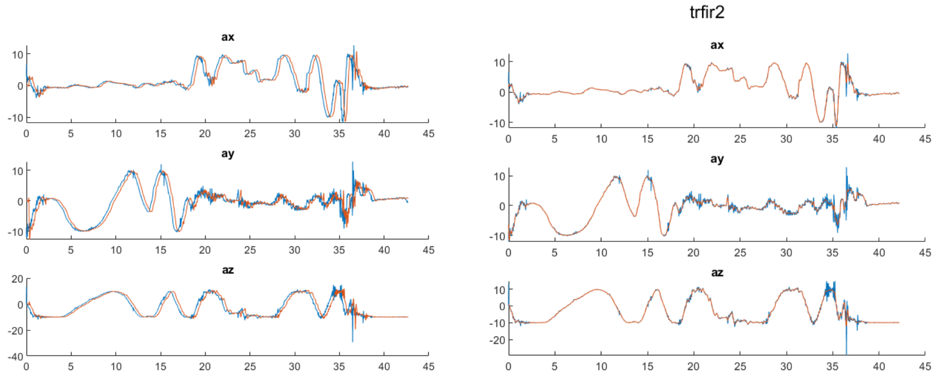


1. Datasets source: Parrot Mambo quadcopter and LSM9DS1 IMU. Terminal emulator PuTTY is used to log the signal.

```
clear;
close all;

% load("IMU_Hover/RSdataMine0904.mat");
fs = 119;
g = 9.81;

fo = 4; %5 is useless
fname = "putty_test"+fo;
data1 = table2array(readtable("IMU_Hover/"+fname));
ax = data1(1:end-1,1)*g;
ay = data1(1:end-1,2)*g;
az = data1(1:end-1,3)*g;
at = 1/fs*(0:(length(data1)-1));

S = ax;
T = at(2)-at(1);
Fs = fs;
L = length(S);
t = at;

X = S;
Y = fft(X);

figure;
P2 = abs(Y/L);
P1 = P2(1:L/2+1);
P1(2:end-1) = 2*P1(2:end-1);

f = Fs*(0:(L/2))/L;
plot(f,P1)
title('Single-Sided Amplitude Spectrum of X(t)')
xlabel('f (Hz)')
ylabel('|P1(f)|')
```



2. Analyze signal with frequency sampling method



3. Low pass filter design with window design method: 4 FIR filters and 1 IIR filter

$$y[n] = (1-\alpha)x[n] + \alpha y[n-1] \tag{15}$$

$$\alpha = \frac{\tau}{\tau + T_s} \tag{16}$$

when τ is the desired time constant, T_s is the sampling interval.

In IMU, $x[n]$ is the angle data calculated by gyro meter reading, $y[n-1]$ is the angle data calculated by accelerometer reading.

4. Complementary filter design

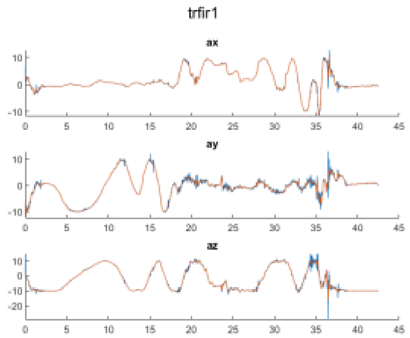


Figure 25: acceleration filter by trfir1

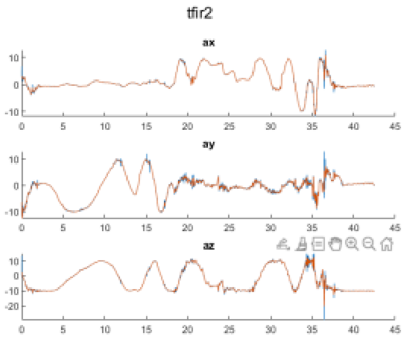


Figure 26: acceleration filter by tfir2

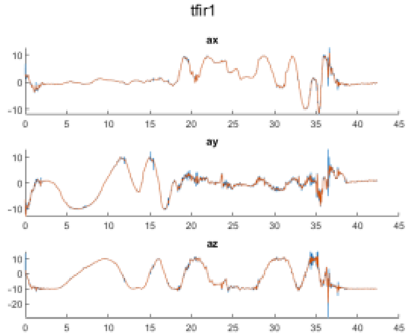


Figure 27: acceleration filter by tfir1

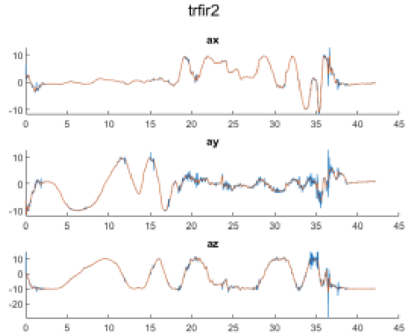


Figure 28: acceleration filter by trfir2

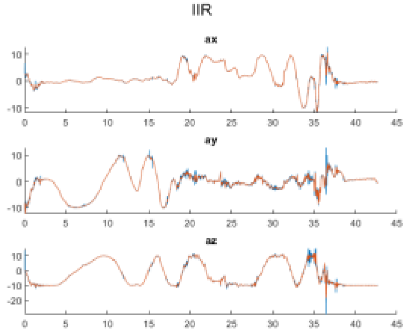


Figure 29: acceleration filter by IIR

5. Performance of the low-pass filters

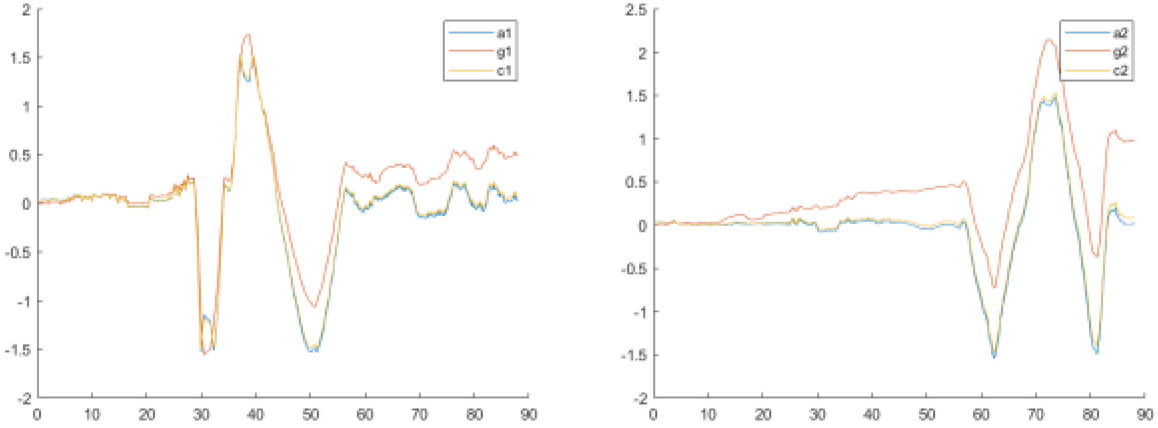
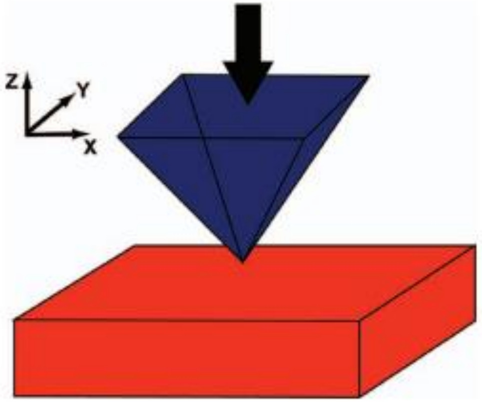
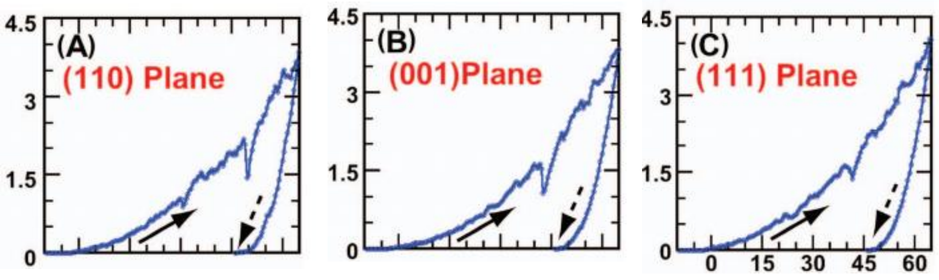


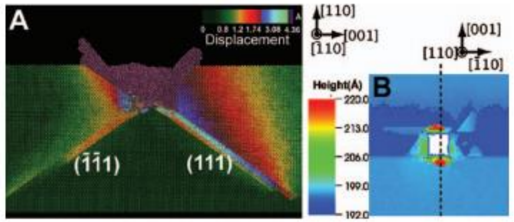
Figure 35: Angle calculated by accelerometer, gyro meter and complementary filter

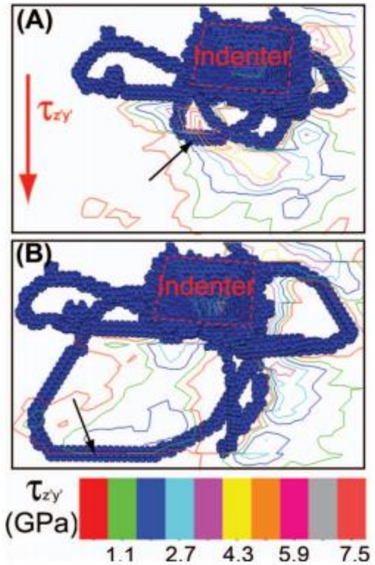
6. Performance of the complementary filter

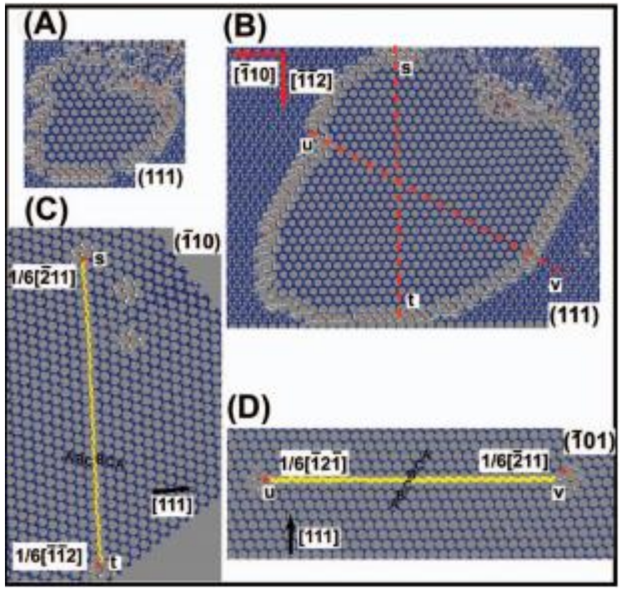
Nanoindentation Simulation







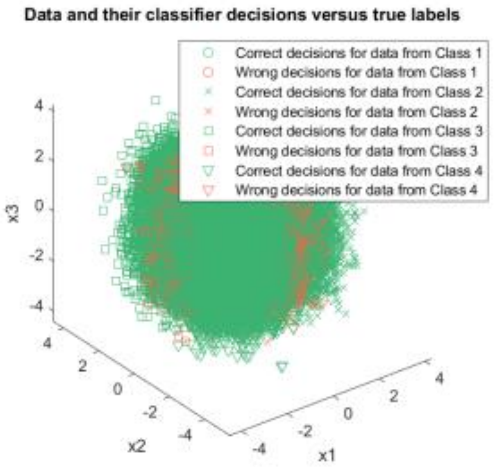




Bachelor Thesis

Multimillion-atom nanoindentation simulation of crystalline silicon carbide with spherical cavity.

Machine Learning



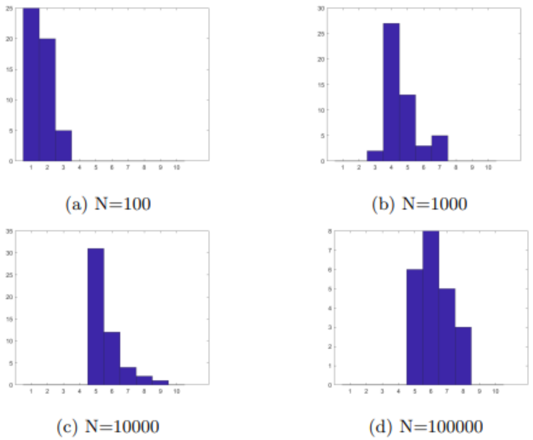


Figure 8: kFold histogram

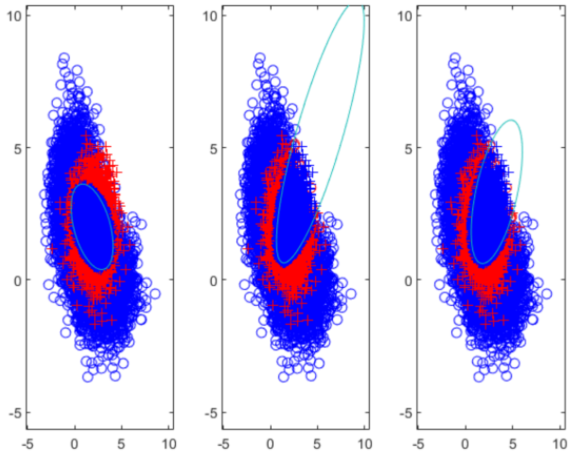


Figure 8: Validation Datasets with Decision Boundary by logistic-quadratic-function

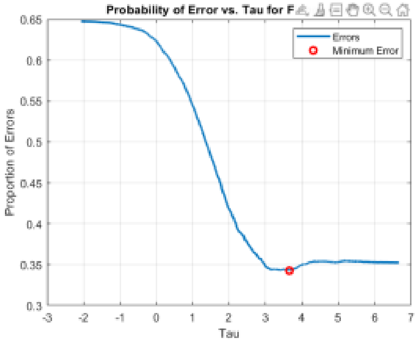


Figure 6: Fisher LDA Probability of Error vs. Tau

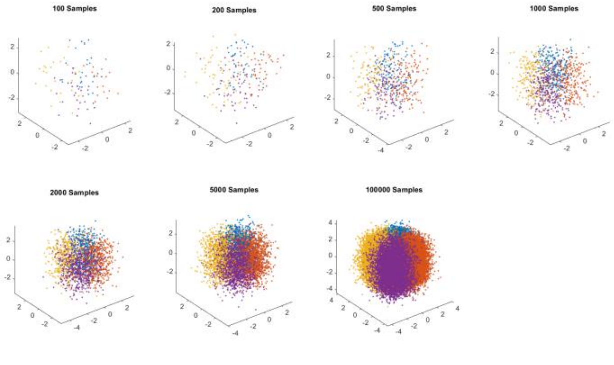


Figure 1: Data Distribution

Used Fisher LDA, ERM, MLE, MAP, Bayesian estimation, BIC and K-fold cross-validation to approximate model parameters. Trained 2-layer MLP.

Sensor and Navigation

Figure 5: 5 images using for mosaic

Figure 7: the panoramic mosaic of entire building

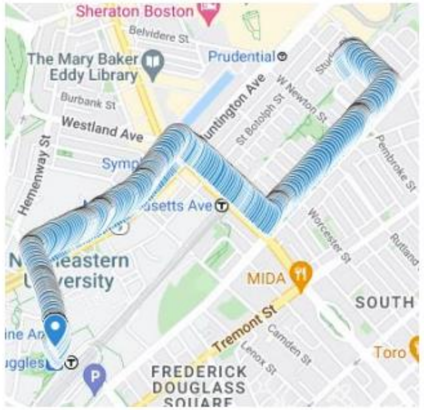


Figure 1: data present in Google Map

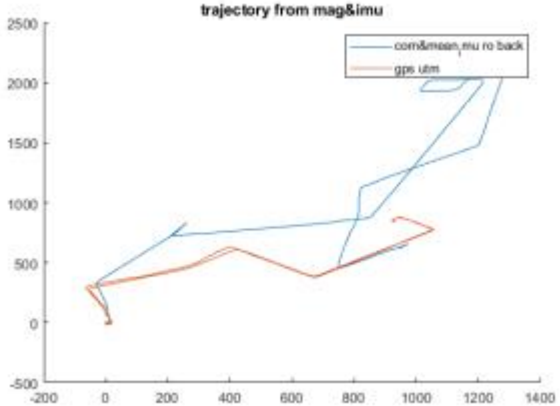


Figure 10: trajectory from calculation and gps

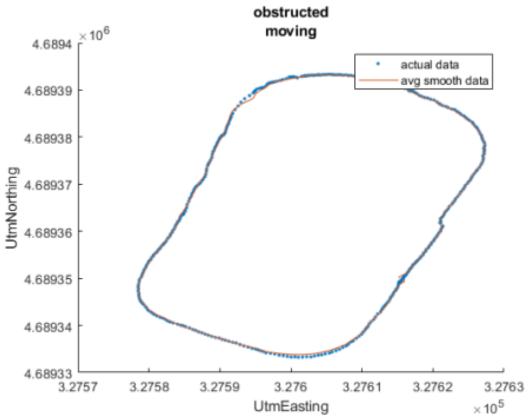


Figure9: Obstructed moving data

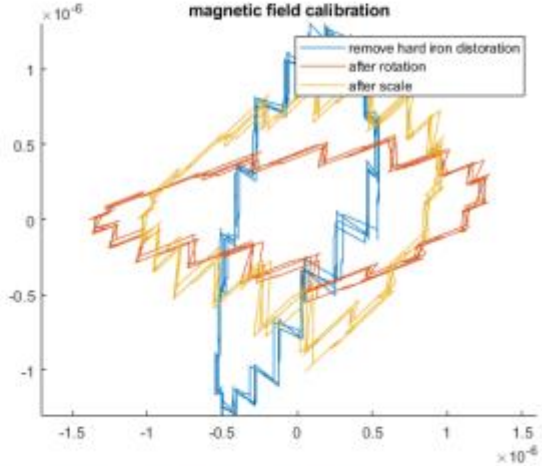


Figure 4:magnetometer calibration result

IMU, GNSS, magnetometer, camera and Lidar.

Internship

Unfortunately, I cannot directly show my work here for some reasons.

Here is the accomplished list of what I have done during my last internship.

- BLDC motor control MATLAB simulation without Simulink built-in Toolbox
- Drive programming and assist the SW team in familiarizing with the prototype machine
- CAN signal capture from i.MX8 and MathWorks Speedgoat
- Data Mining for Formative Study with the EM team to troubleshoot from unexpected performance
- Electrical schematic review with the EE team
- Presentation for internal training
- 8 pages document of knowledge transfer