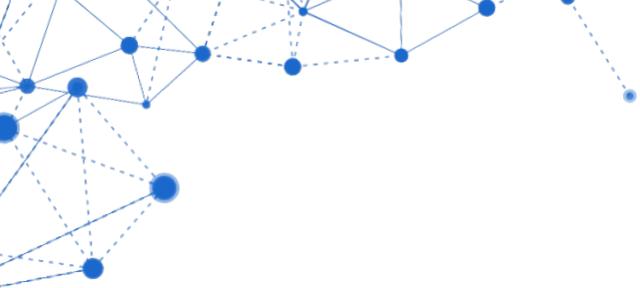




IA Work Report



Dec
Study on Machine
learning on 60GHz V2X
and Tensorflow

2018

Feb
Hand over Peter' s
work and debug.

2019

Jan
Help on road test /Use
neural networks to
make prediction

2019

2019

Mar and forwards
Hand over Peter' s
work and debug.

Objectives

- Get a chance to work on machine learning engineering projects
- Learn team Work
- Learn new knowledge: Tensorflow, cloud functions, javascript



Literature Study & Review

- Study on mmWave and 60GHz V2X
- Study on Linux and Tensorflow
- Made a list about the literature in related to machine learning in Wi-Fi



NN model for throughput prediction

Pre-process data (split,normalize)

Train model

Build model (use keras)

Make predictions

Buliding Model

SNRData	RSSIData	LastBeaconRSSI	LastDataRSSI	Learning Rate	Layer1	Layer2	Layer3	frac	MSE
1	1			0.0005	64	128	64	0.8	2.14
1	1			0.001	64	128	64	0.8	2.83
1	1			0.0005	64	256	64	0.8	2.54
1	1			0.0005	64	128	64	0.9	1.83
1		1		0.0005	64	128	64	0.8	3.36
1		1		0.001	64	128	64	0.8	3.25
1		1		0.0005	64	256	64	0.8	3.31
1		1		0.0005	64	128	64	0.9	2.87
1			1	0.0005	64	128	64	0.8	2.18
1			1	0.001	64	128	64	0.8	1.99
1			1	0.0005	64	256	64	0.8	1.96
1			1	0.0005	64	128	64	0.9	1.27

Model

Key Parameter:

Layer = 3

frac = 0.9 (90% Training Data & 10% Test Data)

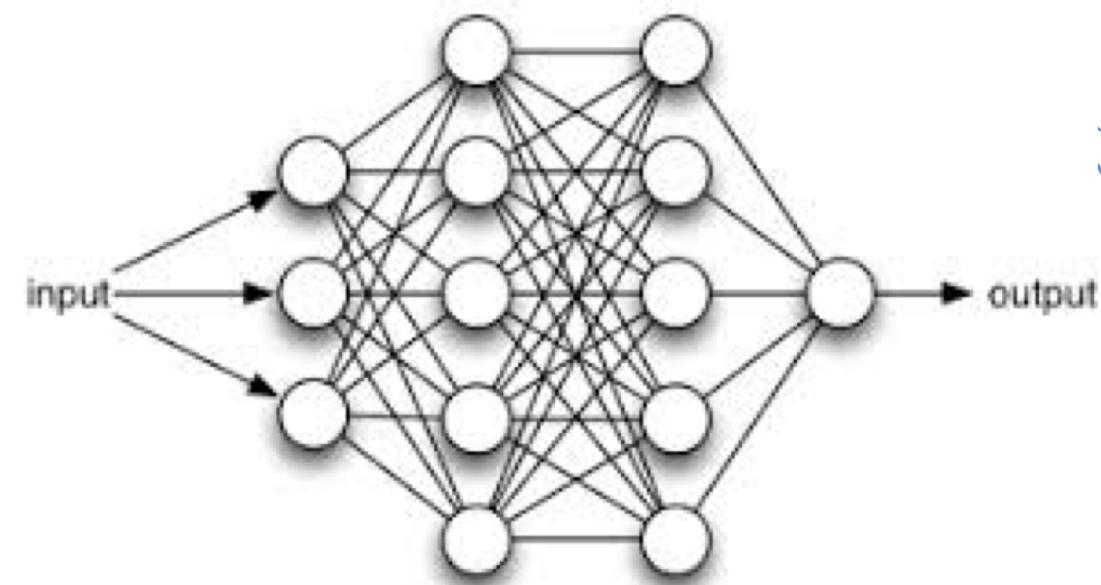
Epochs = 1000

Learning Rate = 0.0005

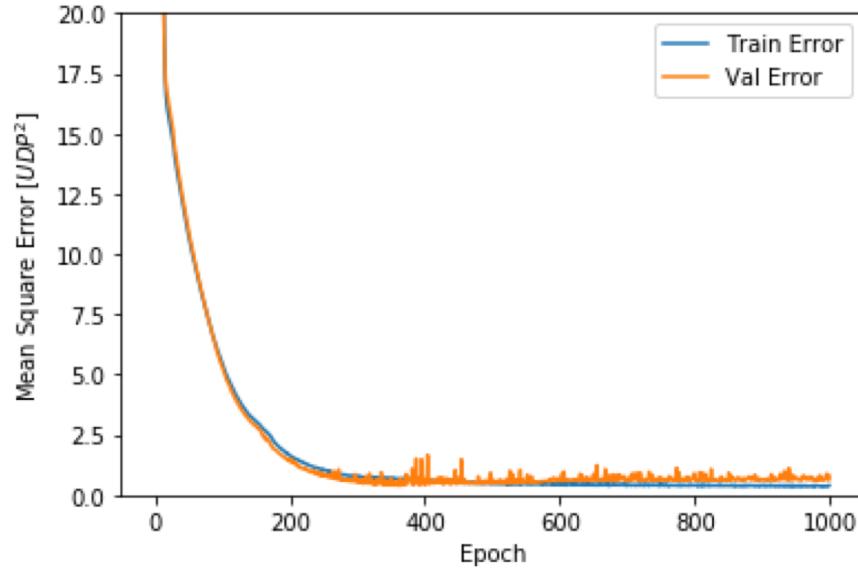
Input: SNRData & RSSIData

Output: UDP Bandwidth / TCP Bandwidth

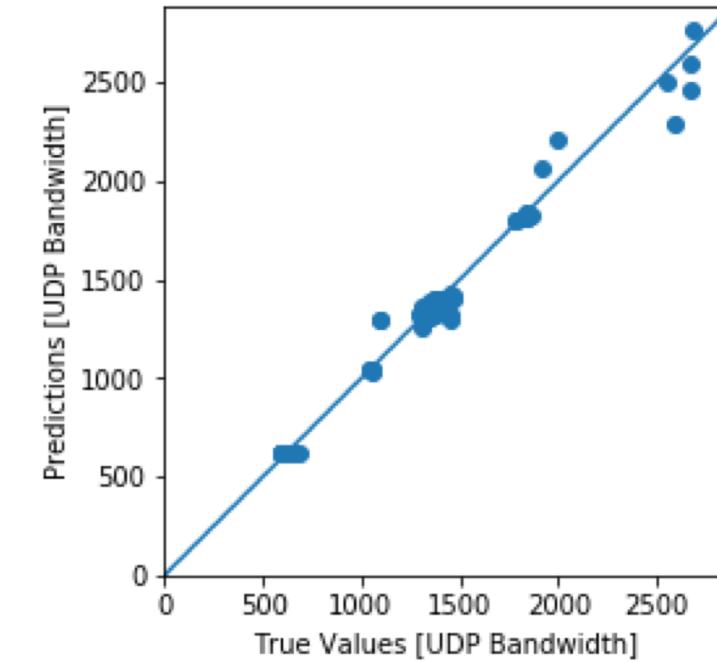
Layer (type)	Output Shape	Param #
dense (Dense)	(None, 64)	256
dense_1 (Dense)	(None, 128)	8320
dense_2 (Dense)	(None, 64)	8256
dense_3 (Dense)	(None, 1)	65



Prediction Results



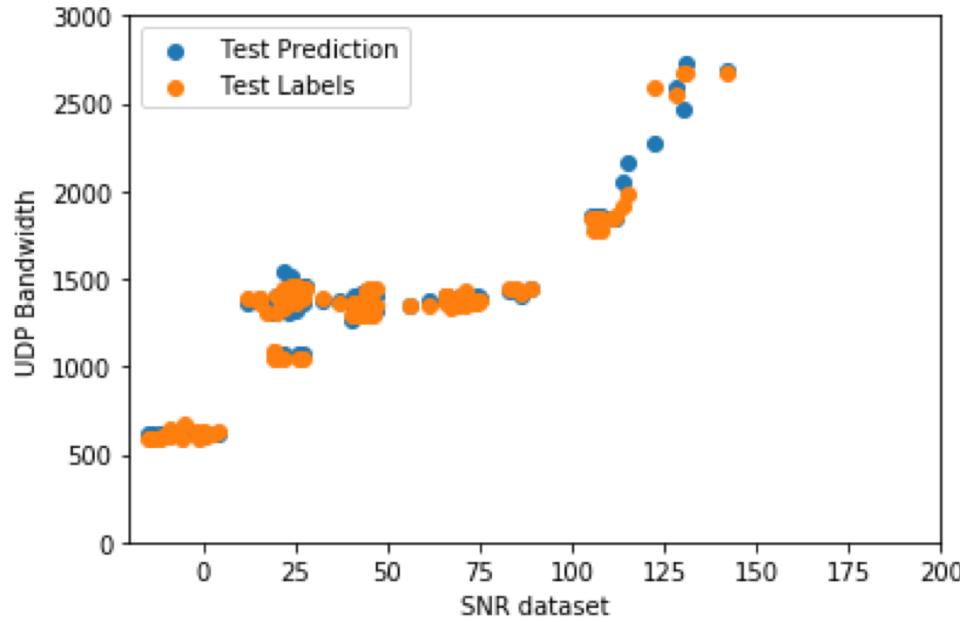
This graph shows MSE(mean Square Error) converges at last.



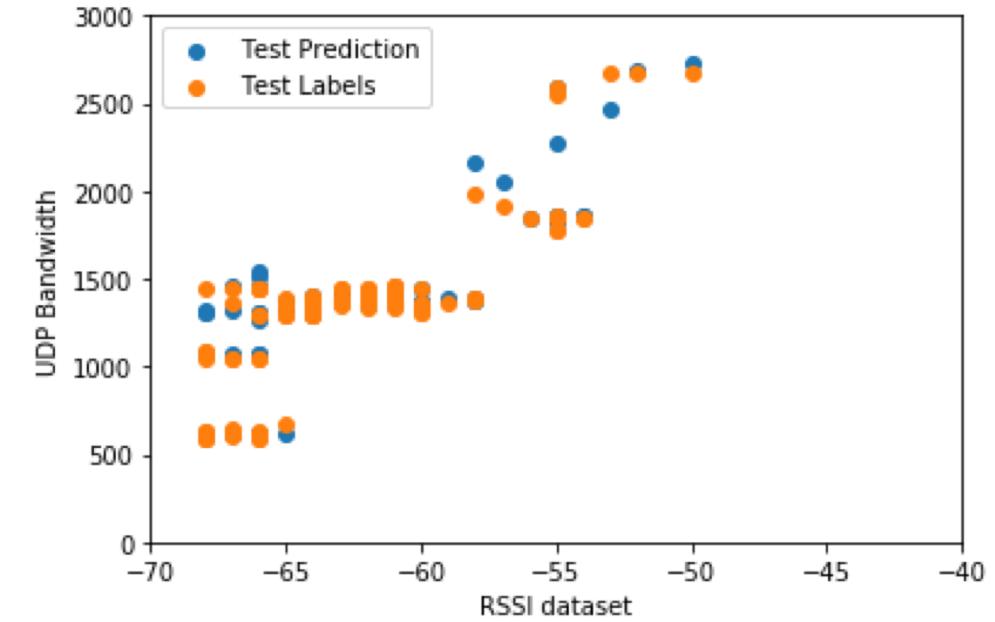
This graph shows the comparison between True values and predictions.

Accuracy(Error < 5%): 90.598 %
Accuracy(Error < 10%): 97.436 %

Prediction Results

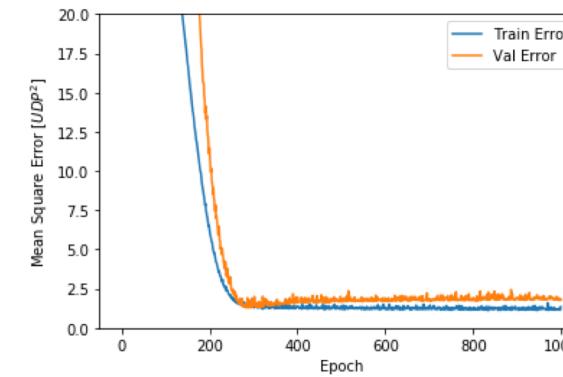
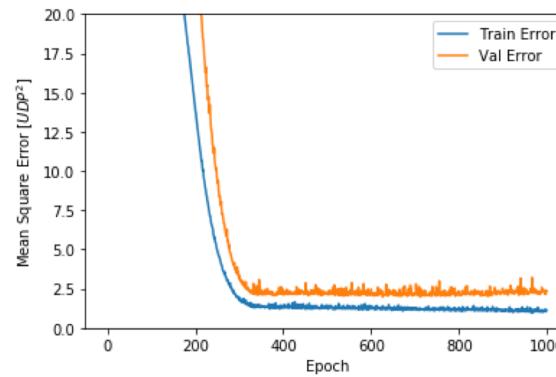
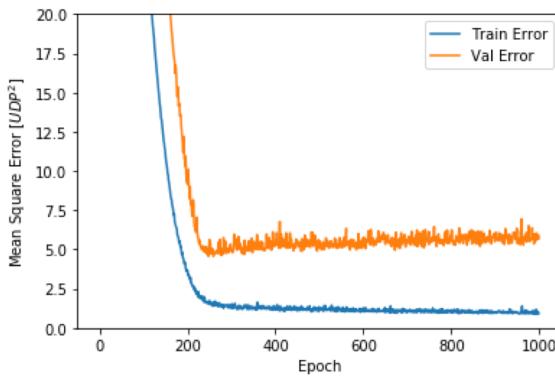


The result in Figure 1 is good,
especially for $\text{SNR} < 120$.



The result for RSSI is a little worse,
so I try to use different RSSI data.

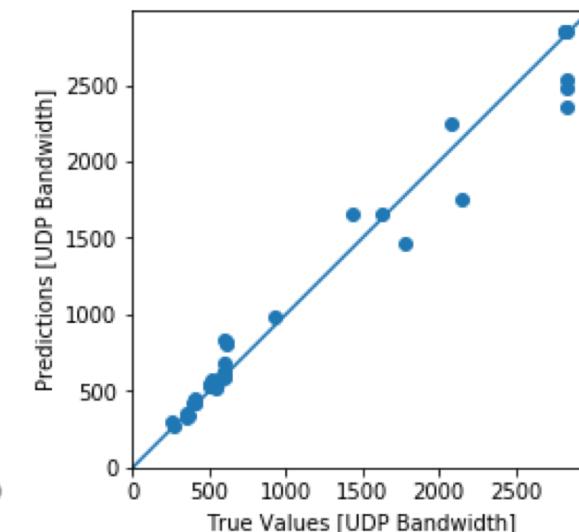
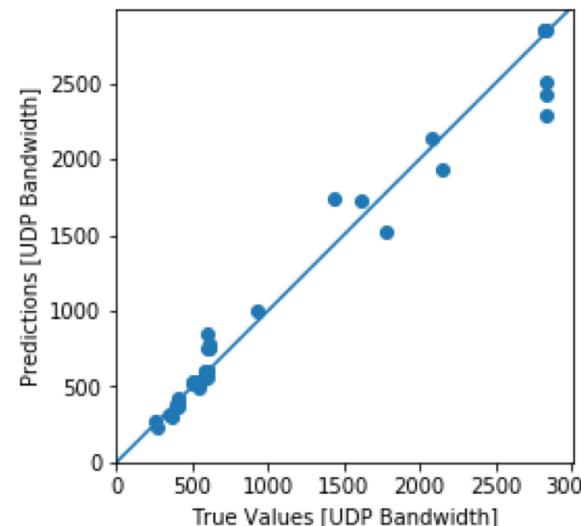
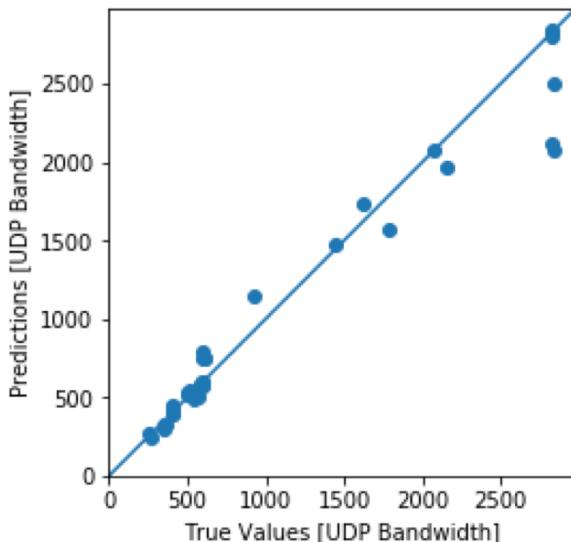
Compare using RSSIData/LastBeaconRSSI/LastDataRSSI



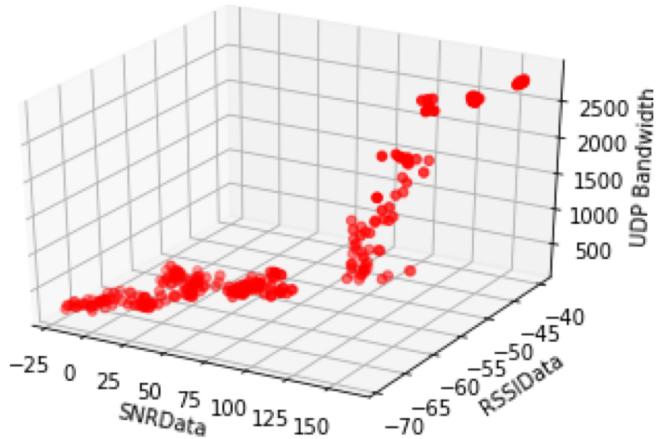
LastBeaconRSSI: MSE = 3.36

RSSIData: MSE = 2.14

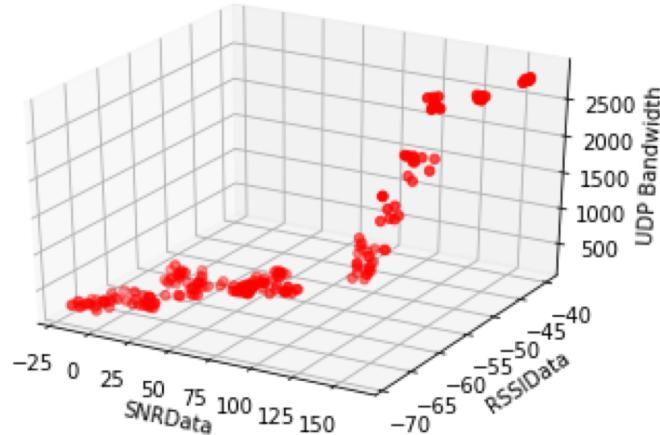
LastDataRSSI: MSE = 2.18



Issues & Problems



Original Data



Filtered Data

Use Z-score to filter data

Choose threshold 1.0, data size is 1168/1811.

Accuracy(Error < 5%): 91.45 %

Accuracy(Error < 10%): 96.58 %

Choose threshold 2.0, data size is 1731/1811.

Accuracy(Error < 5%): 75.14 %

Accuracy(Error < 10%): 94.80 %

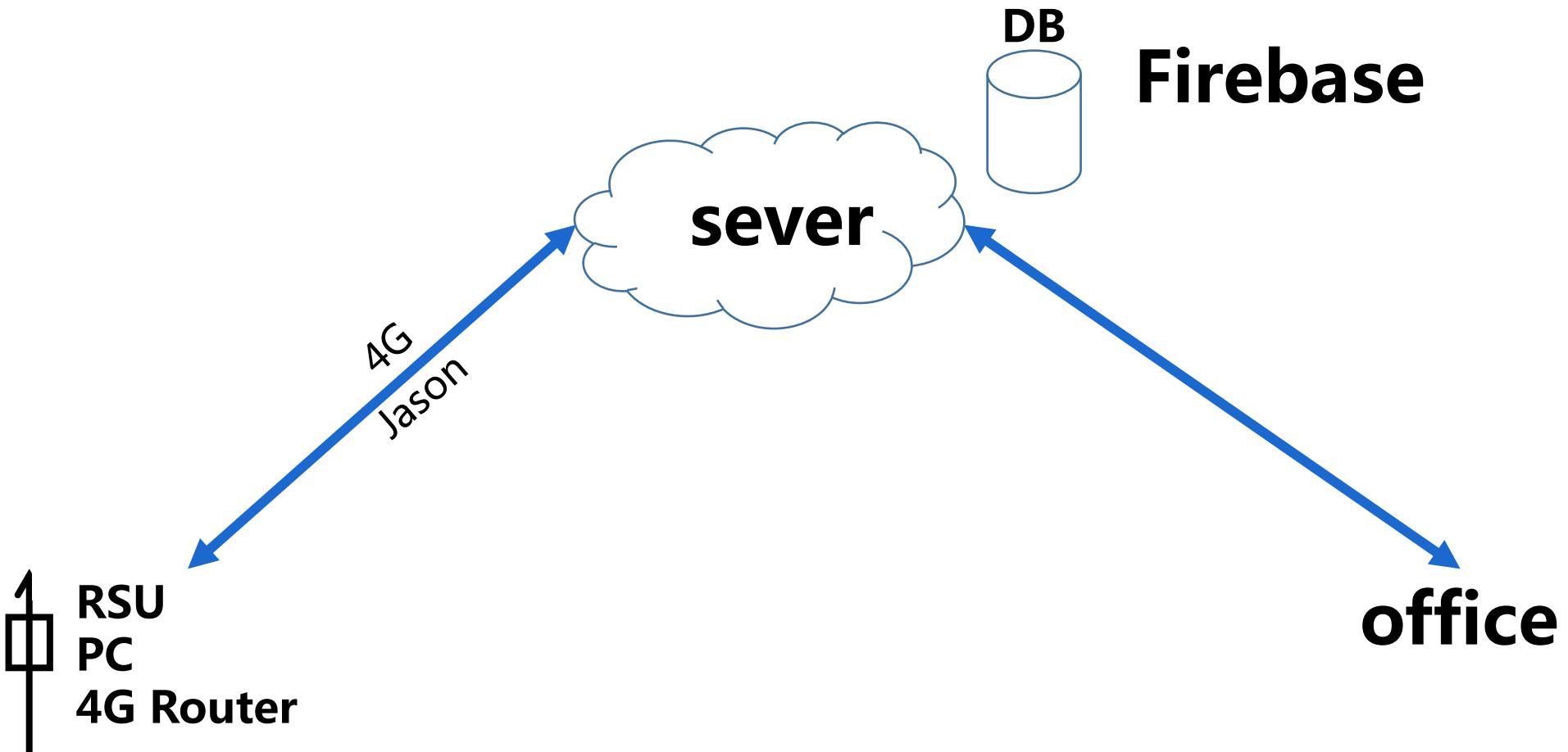


Other Work related

- 
- Handover Peter' s work
 - Debug for Python2 to Python3 on data read-in code
 - Help on road test



Next step





THANKS