

# CSE 891: Selected Topics - AIoT

## Project 2 - Report

### *LoRa Link Model Exploration*

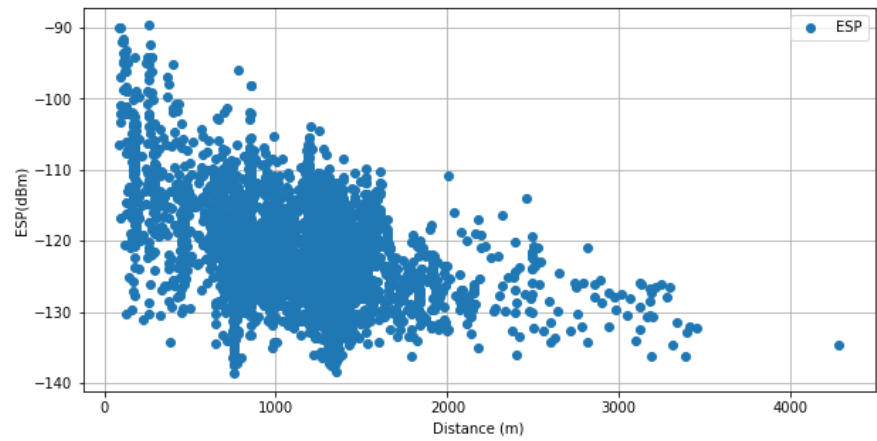
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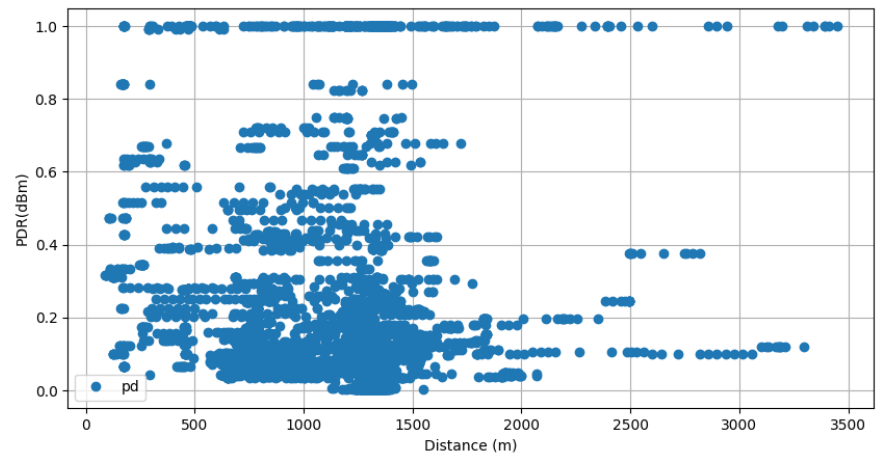
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#### 1) PART 1: Link Quality Evaluation

- a) Already submitted the code
- b) Plotted figures
  - i) ESP



- ii) PDR



c) Discussions

We believe that we were close to our value estimation for ESP(dBm). As we know, the Estimated Signal Power is the received signal strength of the device by the gateway. This graph clearly describes how the power fades away as the distance increases. For example, the density at 1000 m from the given reference point is more intense as compared to the density at 4000 m from the reference point.

**2) PART 2: Link Model Exploration**

a) Already submitted the code

- i) We have evaluated the PL and n values and have included two jupyter notebooks. All our results and discussions are already mentioned in the code.

b) Error for n

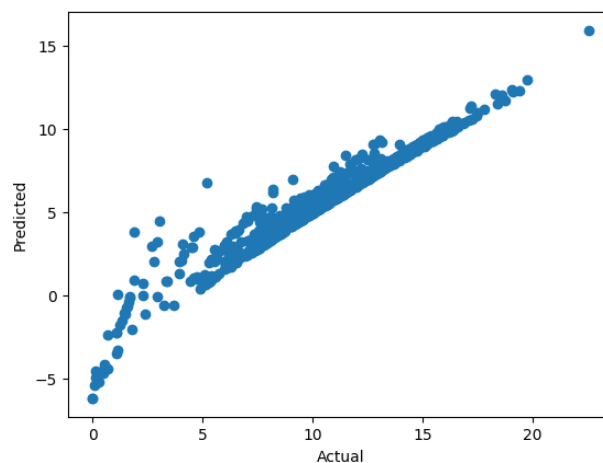
- i) `min(err)` -1.9044271560568853
- ii) `max(err)` 7.0652573469380435
- iii) `mean(err)` 5.152179297923622
- iv) `median(err)` 5.50026711251445
- v) `rms` 5.223676040171309

c) Error for PL

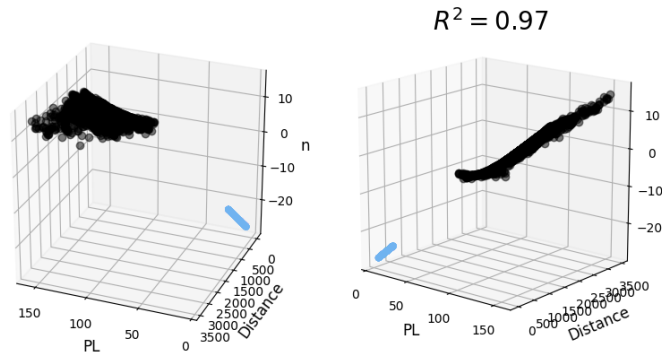
- i) Minimum error: 1.93570763e-09
- ii) Maximum error: 16.97966671
- iii) RMSE value: 0.64845979

d) Plots

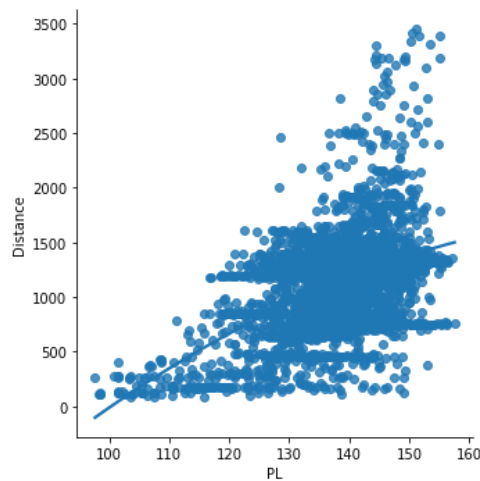
i) Plot1



ii) Plot2



iii) Plot3



- e) Based on your evaluation results, discuss whether your model is accurate, why or why not. Is there any way to improve the estimation accuracy?

Discussion: For training a linear model, we have considered the zero mean gaussian value as constant assuming that it will have very minimal effect on our model even while we train and we test. As per the evaluation of the model, we have minimum, maximum, mean, median and rms values within accepted ranges. This can also be confirmed with the  $r2\_score$  of around 0.97 for  $n$  values and an RMSE value of 0.64 for PL values. This implies that our model is fairly accurate as it is very close to the manually found value.

We could have improved the accuracy by implementing Feature Selection and Scaling and using Ensemble and Boosting Algorithms.