CS425
Homework 1

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1 Finding the Path Loss Exponent

Using my Wifi AP as a transmitter and ym smartphone as a receiver, following readings were taken :

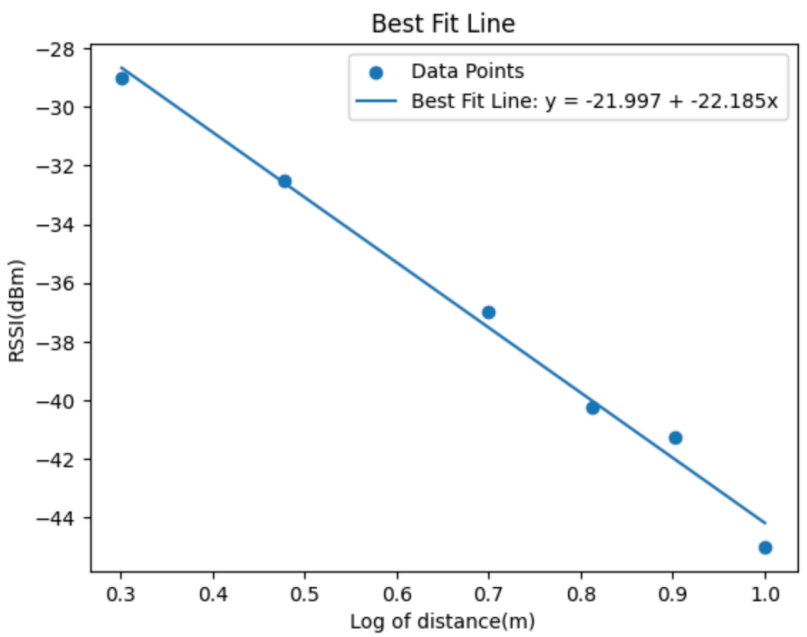
Distance(m)	Reading 1	Reading 2	Reading 3	Reading 4	RSSI(dBm)
2	-28	-30	-29	-29	-29
3	-33	-32	-32	-34	-32.5
5	-37	-36	-38	-37	-37
6.5	-39	-40	-42	-40	-40.25
8	-42	-41	-40	-42	-41.25
10	-45	-46	-43	-46	-45

To find the the best fit line corresponding to this data we can use the following concept : For y = mx + c and data points (x_i,y_i),

m = $\frac{k\cdot\sum_{i=1}^{k} y_i x_i - \sum_{i=1}^{k} y_i \sum_{i=1}^{k} x_i}{k\cdot\sum_{i=1}^{k} x_i^2 - (\sum_{i=1}^{k} x_i)^2}$ = -22.185

c = $\frac{k\cdot\sum_{i=1}^{k} y_i \sum_{i=1}^{k} x_i^2 - \sum_{i=1}^{k} x_i \sum_{i=1}^{k} y_i x_i}{k\cdot\sum_{i=1}^{k} x_i^2 - (\sum_{i=1}^{k} x_i)^2}$ = -21.997

y = -22.185 x - 21.997 where x is the log of the distance from the WiFi AP, and y is the RSSI



Slope of the best fit line = -22.185

To find the variance :

var = $\frac{\sum_{i=1}^{k}(y_i - mx_i - c - \mu)^2}{k}$ where $\mu = \frac{\sum_{i=1}^{k}(y_i - mx_i - c)}{k}$

So The path loss exponent = $\frac{22.185}{10}$ = 2.219 and the variance w.r.t the best fit line is 0.283.

2 Range Estimation

With d_o = 1m, $P_r(d_o)$ = -21.997 dBm

To calculate the distance we use the formula $d = d_o \cdot 10^{\frac{P_r(d_o) - P_r(d)}{m}}$

RSSI(dBm)	Actual Distance	Calculated Distance	Error
35.25	4.2	3.957	0.243
39	6.25	5.840	0.410
43.25	9.45	9.078	0.372
46	12.4	12.077	0.323
46.75	13.25	13.054	0.196

So the average error is 0.309