Assignment 2

Step1: Finding the Path Loss Exponent (40 points)

The purpose of this step is to find out the **path loss exponent** of the room/apartment where you are staying.

(a) First download the **WiFi Analyzer** app in your smartphone. Check whether the app is able to identify your WiFi AP and can collect the received signal strength (RSSI). The time graph will show you the signal strength variation with time.

(b) Now use your AP as a transmitter and your smartphone as a receiver. Vary the distance in between these transceivers and at every positions record ~5-10 RSSI samples at different smartphone orientations (say 4).

(c) Plot all these points in a graph where the RSSI values are in y-axis (in dB or dBm), and the distances are in x-axis (in log scale).

(d) Draw a best fit straight line corresponding to this log-log plot. Find out the **slope** of this line, divide it by 10 and take the absolute value, which is your **path loss exponent**.

(e) Also find out the **variance** of these RSSI samples, w.r.t. the best fit line.

Step 2: Range Estimation (10 points)

The purpose of this step is to find out the distance/range from the path loss exponent that you have found in the last step.

(a) Now use the obtained path loss exponent for estimating some distances, using the following formula (I have ignored the noise term). Assume d_0 as 1 meter, and find $[P_r(d_0)]dB$. Then record $P_r(d)[dBm]$ and estimate the distance d from the corresponding equation.

(b) However, due to the noise there will be some errors in range/distance estimation. So, calculate the distance error by comparing with the actual distance. Repeat this experiment for 5 different distances, and report the average error.

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\begin{aligned}
P_r(d)[dBm] &= P_t[dBm] - P_L(d)[dB] \\
&= P_t[dBm] - [P_L(d_0)]dB - 10n\log_{10}\left(\frac{d}{d_0}\right) \\
&= P_r(d_0)[dBm] - 10n\log_{10}\left(\frac{d}{d_0}\right)
\end{aligned}
$$