Wireless Broadband Service Quality Prediction App

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ML needs large amount of valid data to execute
Here is the process we take to extract and predict values

The android app (Figure 10) collects RF metrics available to the smartphone using the Android Telephony APIs.
Out of all the collected RF metrics, 5GNR RSRP (dBm) and 5GNR SINR (dB) are taken and using POST request is sent to the backend server (Figure 9), where the ML model is hosted.

Upon receiving the 5G-NR values the server feeds them as input to the ML model and the model spits out the prediction which is sent back to the app in JSON format as a response to the POST request (Figure 10).

Customer might be unhappy with this coverage and companies face expensive churn
Our solution is to build an app that predicts consumers’ 5G service quality before they sign up for a 5G internet device.

Three stages to predict 5G service quality:
Radio Frequency (RF) Study: Investigate outdoor-to-indoor propagation for low and mid band 5G to collect data
Machine Learning (ML) Model: Train an ML model to predict service quality (throughput) of home internet
Consumer App: Develop an app for consumers to predict service quality before signing up for T-Mobile Home Internet

Investigate outdoor-to-indoor RF propagation for low and mid frequency bands
○ Collect outdoor/indoor RF metrics using state-of-the-art logging tools
■ Collect low and mid band, 4G and 5G data
■ Real-world data: team member homes, campus
■ Vary environmental factors: building height, near/no window, building/window material, elevation
○ Outdoor-to-indoor coverage data visualization
■ Indoor localization is challenging
■ Ideal CPE placement

RF Study

Data prepped for machine learning
○ Raw data is first cleaned so that completed rows of datasets could be extracted
○ Clean data are then sieved to drop out the columns we do not need
○ Features correlations are checked using a scatter matrix to verify the dependencies of the chosen columns (Figure 4)
○ Then models will be chosen among the state-of-the-art machine learning models (Figure 5)
○ Visualization of the different classes (greater or less than 80MBps) are observed (Figure 7)
○ Hyperparameters are tuned by plotting the spectrum for neighbors of different sizes (Figure 8)

RF Processing

Machine Learning Flowchart

ML Engineering Model

Three stages to predict 5G service quality:

Goals and Deliverables

Abstract

ML Processing

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Investigate outdoor-to-indoor RF propagation for low and mid frequency bands

RF Study

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