Machine Learning Engineer Nanodegree
Capstone Proposal

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Wireless Indoor Localization

Domain Background

Localization is heterogeneous part of the field wireless communication networks that play a vital role in modern life. It's a technique to determine the position of an object or a person.
Indoor localization system is a system that attempts to find the accurate position of the person and object inside a building , mall , rooms… etc.
The localization systems try to identify the position of moving devices with the help of navigation, tracking, monitoring.
Indoor environments are complex, because of signal inference and reflection inside building, it's highly depends on the environment such as position of object and behavior of person, also indoor communication like is unreliable.

Problem Statement

The goal of this project is to predict the room location by observing signal strengths of seven WIFI signals.

Datasets and Inputs

The datasets are provided by UCL Machine Learning Repository

Input Data fields

- Seven WIFI signal strengths
- 2000 instance
- one column of outcome variables that describe the rooms number

Solution Statement

The solution will be prediction of the room number by WIFI strengths, using classification algorithms, specifically using Random Forest algorithm.

Benchmark Model

For this problem, the benchmark model will be using another classification algorithm such as SVM and adaboost.

Evaluation Metrics

Prediction results are evaluated using F2 score ,ROC Curve and AUC

Project Design

First, I'll prepare and visualize data set and decide if any of WIFI's are not useful for localization and dropout it.
Then split the data into 80 % training data and 20 % of testing data.
Trian models using three different algorithms (Random forest , SVM , adaboost).
Start to compare trained models using model evaluation techniques like F2 score ,ROC Curve and AUC.

Reference

- UCL dataset – https://archive.ics.uci.edu/ml/datasets/Wireless+Indoor+Localization

- Academic paper about Domain background https://www.researchgate.net/publication/308842286_A_comparative_study_on_machine_learning_algorithms_for_indoor_positioning

- Algorithms and techniques:
  - https://scikit-learn.org/stable/modules/svm.html
  - https://scikit-learn.org/stable/modules/generated/sklearn.ensemble.AdaBoostClassifier.html
  - https://scikit-learn.org/stable/modules/generated/sklearn.ensemble.RandomForestClassifier.html
  - https://scikit-learn.org/stable/modules/generated/sklearn.model_selection.KFold.html
  - https://scikit-learn.org/stable/modules/generated/sklearn.metrics.confusion_matrix.html