***Final Project (Default):* Indoor Localization Using BLE and WiFi**

**Lab Location**

JEC 5312

**Resources**: *Bluetooth based localization*

File ble\_scanner.py provides a python class that enables easy BLE packet retrieval. You may need to install the Python bluez module in order to run the code. Install bluez with this command: pip install pybluez

Sample usage code is provided in test\_ble\_scanner.py. The following information is retrieved for every packet:

UUID, Major, Minor, TxPower, RSSI

Each of these properties is defined in the Apple iBeacon specification. Information can be found [here](https://developer.mbed.org/blog/entry/BLE-Beacons-URIBeacon-AltBeacons-iBeacon/). Four beacons are provided to you in the IoT lab. Each has a unique UUID and unique Minor value.

**Resources:** *WiFi based localization*

File iwlist.py provides a python code to enable easy WiFi signal strength and quality on the Raspberry Pi. Sample usage code is provided in test\_wifi\_scanner.py. The db, signal\_level, and signal\_total fields may all assist in signal strength.

Four WiFi access points have been set up in the IoT lab for your use. The SSIDs for each access point have been labeled on the access points.

***Calculating Distance from RSSI***

Find a reliable way to convert the BLE and WiFi RSSI measurements from the Raspberry Pi to meters.

***Calculating Location from beacon distances***

Find a reliable way to use multi-lateration techniques and compute the Raspberry Pi position from the known beacon/access point locations/distances.

Several academic papers on the topic of indoor BLE localization have been provided in the resources folder. Feel free to look for other approaches and/or come up with your own through experimentation.

***Deliverables and demo***

* Provide a report (up to 4 pages, upload on LMS by 5/3) describing your localization approach – including algorithms and formulas you have used, experiments you have conducted, and the localization accuracy you have observed for the two cases (BLE and WiFi). Also discuss the pros and cons of each of the two technologies in terms of localization.
* Provide a short video (up to 3 mins, upload on LMS by 5/3) describing your solution and including a short demo.
* Make a presentation or demo in class (up to 10 mins, on 4/28 and 5/2) on your final project.

If you have any questions, please email one of the two lab TAs:

* Sam Atkinson ([atkins2@rpi.edu](mailto:atkins2@rpi.edu))
* Ian Steenstra ([steeni@rpi.edu](mailto:steeni@rpi.edu))