Radar Based Patient Discrimination

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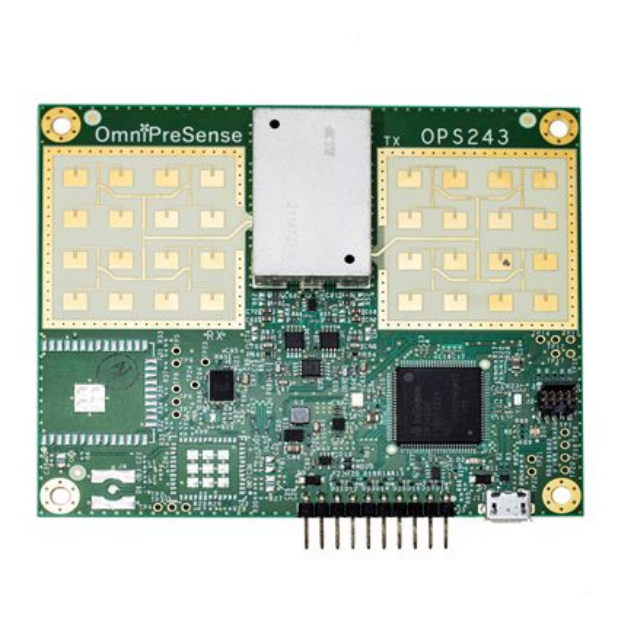
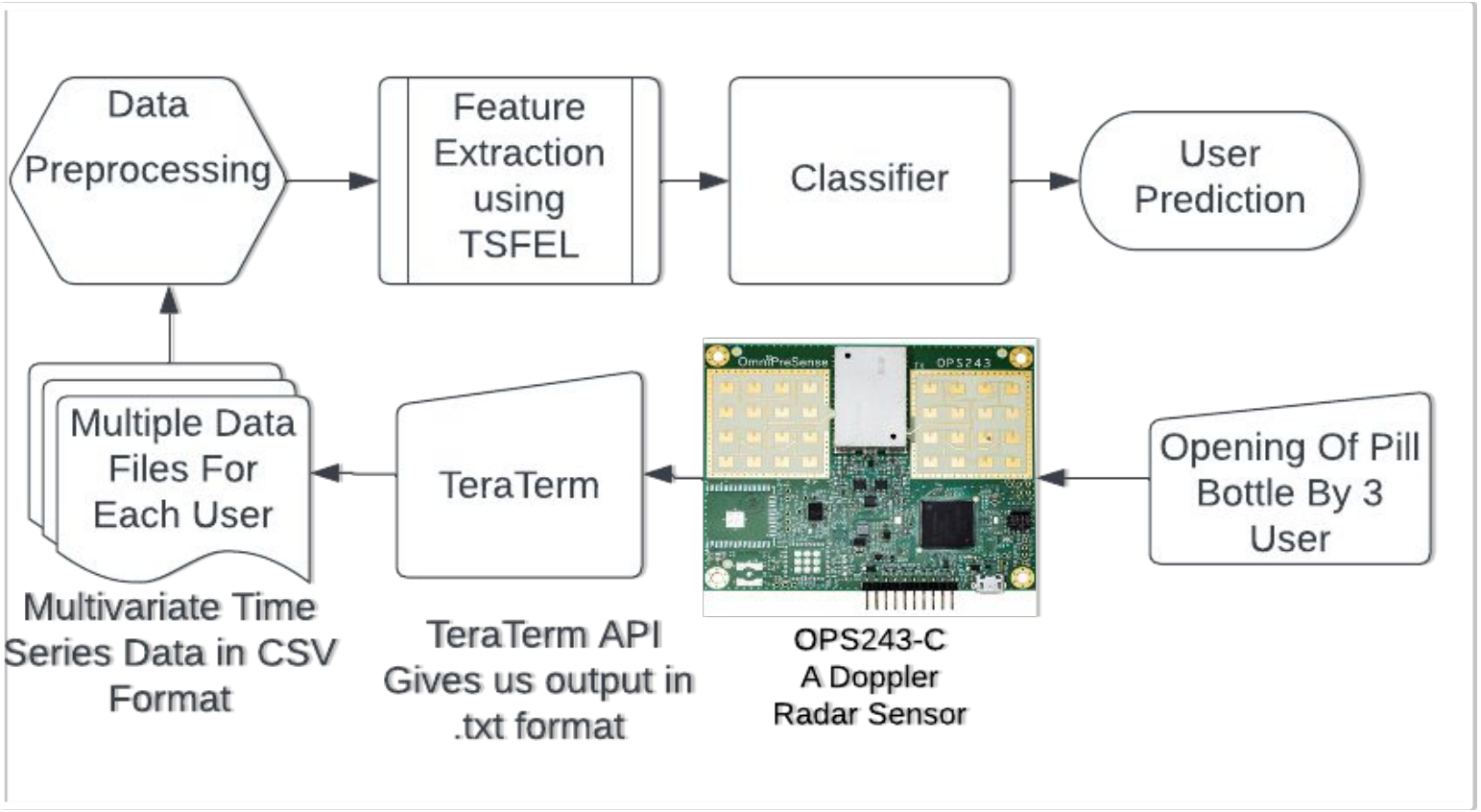
Project Overview

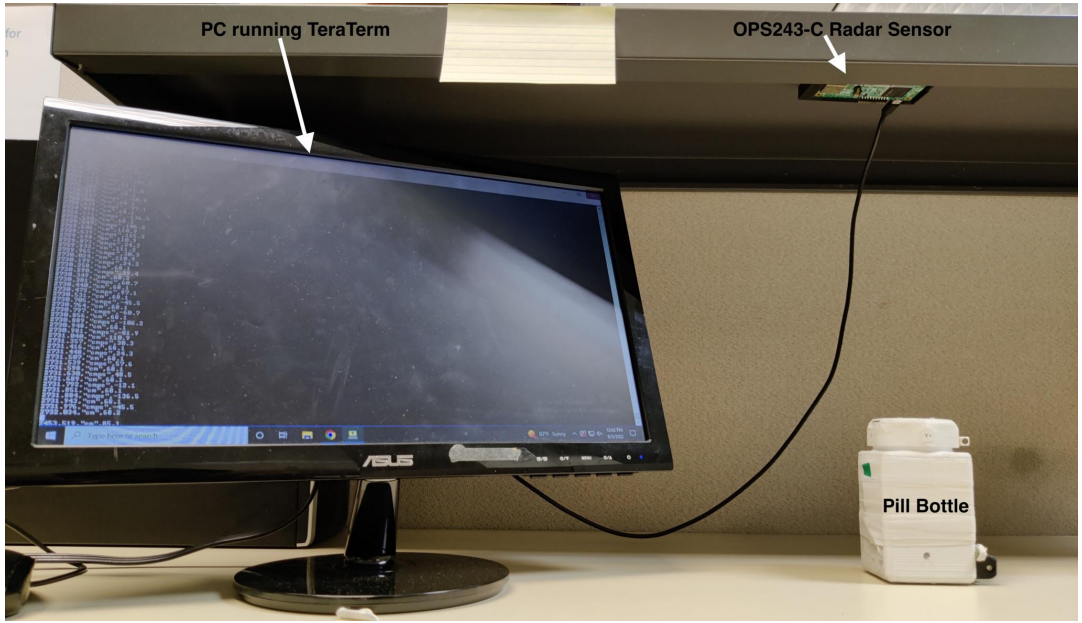
Goal: To develop a radar-based system to monitor subjects taking medications from a pill bottle and identify them using a 243-C FMCW and Doppler Radar Sensor to detect and report speed, range, direction, and motion.



System Overview



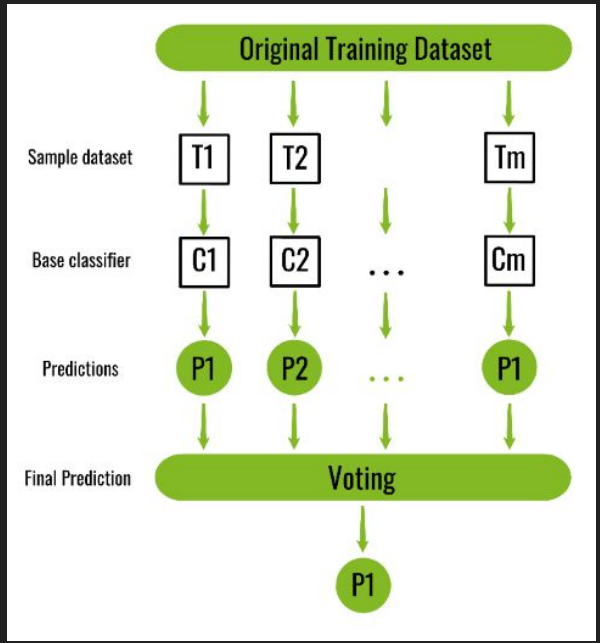
Data Acquisition



Collect data from three users by opening the bottle, taking the pill out, closing the pill bottle, and repeating 20 times (total of 60 samples)

Bagging classifier

The bagging classifier is an ensemble classifier that fits base classifiers on random subsets of the original data and aggregates their individual predictions into a single final prediction.

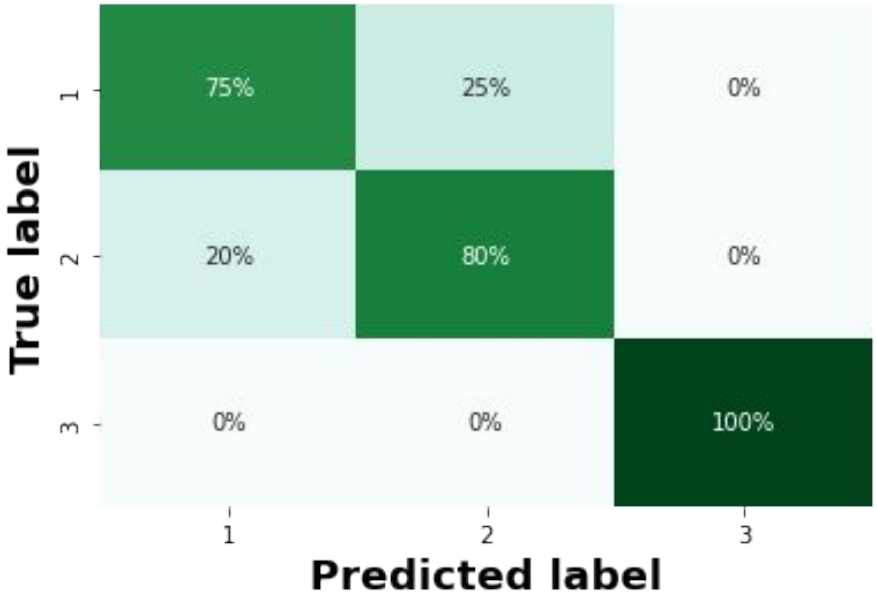


Training and Testing:

- Used TSFEL feature extraction to cut the number of statistics used in the decision making.
- Used a 8:2 training-testing data ratio.

Results

- Achieved an overall 70% accuracy using a bagging classifier by training on 48 samples and testing on 12 samples.
- Results may seem skewed but it is due to limited test data and an uneven distribution in it.
- User 3’s actions were more distinct and pronounced because they reached into the bottle instead of spilling the pills out like users 1 and 2.



Future Work

-We will implement feature selection, a step after feature extraction which will filter out the relevant features and tune the combinations of machine learning algorithms and feature extraction to maximize accuracy.
-We will increase the amount of data by taking more samples from the user to get better accuracy
- Data Augmentation: jittering, scaling, and magnitude warping to further increase the data.

Questions?