Many people around the world are prescribed medication by health care professionals. However, most of this medication is taken at home, where little is known about correct adherence to consuming the medication.

**Motivation:** It is relatively common for people, especially those older, to unknowingly consume the medication in a manner that will decrease the effectiveness or harm the user.

**Aim:** 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

- First, three users collect data by opening the pill, taking the pill out, and then closing the pill bottle each user performs these steps 20 times.
- The radar sensor then collects the data and sends it to Teraterm, giving us data in .txt format.
- The data from Teraterm is then passed through a python script to convert into a CSV file. In this, we also preprocess the data by padding the data for a shorter time with zeroes and by resampling the data to 0.1s to get regular multivariate time series data.
- Then TSFEL library is used to extract features from the time series data in the form of statistics like mean, standard deviation, variance, etc.
- Finally, the feature gathered from TSFEL are then passed to a classifier predicts the user based on the features.

## RESULTS & FUTURE WORK

**Results:**
We achieved an overall 70% accuracy using a bagging classifier by training on 96 samples and testing on 24 samples. The results presented in the confusion matrix may seem skewed but it is due to an uneven distribution in the test data. In addition, 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
- We will use Data Augmentation techniques like jittering, Scaling and Magnitude Wrap to further increase the data

**References**