

# Team SVD: Project 2 Submission

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Team Members and Contributions to the project:

- *Dibyendu Mondal* (Team Lead)

  - Task: Implementing `impute_data()`

  - Task: Trying different classifiers and window sizes

- *Sarthak Wahal*

  - Task: Creating Feature Vectors

  - Task: Implementing different Feature Extraction methods

- *Vaibhav Tendulkar*

  - Task: Feature extraction methods

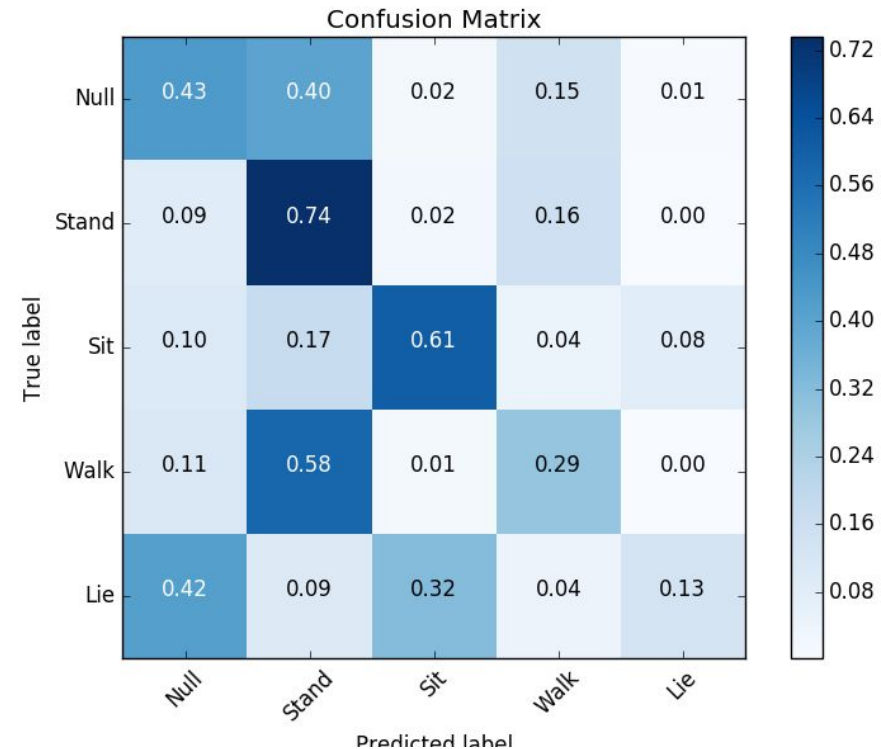
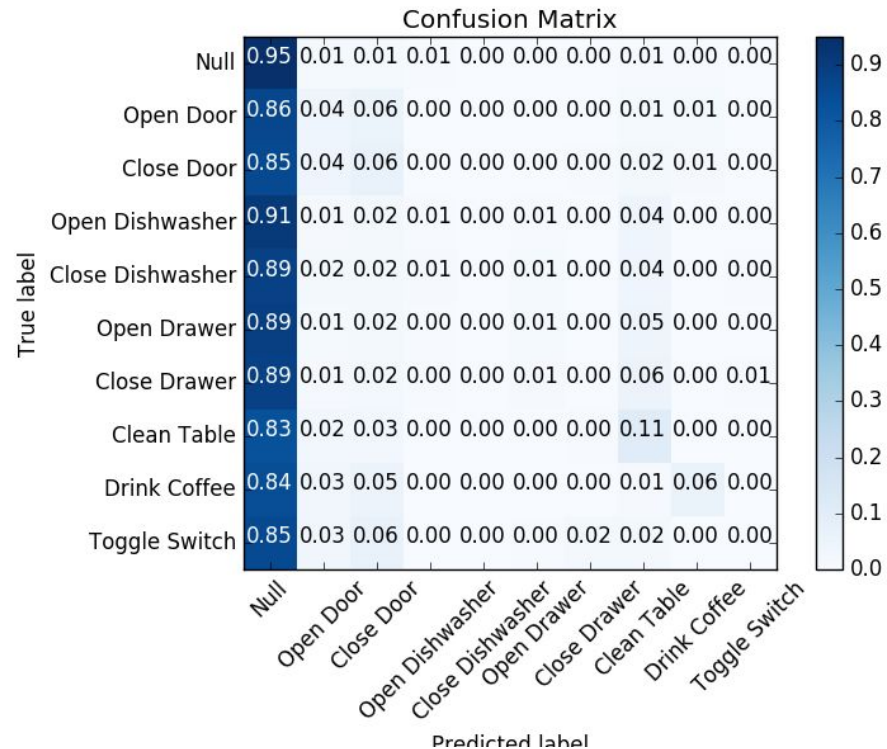
  - Task: Hyper parameter tuning

## Part 2: Sliding Window Activity Detection from 3D Acceleration Wrist Sensors

Classifier Choice: Random Forest

F-score for locomotion: 0.527098352493

F-score for gesture: 0.620183009756

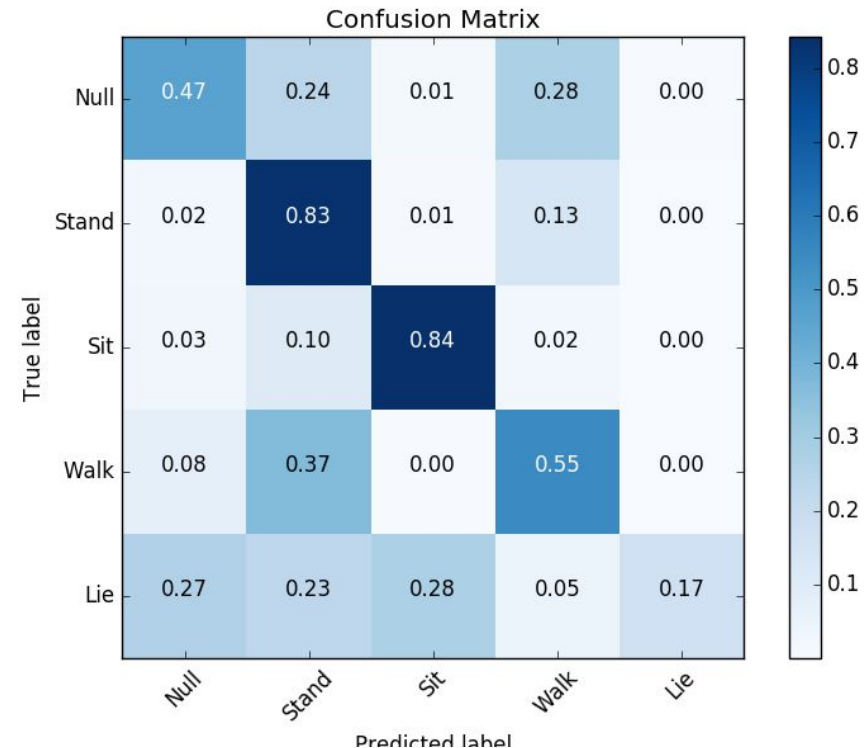
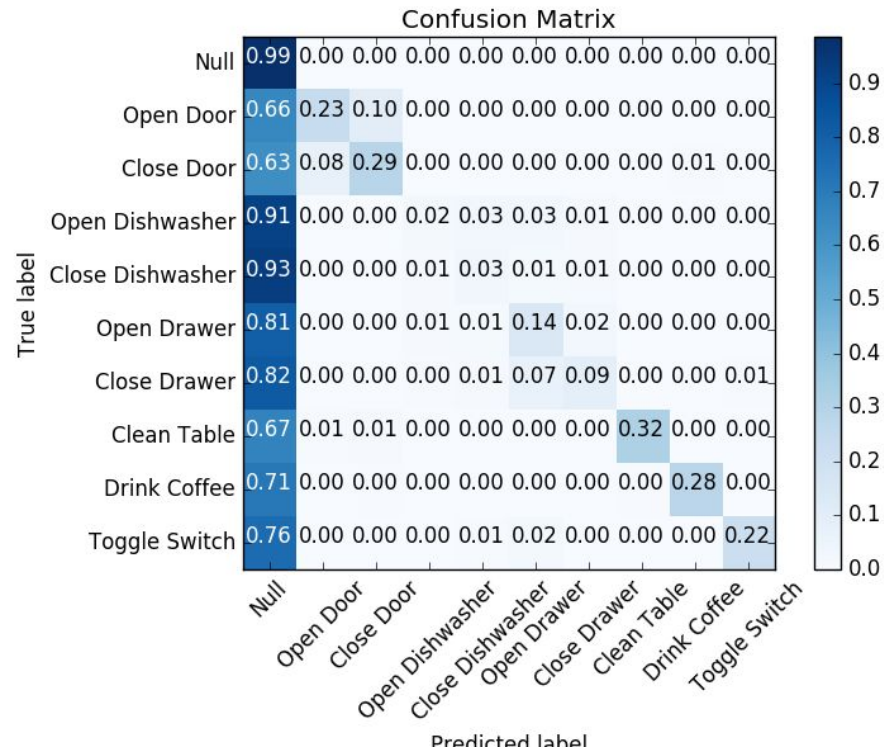


## Part 3: Sliding Window Activity Detection from IMU Wrist Sensors

Classifier Choice: Random Forest

F-score for locomotion: 0.671931306847

F-score for gesture: 0.717839038833

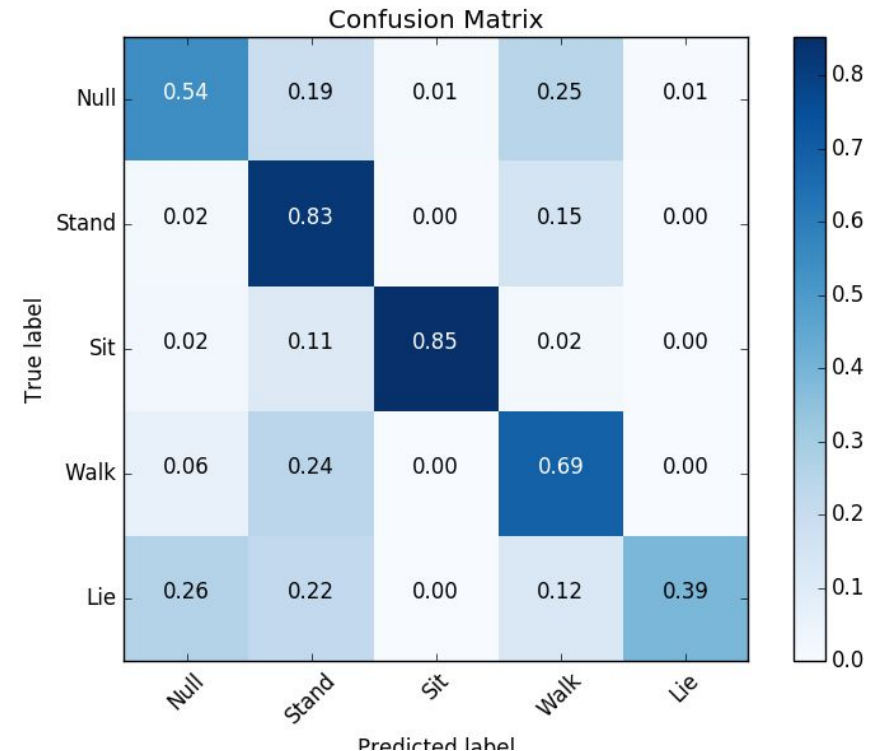
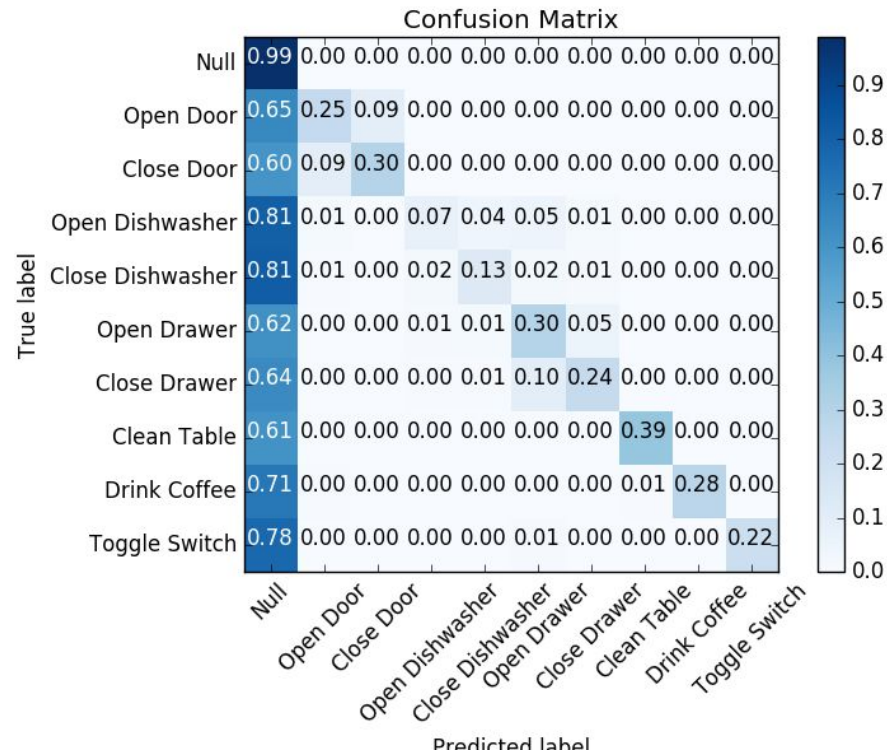


## Part 4: Sliding Window Activity Detection from Full-body Sensor Data

Classifier Choice: Random Forest

F-score for locomotion: 0.733251340141

F-score for gesture: 0.74266987295



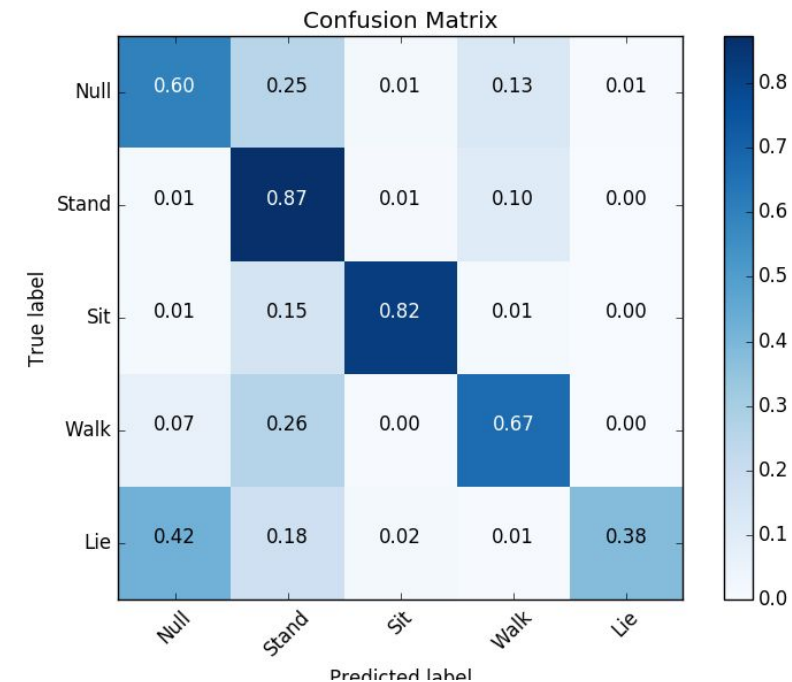
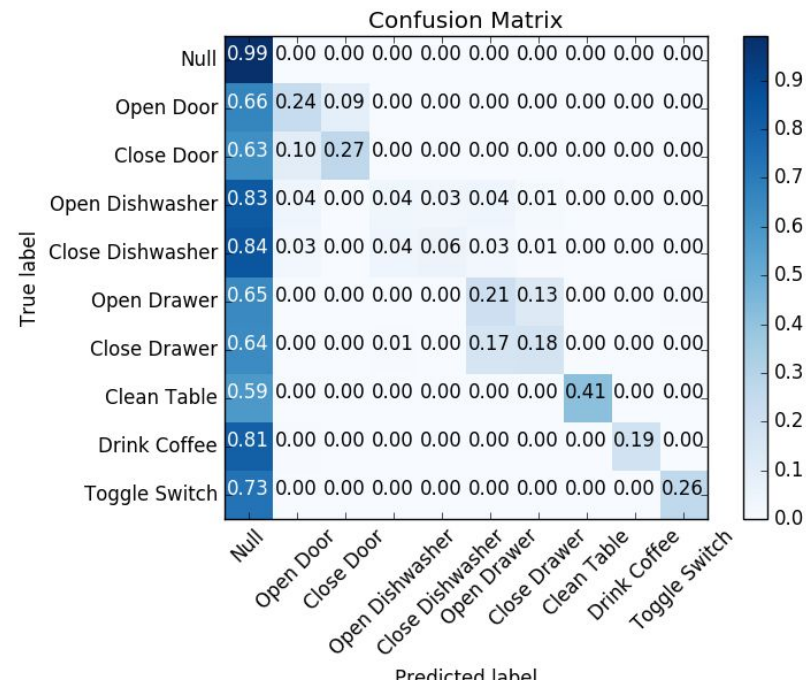
## Part 5: Feature Extraction for Activity Detection from Full-body Sensor Data

Classifier Choice: Random Forest

Method: Root Mean Square

F-score for locomotion: 0.749011152518

F-score for gesture: 0.724038644437





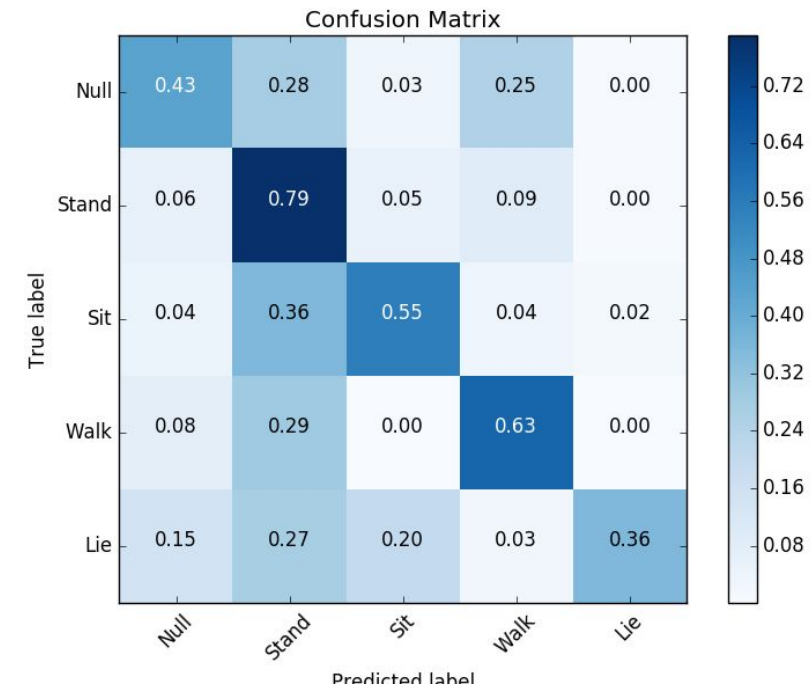
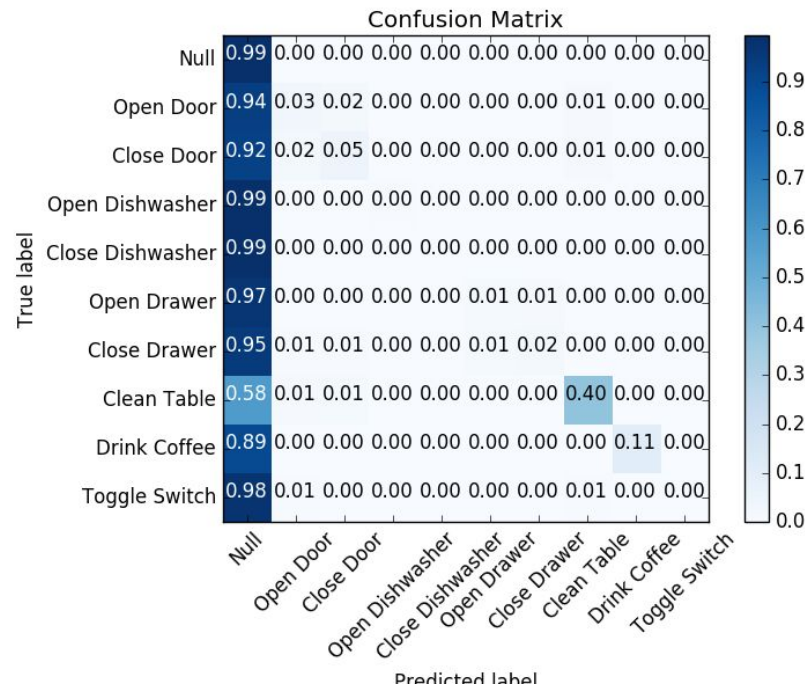
## Part 5: Feature Extraction for Activity Detection from Full-body Sensor Data

Classifier Choice: Random Forest

Method: Standard Deviation

F-score for locomotion: 0.628373433087

F-score for gesture: 0.644256597744



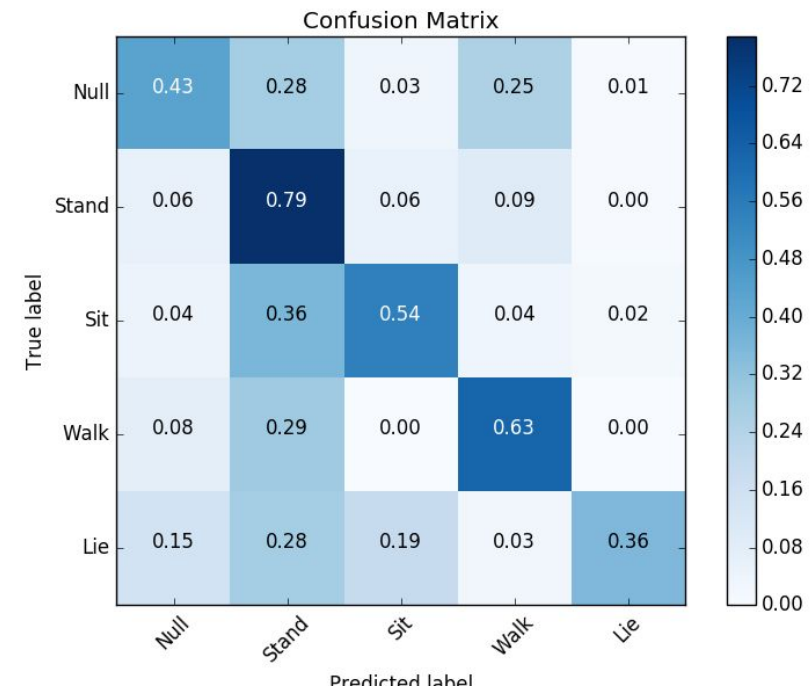
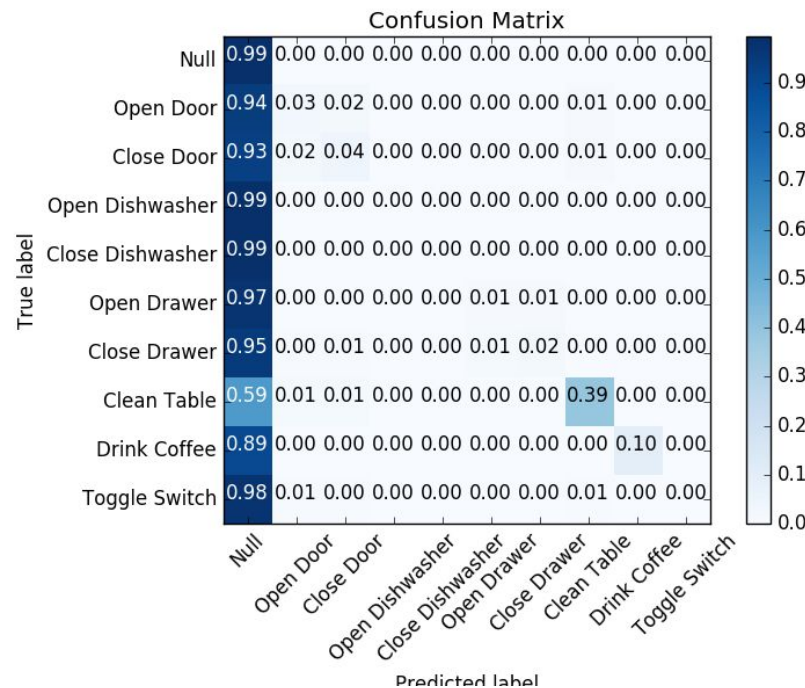
## Part 5: Feature Extraction for Activity Detection from Full-body Sensor Data

Classifier Choice: Random Forest

Method: Mean Absolute Deviation

F-score for locomotion: 0.625875888619

F-score for gesture: 0.642061701822



## Part 5: Feature Extraction for Activity Detection from Full-body Sensor Data

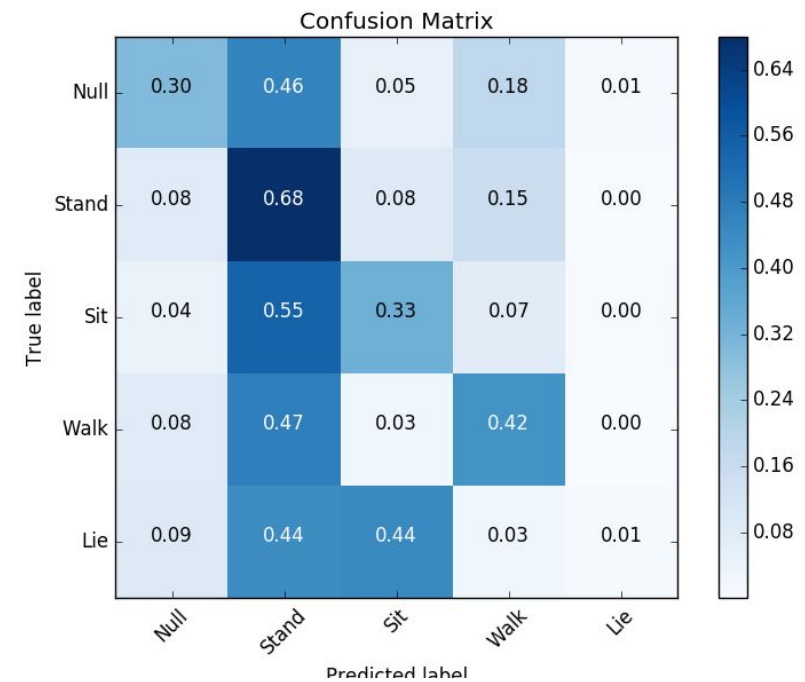
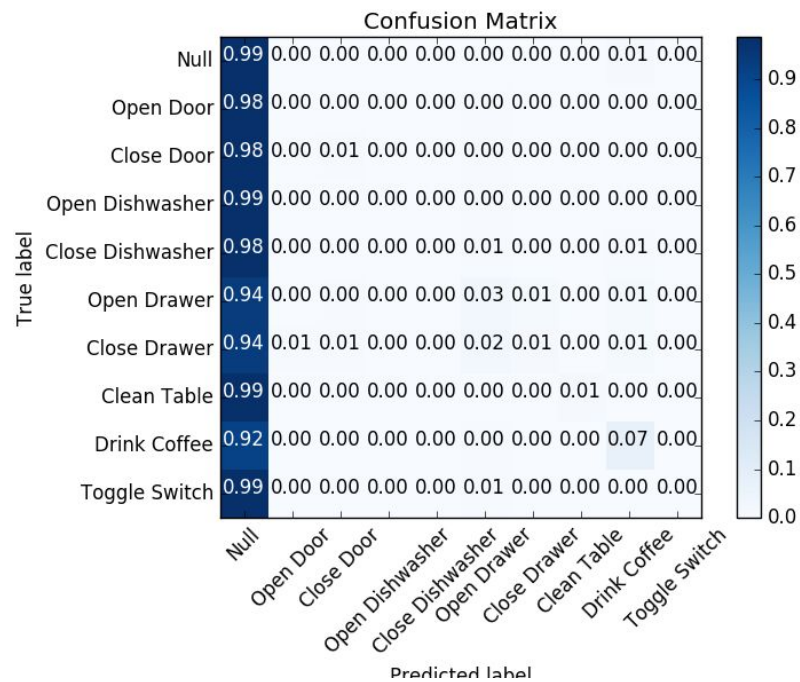
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Classifier Choice: Random Forest

Method: Relative Power in Frequency Band

F-score for locomotion: 0.456515613736

F-score for gesture: 0.619185949819





# Choice of Random Forest

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Ensemble methods tend to not overfit, hence they are a good choice. Decision trees work well on multiclass datasets, without requiring an even distribution of samples for training. They also do not require normalization, and can highlight differences of choice of feature vectors like RMS/SD/Mean very well. In addition, it is relatively fast to train and query, hence was the classification algorithm of choice.

## Part 6 - Ideas for Improvement

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The downside of Decision tree based classifiers is that splits occur on individual features' absolute values and groups of features and their interrelations are not considered together.

It should possibly lead to improvement if we assume a sensor to be fixed and train on relative positions and velocities. This gives us features that are interrelated.

The reason this should improve is that the activity is performed by the body as a whole and that would give better indications. Also, we want to avoid any recording or sensor positioning bias.