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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Preprocessing | Window Size | Columns | Features | Model | Accuracy | Precision, Recall & F-score | Features Selected by Model | Feature Importance |
| Low pass filter, cutoff = 2Hz | Non overlapping, 2 seconds | Accelerometer X, Y, Z | Avg, Max, Min, Range, Std, RMS, Skew, Kurtosis, Energy Peak, Freq Peak, IQR | Random  Forest | 55.26% | Healthy: 1.00, 0.75, 0.86  OA: 0.00, 0.00, 0.00  OA: 0.49, 1.00, 0.66 | Avg, Max, Min, Range, Std, RMS, Skew | Y Min = 0.084  Y Std = 0.072  X Range = 0.065  Y Range = 0.062  Z Max = 0.06 |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z | Mean, Std, Mad, Min, Max, RMS | SVM | 64.06% | Healthy: 0.78, 0.73  LBP: 0.53, 0.76  OA: 0.58, 0.39 | MaxY, StdY, MadY, MaxX, StdX |  |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z | Mean, Std, Mad, Min, Max, RMS | XGBoost | 75.67% | Healthy: 0.92, 0.74  LBP: 0.77, 0.77  OA: 0.59, 0.76 | MeanY, MinX, MadZ, MadX |  |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation | Random Forest | 81.58% | Healthy: 0.97, 0.69  LBP: 0.79, 0.93  OA: 0.71, 0.89 | MeanX, MinX, MaxX, StdY, MadY, IQR\_Y |  |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation | SVM | 67.73% | Healthy: 0.79, 0.75  LBP: 0.56, 0.81  OA: 0.67, 0.43 | IQR\_Y, Max\_Y, Std\_Y, Mad\_Y, IQR\_Z, MaxX, MaxZ |  |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation | XGBoost | 79.86% | Healthy: 0.94, 0.81  LBP: 0.81, 0.80  OA: 0.64, 0.78 | MeanY, MinX, KurtZ, MadY, KurtX, RMS\_X, MinY, EnergyZ, MeanX |  |
| Low pass filter, cutoff = 2Hz, No preprocessing on Gyroscope | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 86.63% | Healthy: 0.96, 0.79  LBP: 0.88, 0.93  OA: 0.76, 0.92 | MinX, MaxX, StdY, Std\_GyroZ |  |
| Low pass filter, cutoff = 2Hz, No preprocessing on Gyroscope | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 70.47% | Healthy: 0.82, 0.81  LBP: 0.59, 0.80  OA: 0.68, 0.45 | Std\_GyroZ, Mad\_GyroZ, Std\_GyroY, MaxY, Mad\_GyroX |  |
| Low pass filter, cutoff = 2Hz, No preprocessing on Gyroscope | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 81.94% | Healthy: 0.94, 0.83  LBP: 0.80, 0.86  OA: 0.69, 0.76 | Mean\_GyroZ, Mean\_GyroY, MeanY, Mean\_GyroX, MinX |  |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 82.90% | Healthy: 0.96, 0.76  LBP: 0.80, 0.90  OA: 0.73, 0.87 | MaxX, Std\_GyroZ |  |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 71.22% | Healthy: 0.84, 0.81  LBP: 0.58, 0.82  OA: 0.71, 0.46 | Std\_GyroZ, Mad\_GyroZ, Std\_GyroX, IQR\_Y, Mad\_GyroX, Std\_GyroY |  |
| Low pass filter, cutoff = 2Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 83.36% | Healthy: 0.95, 0.87  LBP: 0.79, 0.87  OA: 0.72, 0.75 | Mean\_GyroZ, MeanY, Mean\_GyroX, MinX, EnergyY, Kurt\_X, Kurt\_Z |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 85.18% | Healthy: 0.96, 0.76  LBP: 0.78, 0.94  OA: 0.81, 0.90 | MaxX, Std\_GyroZ, Mad\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 73.03% | Healthy: 0.85, 0.84  LBP: 0.59, 0.74  OA: 0.74, 0.47 | Kurt\_X, RMS\_X, Kurt\_Y, IQR\_Z, StdX, IQR\_X, MaxX, MadY, StdY, Mad\_GyroY, MaxY, Std\_GyroY, Mad\_GyroX |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 85.22% | Healthy: 0.97, 0.88  LBP: 0.81, 0.88  OA: 0.74, 0.79 | Mean\_GyroZ, MeanY, Kurt\_Z, Mean\_GyroX, MinX |  |
| High pass filter, cutoff = 1.5Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 85.30% | Healthy: 0.85, 0.88  LBP: 0.86, 0.83  OA: 0.85, 0.83 | RMS\_Y, Std\_GyroZ, Mad\_GyroZ |  |
| High pass filter, cutoff = 1.5Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 51.15% | Healthy: 0.77, 0.65  LBP: 0.42, 0.50  OA: 0.30, 0.31 | MeanZ, MaxY, MinZ, Mad\_GyroX, Std\_GyroX, MaxX, Mad\_GyroY, RMS\_Y, RMS\_Z, RMS\_X, Std\_GyroY, Mad\_GyroZ, Std\_GyroZ |  |
| High pass filter, cutoff = 1.5Hz | Non overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 67.51% | Healthy: 0.78, 0.87  LBP: 0.59, 0.81  OA: 0.54, 0.26 | MadZ,MadY, Std\_GyroZ, Mean\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 8 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 85.14% | Healthy: 0.97, 0.77  LBP: 0.81, 0.94  OA: 0.77, 0.89 | MaxX, Std\_GyroZ, Mad\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 8 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 72.32% | Healthy: 0.85, 0.83  LBP: 0.59, 0.81  OA: 0.73, 0.47 | Kurt\_X, StdZ, MadX, MaxZ, RMS\_X, IQR\_Z, Kurt\_Y, StdX, IQR\_X, MaxX, MadY, Mad\_GyroY, Mad\_GyroX, Std\_GyroY, StdY, Std\_GyroX, MaxY |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 8 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 84.79% | Healthy: 0.97, 0.87  LBP: 0.80, 0.88  OA: 0.74, 0.78 | Mean\_GyroX, MinX, EnergyY, MeanY, Mean\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 12 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 83.13% | Healthy: 0.97, 0.72  LBP: 0.76, 0.94  OA: 0.77, 0.90 | MeanX, MaxX, StdY, Std\_GyroZ, Mad\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 12 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 73.05% | Healthy: 0.85, 0.84  LBP: 0.59, 0.82  OA: 0.74, 0.48 | Kurt\_Z, RMS\_X, StdX, Kurt\_Y, IQR\_Z, IQR\_X, MaxX, MadY, StdY, Mad\_GyroY, MaxY, Std\_GyroY, Mad\_GyroX, Std\_GyroX, IQR\_Y, Mad\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | Non overlapping, 12 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 85.57% | Healthy: 0.98, 0.88  LBP: 0.81, 0.88  OA: 0.75, 0.79 | MinX, MeanY, Mean\_GyroZ, MadZ |  |
| Low pass filter, cutoff = 1.5Hz | 50% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random  Forest | 81.11% | Healthy: 0.95, 0.69  LBP: 0.69, 0.91  OA: 0.82, 0.89 | MeanX, MaxX, Std\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | 50% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 71.51% | Healthy: 0.84, 0.83  LBP: 0.58, 0.82  OA: 0.72, 0.45 | MaxZ, Kurt\_Y, RMS\_X, StdZ, IQR\_Z, IQR\_X, MaxX, StdX, MadY, Mad\_GyroY, Mad\_GyroX, MaxY, StdY, Std\_GyroY, Std\_GyroX, IQR\_Y |  |
| Low pass filter, cutoff = 1.5Hz | 50% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 83.51% | Healthy: 0.96, 0.87  LBP: 0.80, 0.86  OA: 0.71, 0.76 | Kurt\_X, Kurt\_Z, Mean\_GyroX, MinX, MeanY, Mean\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | 25% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 84.49% | Healthy: 0.97, 0.74  LBP: 0.73, 0.93  OA: 0.85, 0.91 | MeanX, Std\_GyroZ, Mad\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | 25% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 74.02% | Healthy: 0.87, 0.85  LBP: 0.60, 0.82  OA: 0.75, 0.49 | Kurt\_X, Kurt\_Y, StdZ, RMS\_X, MadY, MaxZ, IQR\_Y, StdX, StdY, MaxY, MaxX, Mad\_GyroY, Std\_GyroY, Mad\_GyroX, Std\_GyroX, Mad\_GyroZ, Std\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | 25% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 83.94% | Healthy:  LBP:  OA: | Kurt\_Z, AutoCorr\_Y, Mean\_GyroX, MinX, MeanY, Mean\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | 75% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | Random Forest | 84.65% | Healthy: 0.97, 0.74  LBP: 0.79, 0.93  OA: 0.79, 0.91 | MinX, MaxX, Std\_GyroZ, Mad\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | 75% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | SVM | 72.04% | Healthy: 0.84, 0.83  LBP: 0.59, 0.81  OA: 0.72, 0.46 | Kurt\_X, Kurt\_Y, StdZ, RMS\_X, MaxZ, StdX, MadY, Mad\_GyroY, MaxX, IQR\_Y, Mad\_GyroX, StdY, Std\_GyroY, Std\_GyroX, MaxY, Mad\_GyroZ |  |
| Low pass filter, cutoff = 1.5Hz | 75% overlapping, 10 | Accelerometer X, Y, Z  Gyroscope X, Y, Z | Mean, Std, Mad, Energy, IQR, Skewness, Kurtosis, Min, Max, RMS, Auto correlation  Gyro: Mean, Std, Mad | XGBoost | 83.65% | Healthy: 0.96, 0.87  LBP: 0.80, 0.87  OA: 0.72, 0.75 | Kurt\_Z, Mean\_GyroX, MinX, MeanY, Mean\_GyroZ |  |