

Estimating the cognitive functional level in Parkinson’s patients using accelerometer data

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Summary/ Abstract

While Montreal Cognitive Assessment (MoCA) is widely used to monitor the cognitive function of Parkinson’s patients, it is difficult to continuously monitor the cognitive function outside the clinical setting. Parkinson’s disease and its progress are the confounding factor of the decreased cognitive function and the compromised motor performance. We propose to use accelerometer data which can be collected continuously to predict the MoCA scores.

Problem addressed

Continuous monitoring of cognitive function and predicting the MoCA score outside of a clinical environment.

Project Objectives

The main objective of this project was to develop a machine-learning model that utilizes the accelerometer data from the wearable sensor to estimate the Montreal Cognitive Assessment (MoCA) score of individuals suffering from Parkinson's disease.

Tiemline

Jan-Feb
Data Collection after obtaining permission

Feb-Mar
Data Cleaning and Feature extraction

Mar-Apr
Feature Selection and developing the Machine learning pipeline.

Project Execution

Data Collection

- The data was collected from the Parkinson’s Progressive Markers Initiative website.
- Data was collected for 271 patients out of which 29 were control.

Data Preprocessing

- Python was used to calculate the Euclidean Distance, apply Butterworth filter and filter the data between 9am to 5 pm

Data Analysis

- Random Forest model was done with hyperparameter tuning and the performance was evaluated based on RMSE.

Collected Accelerometer Data from Parkinson’s Progressive Markers Initiative website

- Demographic Analysis
- Calculating Euclidean Distance
- Resampling at 100Hz
- Applying Butterworth Filter (Fourth order, 20hz)
- Data Selected from 9am-5pm

Feature extraction using -TSFEL
Window size- 5 Mins, 10 Mins, 15 Mins, 1hour, 1 hour+5 mins

389 features extracted

Statistical calculation of the features

Features Selection
• LASSO

Checking for Correlation with MOCA

2723 features extracted

ML
• Random Forest

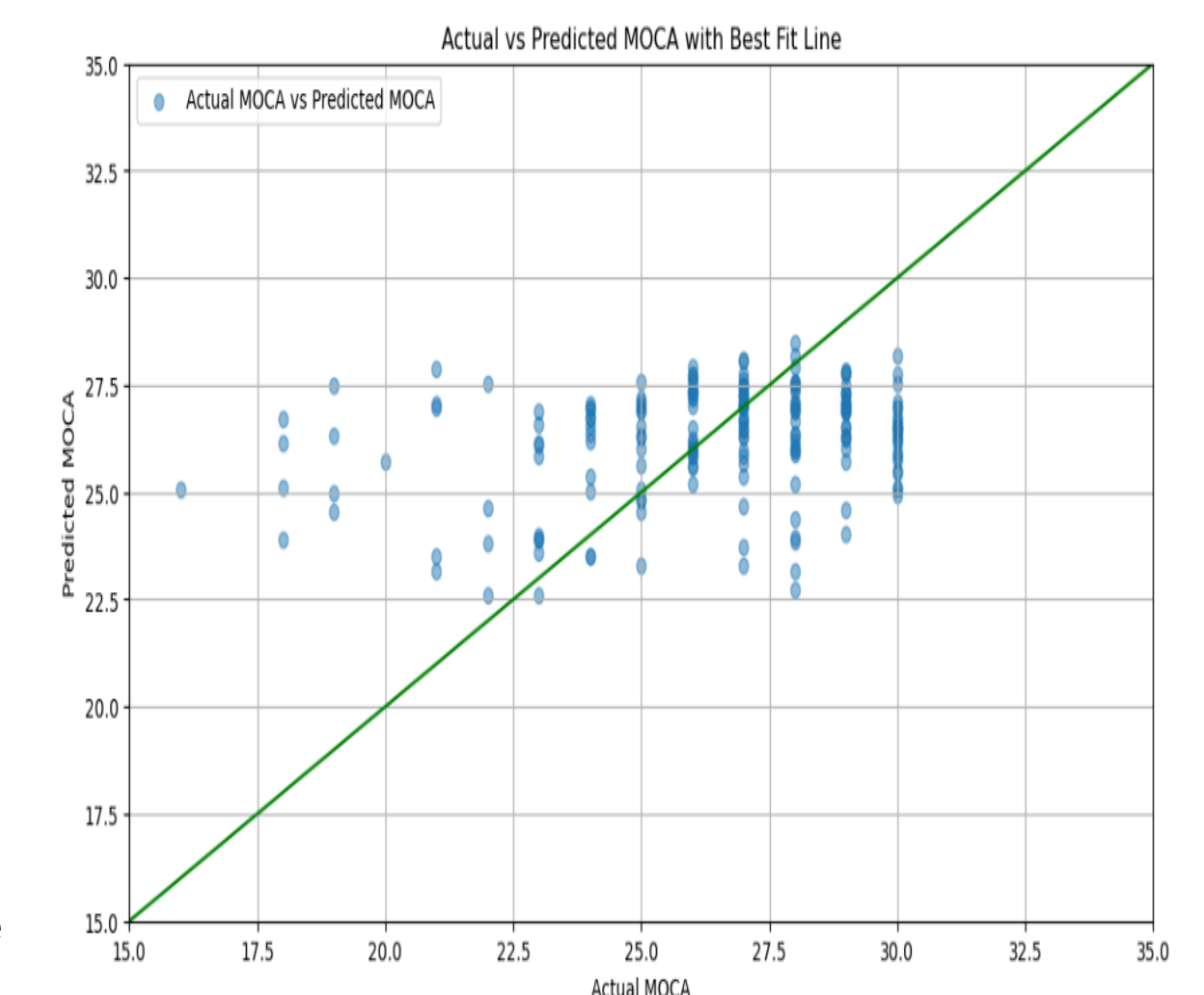
Predicted MOCA Score

Project Outcomes

Model	Time	RMSE	R squared
RF (LOSO CV)	5Mins(overlap)	2.83	0.048
RF CV=10	5Mins(overlap)	2.85	0.038
RF	5Mins(overlap)	2.89	0.061

Findings/ Conclusions

- Though the RMSE was lower than 3 the model’s performance can be improved and the target RMSE should be below 1.73.
- The low R-squared suggest that the model could only explain 4.8% of the variance of the features.
- However, this project helped to develop a pipeline which can improved even further going forward.



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References

QR CODE