BE018: Gait Monitoring and Analysis of Parkinson's Disease Patients

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Research question:

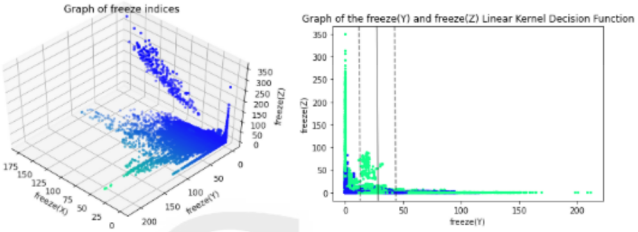
What is the best machine learning algorithm to analyse gait parameters before Freezing of Gait in Parkinson's Disease patients?

Parkinson's Disease: A progressive, neurodegenerative disorder that is characterised by a number of symptoms such as tremors, rigidity and loss of postural reflexes.

Freezing of Gait: Brief episodic absence or reduction of forward progression of feet despite the intention to walk, leading to falls. It is usually triggered by visual stimulation: stress, tight spaces or a sudden change in direction.

Gait Parameters: Non-arbitrary parameters that define a person's movement, e.g. stride length.

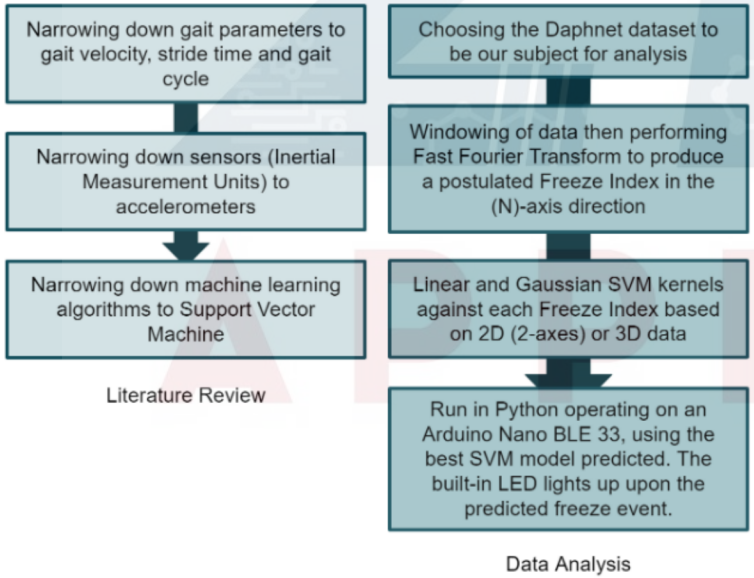
Results:



Kernel	Linear Kernel				Radial Basis Kernel			
Parameters	freeze(X) and freeze(Y)	freeze(X) and freeze(Z)	freeze(Y) and freeze(Z)	All 3 Parameters	freeze(X) and freeze(Y)	freeze(X) and freeze(Z)	freeze(Y) and freeze(Z)	All 3 Parameters
Specificity	1.000	0.975	1.000	1.000	0.990	0.990	0.991	0.989
Sensitivity/ Recall	0.000	0.243	0.006	0.002	0.174	0.183	0.163	0.260
Precision	0.000	0.509	0.889	0.867	0.650	0.664	0.665	0.723
Accuracy	0.903	0.904	0.904	0.904	0.911	0.912	0.911	0.918
F_1 Score	0.000	0.329	0.011	0.005	0.275	0.286	0.262	0.382

Table of Algorithm Evaluation Functions with regards to kernels and parameters

Methodology:



Conclusions:

After analyzing, the most suitable parameters for classification are freeze(Y) and freeze(Z) based on the acceleration data in the public datasets and the best model is the linear kernel model in terms of specificity and precision. This has shown that the forward acceleration is the least helpful to predicting the freeze event.

Besides that, a prototype has been created to test the performance of the identified most suitable parameters via the algorithm created.