ULB UNIVERSITÉ LIBRE DE BRUXELLES

Preparatory work for the Master Thesis

-

Machine learning for analysis of EEG signals in neurosciences.

Lemahieu Antoine

Faculté des Sciences
Université Libre de Bruxelles

April 20, 2021

Advancement

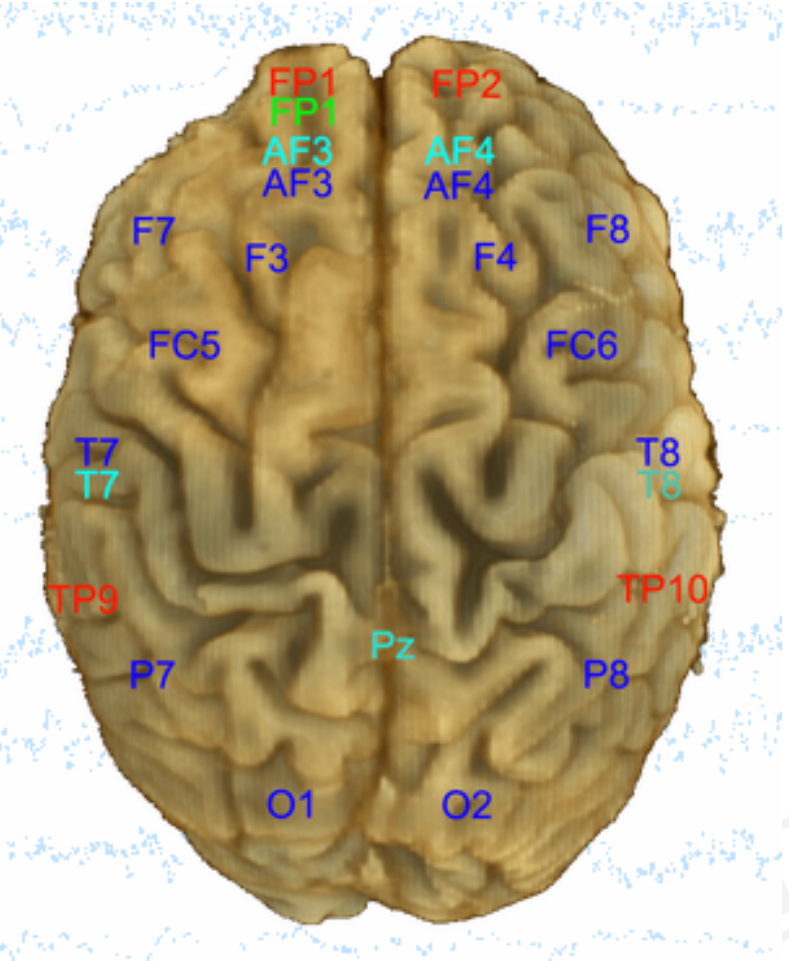
What has been done (From 24/03 to 21/04) :

- Keep reading articles.
- Data manipulation and try classification on MNIST "MindBigData" dataset.

Datasets and implementation

MindBigData,
"MNIST" of the brain.
Link
: `http://www.mindbigdata.com/opendb/index.html`

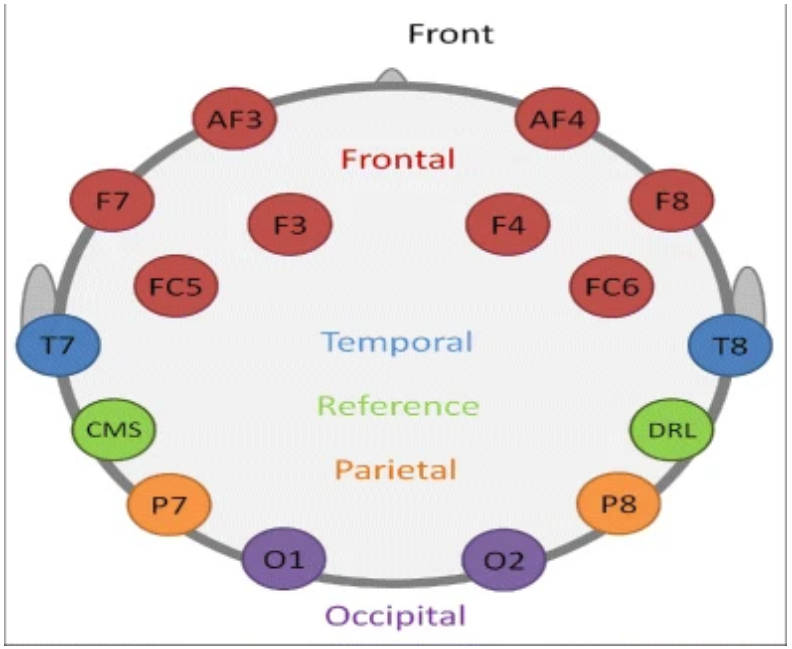
Uses the "Emotiv EPOC" headset.
Commercial and low-priced.
Covers 14 channels (blue) following the "10-20" system.



Electrodes placement

Datasets and implementation

The "Emotiv EPOC" headset has 14 channels (2 channels are references).



Electrodes placement on the "Emotiv EPOC" headset [1]

Dataset and implementation

Dataset :

- MindBigData, "MNIST" of the brain. Link : `http://www.mindbigdata.com/opendb/index.html`

Largest dataset with the headset "Emotiv EPOC".
Around 90.000 EEG signal samples per digit. (910.000 in total)

Dataset and implementation

Implementation and classification :

- Lot of time loss with the reading of the dataset.
- MindBigData, "MNIST" of the brain dataset stored in a "txt" file.
- Basic classification on subset of the dataset : Only two digits : 0 and 1

Dataset and implementation

Classification :

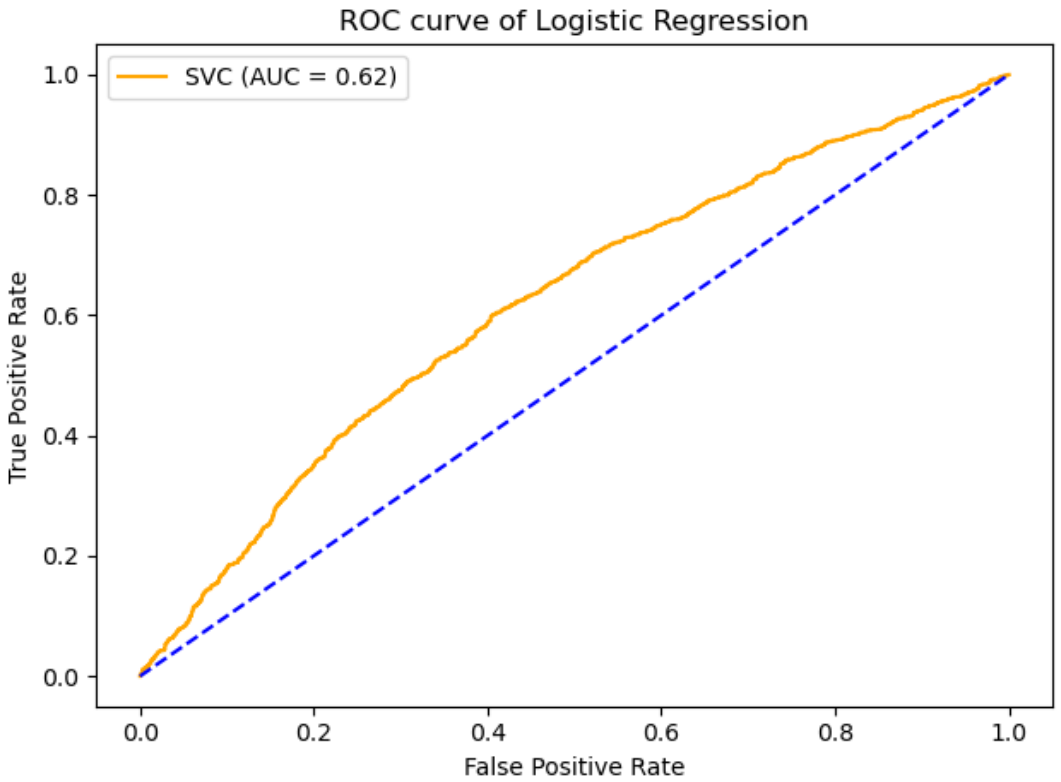
- Logistic regression
- Support Vector Machine

Classifier	Classification Accuracy
Logistic Regression	59.3%
Support Vector Machine	59.6%

Evaluation :

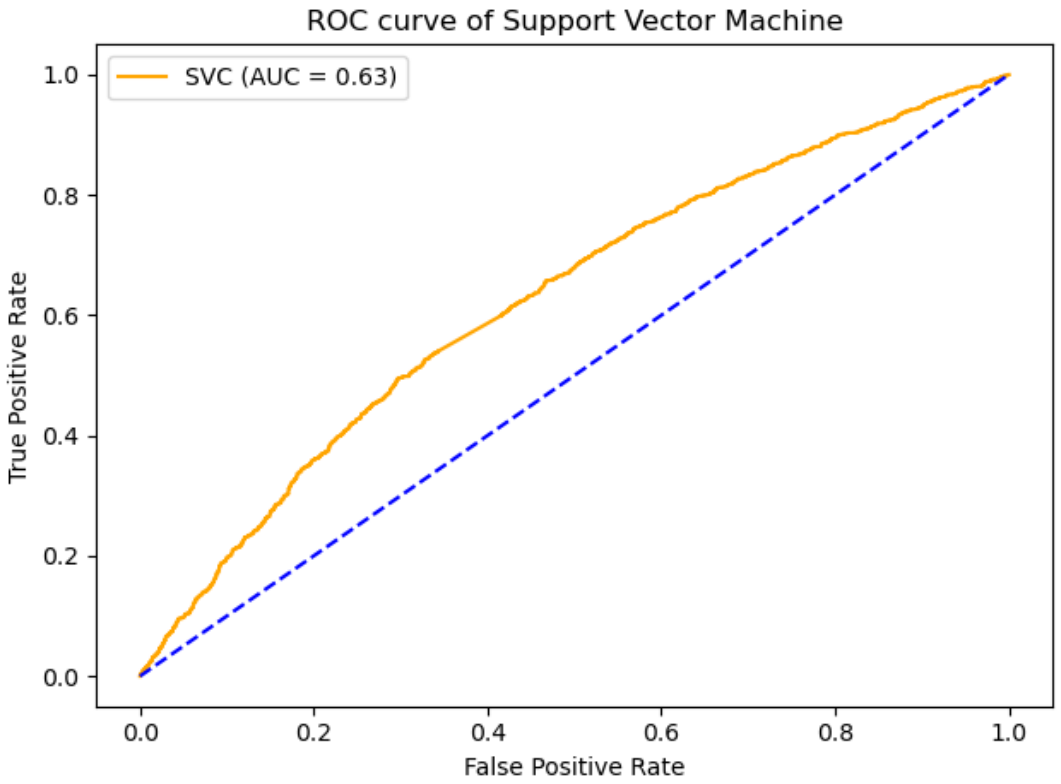
- ROC curves
- Confusion matrix

Dataset and implementation



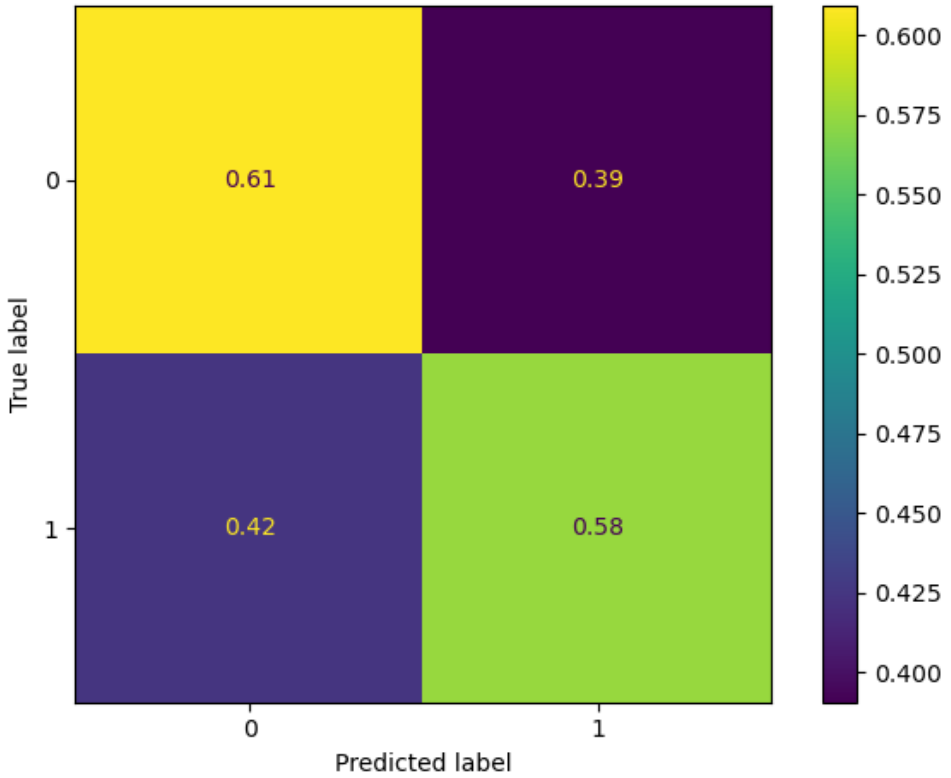
ROC curve for Logistic Regression classification

Dataset and implementation



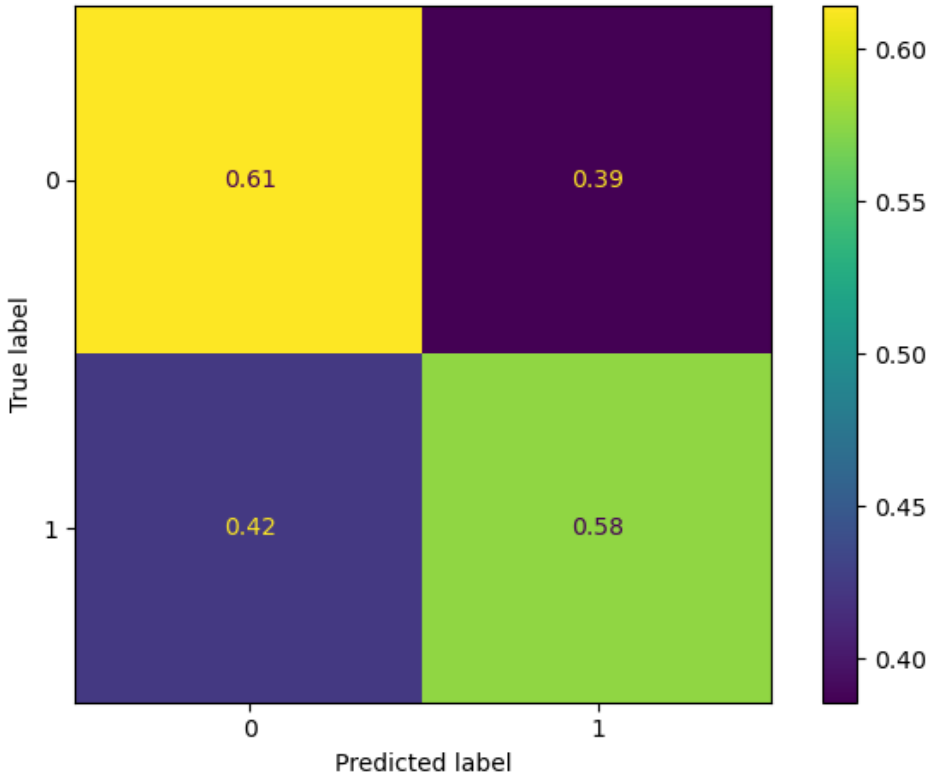
ROC curve for Support Vector Machine classification

Dataset and implementation



Confusion matrix for Logistic Regression classification

Dataset and implementation



Confusion matrix for Support Vector Machine classification

Planning

- Keep reading some articles.
- Writing the report.