

EE6024 Python Assignment 3 & Report.

27th March 2023

A database of 17 EEG recordings with 8 channels of data is available on Canvas and can be used to build a system to detect seizures present in the EEG. In addition per channel annotations of seizure/non-seizure is available to provide the labels for training any appropriate classifier.

1. In python, carry out the following tasks:

- (a) Segment the data into epochs. In the ANSeR algorithm the EEG is split into 8s epochs with 50% overlap between epochs. Thus each epoch consists of $N = 256$ samples (8 seconds of data at a sampling frequency of 32Hz gives $32 \times 8 = 256$). You may chose to divide the EEG recordings into any suitable number of Epochs.
- (b) Signal processing features from the Time and Frequency are commonly used to distinguish seizure from non-seizure EEG. The ANSeR algorithm uses 55 different features to describe each epoch of EEG. You may develop as many features as you require.
- (c) Train a classifier to distinguish between seizure features and non-seizure features. The ANSeR algorithm uses a Support Vector Machine. You may use any appropriate classifier, however it is important that a patient independent system is employed, that is no data from a testing patient should be used in training the classifier.
- (d) The ANSeR algorithm detects seizures in each channel, but reports a global result. You may use any post-processing method after your classifier to increase system performance.
- (e) A Test EEG file (TestEEG75CzC3Processed.csv) and annotations (TestAnnotationCzC3EEG75.csv) is provided to allow you to demonstrate your system. Report the results of your system performance using the metrics of Sensit

2. Use the Layout facility in Jupyter or Google Colab Notebooks to present your work as a report. You should use Python to generate the appropriate figures for the report.

https://colab.research.google.com/notebooks/markdown_guide.ipynb

3. The report should include the following sections:

- (a) Summary. Write a concise summary, abstract or synopsis that accurately and succinctly tells the reader what is contained in the report.
- (b) Description and justification of epoch creation.
- (c) Description and justification of feature selection.
- (d) Description and justification of classifier used.

- (e) The choice of epoch creation, features used and classifier employed must be justified through the use of performance metrics. The metrics used must be explain and justified. The relevance of any particular metric must be explained. You must also justify your choice of metrics.
 - (f) Description and justification of data selection for training and testing.
 - (g) Analysis of performance of the classifier on the test data and discussion.
 - (h) Conclusion.
4. Please ensure that
- You have fully commented your Python code so that it includes a description of the methods used and is clear what each step is. You need to demonstrate an understanding of what the code does in your commenting.
 - You have fully explained all the parameters of the python functions you have used.
 - You have automated as much of the process as possible.
 - You have labeled the plots correctly.
5. Python Code can be developed in any of the following two environments
- Google Colaboratory
<https://colab.research.google.com>
 - Anaconda with Jupyter notebooks
<https://www.anaconda.com/products/individual>
6. Submission is a File that can be Run in:-
- Google Colaboratory [filename.ipynb](#)
 - Jupyter Notebooks [filename.ipynb](#)
7. You can use any Python Library or Code available. References to code or libraries used must be included.

Submit your Notebook on Canvas of a single Python notebook (filename.ipynb) by 17.00 on Friday 5th May.

Please note the UCC Policy on Plagerism which can be found at:

<https://www.ucc.ie/en/exams/procedures-regulations>

Professor Liam Marnane