Rough Paths and Applications to Machine Learning: Assessed Coursework

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In this coursework, you will compete in the Kaggle competition HMS - Harmful Brain Activity Classification. The goal is to detect and classify seizures and other types of harmful brain activity by training a machine learning model on electroencephalography (EEG) signals recorded from critically ill hospital patients. The model you will implement will be based on signature methods.

Instructions

1. Form groups of ideally 3 or 4 students and choose the nickname of the group. Note that the nickname must be the same as the one used for your Kaggle submissions.

2. Familiarise yourself with the Kaggle environment, the dataset descroption, the evaluation procedure for this competition, and with the science behind EEG recordings (and other aspect of computational neuroscience you think will help you winning!).

3. This is a python competition. Submissions must be made through Kaggle notebooks (very similar to Jupyter IPython notebooks). Familiarise yourself with the code requirement; see code competition FAQ. Some examples are provided in the notebook section. You might find helpful to regularly read competition discussions.

4. Your model MUST make use of signatures, signature kernels or neural CDEs. There are several python libraries for signatures (esig, iisignature), signature kernels (sigkernel, sigkerax) and neural CDEs (torchcde, diffrax). You are free to choose whichever library you like. You may want to combine signatures with classical ML models such as random forests, gradient boosting, support vector machines or neural networks.

5. The final submission will consist of the Kaggle notebook and a written report in PDF of maximum 5 pages.

6. Your final mark will be determined by your position in the final leaderboard as well as the clarity of your report.

Deadlines

- **January 22, 2024** - Send me an email with the names of the students and the nickname of your group @ `c.salvi@imperial.ac.uk`.

- **April 1, 2024** You must accept the competition rules by this date to compete. This is the last day participants may join or merge teams.

- **April 8, 2024** You must submit to the Kaggle competition and sene me the Kaggle notebook and the written report by this date.