IE6400 Foundations Data Analytics Engineering
Fall Semester 2023

Group Projects

Project 3:

Topic: EEG Classification Model

Project Overview:
In this project, you will build a classification model to analyze EEG data and classify it into different categories. EEG data is widely used in neuroscience and medical fields, including the diagnosis of epilepsy. You will be using two EEG datasets to train and evaluate your model.

Datasets:

1. CHB-MIT EEG Database
    - This dataset contains EEG recordings from patients with epilepsy. It includes various seizure types and non-seizure data.
1. Bonn EEG Dataset
    - This dataset contains EEG recordings with a focus on epileptic seizures.

Tasks:

1. **Data Preprocessing:**
    - Download and extract the datasets.
    - Explore the data to understand its structure and characteristics.
    - If necessary, preprocess the EEG data, including handling missing values, noise reduction, and data augmentation.
2. **Feature Extraction:**
    - Extract relevant features from the EEG signals. You may consider time-domain and frequency-domain features.
3. **Data Splitting:**
    - Split the data into training, validation, and test sets.
4. **Model Selection:**
    - Choose an appropriate machine learning or deep learning model for EEG classification. Consider models like Convolutional Neural Networks (CNNs) or Recurrent Neural Networks (RNNs).
5. **Model Training:**
    - Train your chosen model on the training data using appropriate training techniques.
    - Implement strategies to avoid overfitting, such as dropout or early stopping.
6. **Model Evaluation:**
    - Evaluate your model's performance on the validation set using relevant evaluation metrics (e.g., accuracy, precision, recall, F1-score).
    - Fine-tune hyperparameters as needed to optimize performance.
    -

7. **Testing:**
    - Assess the final model on the test set to ensure its generalization capability.
8. **Results and Visualization:**
    - Visualize the EEG data and model predictions. Create plots and graphs to illustrate your findings.
9. **Report:**
        - Introduction and background information.
        - Data preprocessing and feature extraction methods.
        - Model architecture and training details.
        - Evaluation results and discussion.
        - Conclusion and future work.

Deliverables:

1. Jupyter Notebook or Python script containing your code.
2. Project report in PDF format.

Grading Criteria:

- Data preprocessing and feature extraction (20%)
- Model selection and training (20%)
- Model evaluation and performance (20%)
- Code quality, organization, and documentation (15%)
- Project report (25%)

Important Notes:

- This project requires a good understanding of machine learning and signal processing.
- Make sure to properly document your code and provide explanations for your choices.
- Plagiarism will not be tolerated; ensure all work is original.

Submission Deadline: December 15th, 2023

Feel free to reach out if you have any questions or need assistance during the project. Good luck, and enjoy working on this EEG classification project!