

# Configuration Manual

MSc Research Project  
Data Analytics

Muhammad Awais Quarni  
Student ID: 23373326

School of Computing  
National College of Ireland

Supervisor: Dr.Hicham Rifai

National College of Ireland  
Project Submission Sheet  
School of Computing



|                             |                       |
|-----------------------------|-----------------------|
| <b>Student Name:</b>        | Muhammad Awais Quarni |
| <b>Student ID:</b>          | 23373326              |
| <b>Programme:</b>           | Data Analytics        |
| <b>Year:</b>                | 2025                  |
| <b>Module:</b>              | MSc Research Project  |
| <b>Supervisor:</b>          | Dr.Hicham Rifai       |
| <b>Submission Due Date:</b> | 11/08/2025            |
| <b>Project Title:</b>       | Configuration Manual  |
| <b>Word Count:</b>          | XXX                   |
| <b>Page Count:</b>          | 2                     |

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.

**ALL** internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

|                   |                       |
|-------------------|-----------------------|
| <b>Signature:</b> | Muhammad Awais Quarni |
| <b>Date:</b>      | 10th August 2025      |

**PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST:**

|                                                                                                                                                                                            |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Attach a completed copy of this sheet to each project (including multiple copies).                                                                                                         | <input type="checkbox"/> |
| <b>Attach a Moodle submission receipt of the online project submission</b> , to each project (including multiple copies).                                                                  | <input type="checkbox"/> |
| <b>You must ensure that you retain a HARD COPY of the project</b> , both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer. | <input type="checkbox"/> |

Assignments that are submitted to the Programme Coordinator office must be placed into the assignment box located outside the office.

| <b>Office Use Only</b>           |  |
|----------------------------------|--|
| Signature:                       |  |
| Date:                            |  |
| Penalty Applied (if applicable): |  |

# Configuration Manual

Muhammad Awais Quarni  
23373326

## 1 System Requirements

### 1.1 Hardware

- Intel i5, i7 (5th Gen or above) / AMD Ryzen 7 or higher
- Google Colab Pro with GPU / NVIDIA GPU with at least 8 GB VRAM.
- RAM minimum 8 GB
- Storage 50 GB free space.

### 1.2 Software

- Window 10,11 / Google Colab Environment.
- Python 3.9+
- MNE-Python, NumPy, Pandas, Matplotlib, Scikit-learn, PyTorch, TSNE, Seaborn

## 2 Installation and Setup

- Clone or download the project files from GitHub or Google Drive.
- Install Python dependencies using.
- `pip install mne numpy pandas matplotlib scikit-learn torch torchvision seaborn`

### 2.1 Access dataset

Mount Google Drive in Colab using:

```
from google.colab import drive  
drive.mount('/content/drive')
```

Locate the AMBER dataset Awais et al. (2023) path and update it in the script.

## 3 Running the Project

### 3.1 Data Preprocessing

- Load EEG signals (EDF format) and event markers (CSV).
- Apply bandpass filtering (0.1-30 Hz).
- Extract epochs ( $-200$  ms to  $+800$  ms).
- Normalize and augment (jitter, scaling).

## 4 Model Training

- Run SimCLR, TS-TCC, VICReg contrastive learning models.
- Train baseline CNN for supervised comparison.

### 4.1 Evaluation

- Extract embeddings from contrastive models.
- Use Logistic Regression for downstream classification.
- Evaluate with Accuracy, ROC-AUC, Precision, Recall, and F1-score.

## References

Awais, M. A., Redmond, P., Ward, T. E. and Healy, G. (2023). Amber: advancing multimodal brain-computer interfaces for enhanced robustness—a dataset for naturalistic settings, *Frontiers in Neuroergonomics* **4**: 1216440.