

A multi-tenant system to manage electroencephalogram (EEG)

Mentor: Prof. Luís Bastião Silva (bastiao@ua.pt) and Prof. Carlos Costa (carlos.costa@ua.pt)

Number of groups elements: ≥ 4

Overview

The electroencephalogram is a type of exam to record de brain activity. Its results are used by several medical specialities, mainly neuroscience, and also for several researchers crossing computer science domain. One of the major existing issues is the lack of standardization and interoperability in the existing data format, that mainly depending on the manufacture (e.g. NeuroScan, BioSemi, EGI, etc). Fortunately, there is a *de facto* standard named European Data Format (EDF) that was created to boost the compatibility with different software manufactures and research applications. However, in the real world, there are at least two major problems: 1) the standard format is not used by mostly of the manufactures; 2) in the healthcare facilities the available archives are PACS and DICOM compatible only.

The goal of this project is to create an information system capable of receive and visualize EEG files from distinct proveniences, independently of the manufactures. The system should provide a multi-tenant platform, DICOM and EDF compatible with tools to manage, visualize and reports EEGs in the web enviroment.

User requirements

The application should be able to support distributed service requests, in a multi-user and multi-institutional modus operandi. It must be a centralized Cloud-based platform that should cope with the following requirements:

- Monitoring a folder or a set of folders. The operator will drag / paste the files in the shared folder. The application will try to process it by the wrapper service. Two workspaces will be provided:
 - Transferred area: it will contain the successfully transferred data. This area will be kept for an arbitrary and configured number of days that will be working as a temporary cache.
 - Errors area: All the files that does not be able to parse or sent will be moved to the errors area. This will allow to manually solve these errors. For the errors, the solution will track them into the logs and also provide support for Jira Ticket or Github Issue creating or other error tracking system integration.
- Transferred the files will be uploaded by a RESTful API.
- Standardization of EDF Service:
 - a service will be able to receive a file (EEG) in a proprietary format should be able to conversion to a standard de facto EDF, but also encode-decode for an encapsulated DICOM. Files can be stored in any PACS (e.g., Dicoogle PACS)
- Web EEG Platform and Viewer

- Visualize the EEG files in the browser. The EDF are usually files that vary between 50 to 100Mb, record in different time frames. The system should be able to deal with signal display in an efficient manner.
- Track and monitor the exams from different institutions and also existing feeders/nodes and dashboard with list of successfully transfer and errors.

Resources

- Datasets EEG:
 - EDF: <https://github.com/BUCANL/Face13>
 - Other formats: <https://headit.ucsd.edu/studies>
- Dicoogle
 - www.dicoogle.com
 - <https://bioinformatics-ua.github.io/dicoogle-learning-pack/docs/introduction/>
- Open source EEG viewer (example):
 - https://bilalzonjy.github.io/EDFViewer_V1/EDFViewer_V1.html