Development of a Cloud-based Data Management and Analytics System for Neurostimulation Studies

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

The aim of this project is to develop an analytics data management system for hosting multimodal datasets that are acquired during human brain and/or spinal cord stimulation studies. The data management system shall run on an internet cloud platform and offer a secure data service for both data acquisition and analytics software tools. The project involves the development of both front-end and back-end components.

Background and Motivation

CereGate is a neurotechnology company developing novel communication interfaces with the nervous system. The key components of our interfaces are the software platforms that we develop. Our platform is hardware-agnostic and can be utilized to develop a multitude of therapeutic solutions.

CereGate is preparing for a next series of research studies that need to be performed in collaboration with institutes in different geographic locations. The studies typically involve the recording of data from multiple modalities, such as neurophysiological recordings from deep brain stimulation or spinal cord stimulation implants, movement sensors, video, behavioral annotations, etc. For this we are aiming to develop an infrastructure that allows acquisition of such data from different geographic sites and allows both local and remote access for data exploratation, quality control, and analysis. The system shall also allow storage and analysis of datasets from our prior studies.

Student's Tasks Description

The student working on this project will map out user needs, translate these into system requirements, and then conceptualize a systems architecture. The project will also involve implementation in a to-be-determined suitable cloud platform. The implementation phase will require the realization of a database structure, and a web-based a user interface to this backend. The project will be substantiated by a project plan that the student will baseline in the initial weeks.

In this project the student will learn to plan and realize a neurotechnology research infrastructure based on state-of-the-art software and data-analytics technologies.

Technical Prerequisites

To complete this project, the student should have following skills:

- Programming in Python
- Web development (e.g., Django/Flask)
- Databases
- Cloud services (e.g., AWS, Google Cloud)
- Experience with version control systems such as Git
- Some experience with neurophysiological recording data (nice to have)

- Front-end development (nice to have)
- Experience with unit test (nice to have)

References

Abe, T., Kinsella, I., Saxena, S., Buchanan, E. K., Couto, J., Briggs, J., ... & Cunningham, J. P. (2022). Neuroscience Cloud Analysis As a Service: An open-source platform for scalable, reproducible data analysis. Neuron, 110(17), 2771-2789.

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