A picture containing text

Description automatically generated

Area Specific Signature of Neural Activity

The cerebral cortex is the computational center of the brain. From anatomical perspective this structure appears as a homogeneous structure across the entire brain. However, studying the microscopic properties of the cerebral cortex revealed systematic differences in structure among different cortical areas. Based on these differences the cortex was subdivided into anatomical sub-regions and later studies revealed that these sub-regions are responsible for unique functions: vision, somatosensation, emotions, motor control etc.

However, when measuring brain activity in the intact brain (e.g., during brain surgeries in humans) no information is available about the fine microstructure of the recording area. The question we addressed here is can we use neural signals recorded from the brain to specifically identify the recoding sites. In other words, what is the mapping between the structural and functional organization of the brain.

We will address this question using brain signals recorded from cortical and subcortical areas of the brain. Our project is a follow up to a project from last year. The main difference in our project is the type of signals that are being tested. Our signals are called CLF and are being sampled at low frequency (1kHz), while last year’s samples are called CUnit and are being sampled at high frequency (32kHz). Each signal measured the local spiking activity from a specific labelled point in the brain.

The project will include the following steps:

1. Studying the properties data and extracting features
2. Classification of a single monkey using Random Forest, KNeighbors, LDA and QDA
3. Applying modern techniques of fully connected network on the features of data (NN)
4. Classification of several monkeys using the different classification algorithms.
5. Trying to find sub-areas for each area of the brain.

Our main challenge was processing the data and trying to find what are the most relevant features for classification. Because our signal is a low frequency signal, we needed to find other kind of features other than audio features, and then find the best combination from all those features.

**Project Members**

Karin Shmit [karin.shmit@mail.huji.ac.il](mailto:karin.shmit@mail.huji.ac.il)

Shir Shabat [shir.shabat@mail.huji.ac.il](mailto:shir.shabat@mail.huji.ac.il)

**Supervisors**

Prof. Yifat Prut, The Hebrew University of Jerusalem

Mr. Snir Weiss, The Hebrew University of Jerusalem