



Graph-Learning in Resting-state Functional MRI

Project Management and Software Development
for Medical Applications

General Info

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There will also be a second supervisor

Project Abstract

We will use the resting-state functional MRI images of schizophrenic patients to represent the functional brain as a graph and build the graph with BOLD-signal represented as node features and anatomical data and edges are the partial correlation values between the bold signals of the nodes.

Background and Motivation

Functional imaging methods allow doctors and scientist to understand human brains beyond just its anatomy. In recent years, Graph Machine Learning techniques allowed us to fully utilize the power of medical imaging. Representing the functional brain as a graph paved the way to deduct information of how spatially not connected areas in the brain work together on a functional basis. In this case we would use rsf-MRI images of schizophrenic patients, represent their functional brain as a graph and deduct information about their brain state.

The student will learn about resting-state functional MRI, such as the BOLD signal, and how functional imaging can be used to deepen our understanding of human brain and improve diagnosis and treatment of mental illnesses by paving the way into individualized medicine. Additionally, she will learn about and implement a graph deep learning method on the case of medical

images and see how ML algorithms can be used in clinical setting.

Student's Tasks Description

- Process fMRI data of schizophrenic patients
- implement a graph learning approach: Use Deep Graph Method Infomax to find proper embeddings and then apply clustering algorithm to find clinically meaningful subgroup of schizophrenic patients

Technical Prerequisites

Python, graph learning is a plus (500)

References

<https://www.sciencedirect.com/science/article/pii/S1361841522001189>

[1809.10341] Deep Graph Infomax (arxiv.org)