Deep Learning on Graphs (CSE-AIML) UE22AM342BA2

Course Project One Pager

Team Details

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Project Title

Identifying Regions of Hyperactivity in fMRI Data Using Transformer-Hypergraph Architectures

Possible Dataset and source

1. ABIDE Data: Autism Brain Imaging Data Exchange
2. ADNI Data: Alzheimer's Disease Neuroimaging Initiative

Uniqueness of the topic

- Our project integrates hypergraph and transformer architectures to analyze fMRI data, focusing on neurodevelopmental and psychiatric disorders.
- Hypergraphs are particularly advantageous in this context as they capture high-order relationships among multiple brain regions, providing a more nuanced understanding of brain network dynamics compared to traditional graph-based methods.
- By refining existing hypergraph-transformer frameworks and customizing them for these disorders, we address the limitations of commercial pipelines and enhance the model's adaptability for complex brain network analysis.
- By leveraging the strengths of both hypergraphs and transformers, our project provides a novel perspective on brain disorder diagnostics, potentially leading to more accurate assessments.

Your Learning goal

- Understand how hypergraphs work
- Learn how to merge two different architectures for a common goal
- Learn how to make effective pipelines and work with large amounts of data

Reference paper, if any (provide the URL)

No	Title	Link
1	A hypergraph transformer method for brain disease diagnosis	https://www.frontiersin.org/journals/medicine/articles/10.3389/fmed.2024.1496573/full
2	Constructing high-order functional networks based on hypergraph for diagnosis of autism spectrum disorders	https://www.frontiersin.org/journals/neuroscience/articles/10.3389/fnins.2023.1257982/full
3	Be More with Less: Hypergraph Attention Networks for Inductive Text Classification	https://aclanthology.org/2020.emnlp-main.399/
4	Multi-Hypergraph Learning Based Brain Functional Connectivity Analysis in fMRI Data	https://pmc.ncbi.nlm.nih.gov/articles/PMC7376954/
5	HyperBrain: Anomaly Detection for Temporal Hypergraph Brain Networks	https://arxiv.org/abs/2410.02087