Deep Learning on Graphs
UE22AM343BB3
Assignment 2

Axe capital investments.

1st April 2025 to 8th April 2025

1 Background

The stock market is a complex system where relationships between stocks can be represented as a graph. Each stock is a node, and hyperedges define groups of stocks that share common properties, such as industry or sector.For this assignment, you will analyze the relationships between stocks using graph-based learning techniques. Your goal is to predict stock performance by leveraging the structure of a stock hypergraph.

2 Your Task

You are provided with the stock movement from 2019-2022 of 20 stocks
The task at hand, is to predict the behaviour for the next year 2023.

2.1 How to do your tasks?

For the task, the expected approach is to use a hypergraph-based method to predict stock trends based on the relationships between stocks in the validation dataset. You should extend your model to generalize beyond the known stocks and predict movements in the blind test dataset, whose values are not given in the validation dataset.

2.2 Problem Description

- **Goal:** Predict the metrics of a stock based on the relationships within its hyperedge.
- **Motivation:** Stocks within the same hyperedge share common influences. By modeling these relationships, we can improve prediction accuracy.

3 Dataset

For this task, you will use a dataset containing stock price movements from various sectors, provided in two parts:

- **Training Data:** Contains stock prices for all stocks. 2019-2022. Features include *Open, High, Low ,Close, Volume.*
- **Hyperedges:** Given a set of 8 hyperedges with 20 different stocks.
- **Validation Data:** Contains stock prices of 10 stocks from different sectors covering all hyperedges. This is used to evaluate your model's effectiveness on known stocks. 2023-2023 end.
  You can use this data to compare the performance of some of the stocks in your model. The other

4 Test Cases

To evaluate the predictive model's accuracy, we generate a set of test cases for stocks that are not included in the validation set. Each test case corresponds to a specific stock and date, requiring the model to generate predictions for key stock market indicators.

4.1 Test Case Fields

Each test case is structured as a JSON object with the following fields:

- `"ticker"`: The stock symbol for which predictions are needed.
- `"date"`: The target date for prediction, spaced at weekly intervals from the start date.
- `"predicted_open"`: Placeholder for the model's predicted opening price.
- `"predicted_high"`: Placeholder for the model's predicted highest price.
- `"predicted_low"`: Placeholder for the model's predicted lowest price.
- `"predicted_close"`: Placeholder for the model's predicted closing price.
- `"predicted_volume"`: Placeholder for the model's predicted trading volume.
- `"eval_metric"`: The evaluation metric used to assess prediction accuracy. In this case, `"MAPE"` (Mean Absolute Percentage Error) is used.

4.2 Populating the Test Cases

Test cases are generated by selecting stock tickers that are not part of the validation dataset. The placeholders for predicted values will be filled by the model during evaluation. These test cases ensure a structured assessment of model performance and provide a standardized format for comparison.
Ensure that you include the script to populate this file, directly from your model outputs, trying to use readily available stock data is not acceptable.

4.3 Suggested Approaches

- **Hypergraph Neural Networks (HGNN):** Leverage hypergraph structures to model multi-stock dependencies.
- **Graph Attention Networks (GAT):** Use attention-based methods to identify key relationships between stocks.
- **Classic ML Techniques:** Consider feature engineering methods such as moving averages and sector-based analysis.

5 Deliverables

- Code Implementation (Jupyter Notebook or Python script).
- **Model Performance Report (2-3 pages)**: Describe your approach, methodology, results, and limitations.

6 Submission details

You will be required to submit your work on this Google Form.