ELTE EÖTVÖS LORÁND UNIVERSITY

Multimodal Forecasting of Stock Prices using GPT-2 Embeddings and Dynamic Graph Networks.

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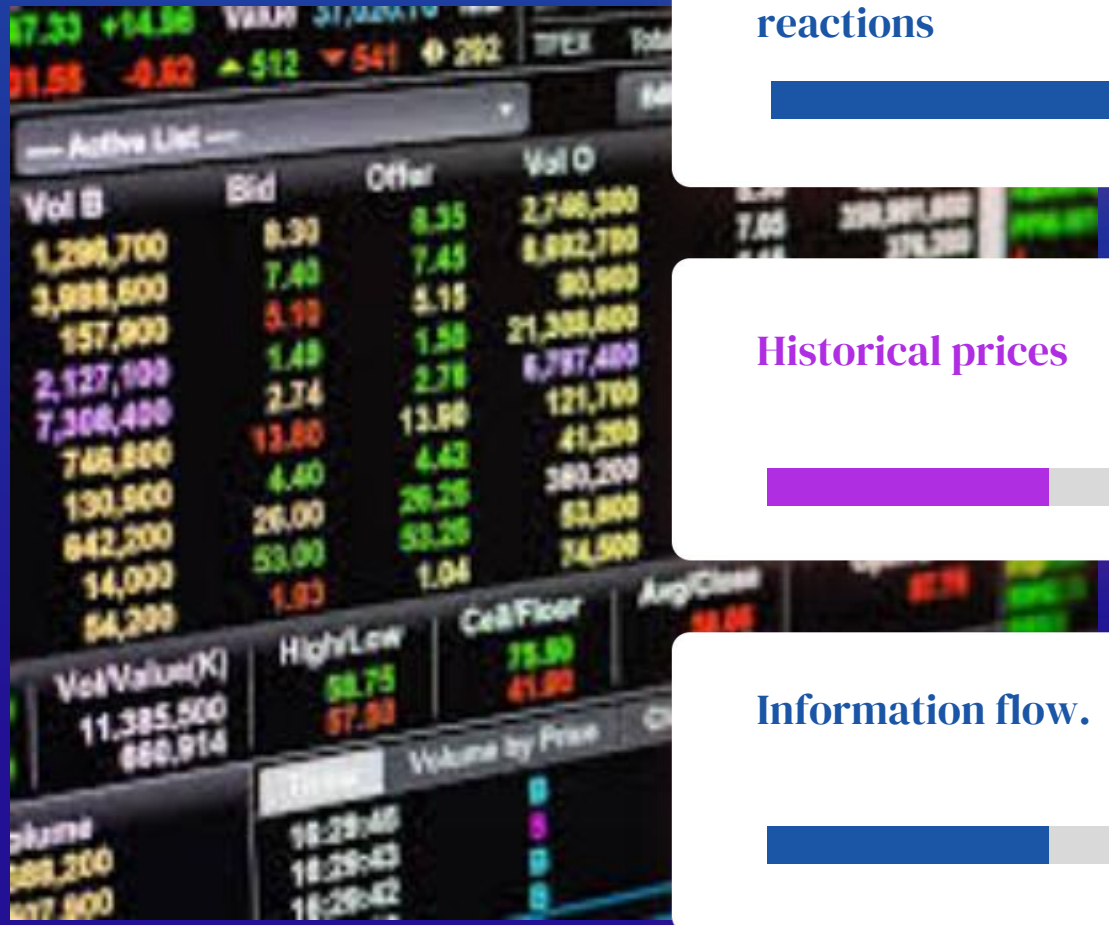
Motivation

–Markets react to information, not only prices.

–News sentiment influences short-term price movements.

– Multimodal models allow joint learning of numerical and textual data.

Research Question and data



Financial Markets reactions

Historical prices

Information flow.

Research Question.

Does integrating daily news data with stock price data improve predictive modelling?

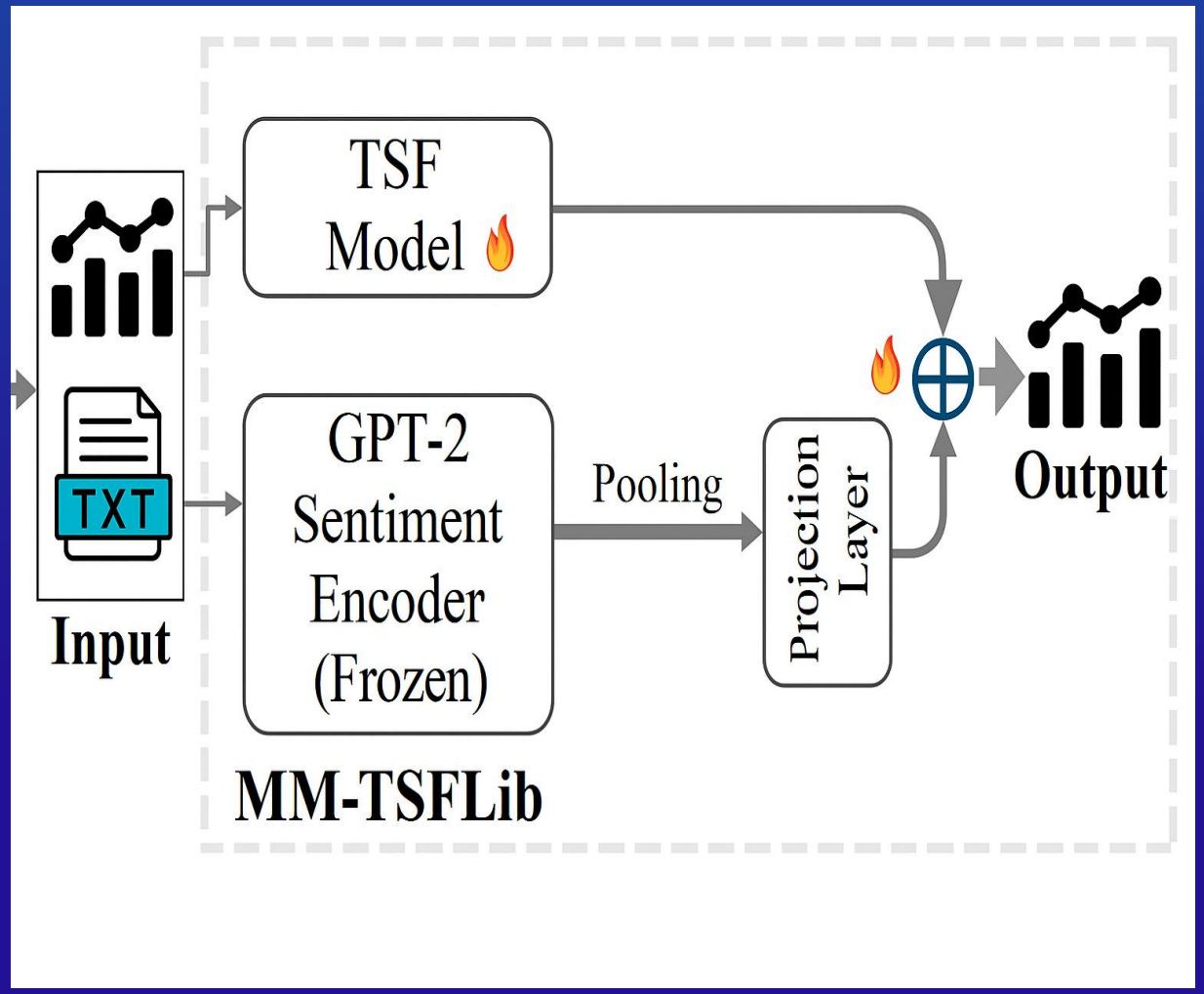
Stock data

-- S&P 500 stocks (subset) FROM 2015-DECEMBER 2025

NEWS data

----Alpha Vantage

Method and process

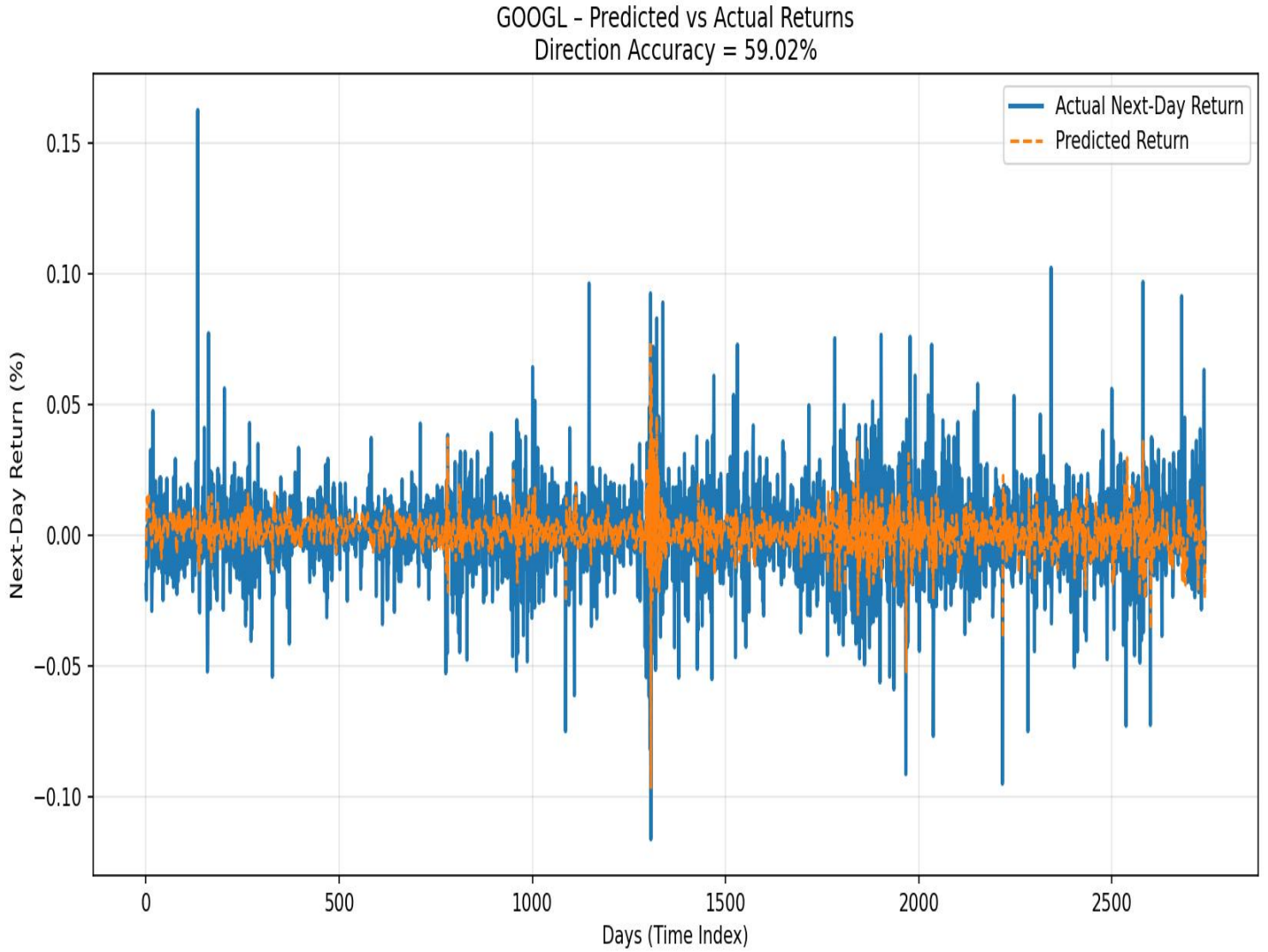


1.News → GPT-2 embeddings

2.Embeddings + prices → MM-TSFlib

3.Output → prediction + graph

Initial results of the training.



- 10 years of stock data

– The model achieved a test RMSE of 0.0148 (1.48%), demonstrating effective feature learning from multimodal inputs.

- Case Study (GOOGL: Experiments on top-tier stocks yielded a Directional Accuracy of 59.02% while it was 57.20% for Amazon.

DECLARATION OF THE USE OF AI.

- Compliance: Provided per Rector's Instruction 4/2025 (X. 28.).
- Methodological AI: GPT-2 was used as a frozen feature extractor for high-dimensional sentiment encoding
- Productivity AI: AI was used used to help guide in organizing the structure of this presentation, it was used as a research tool to find the best tools to use for my project which was according to my guidance and need, it was used as a debugging tool to assist in fixing issues with the code,application of the models as well as optimizing the code according to my prompt and with me guiding it on how to do it etc.
- AI was also used to refine my report as the report would not fit in 2 pages hence it was used to help with shortening my sentences so that the report fits the requirement.It also used to regenerate the class diagram to fit the structure of my project.

Thank you
For your attention.