



# AI SHARE TRADER



## Introduction

The stock market is influenced by various factors. While deep learning models capture temporal dependencies, they often miss interdependencies between assets. Graph Neural Networks (GNNs) and Spatio-Temporal Graph Neural Networks (ST-GNNs) model these relationships, yet their application to the Johannesburg Stock Exchange (JSE) for predicting stock trends remains limited.

## Research Objectives

This research evaluates the advantages of ST-GNN architectures over TCN and MLP for stock forecasting on the JSE. It focuses on prediction tasks (single-step, multi-step, and trend-line), simulated trading profitability, the impact of different adjacency matrix methods, and employs Unity-based visualisations to improve understanding of outputs for financial decision-making.

### ST-GNNs

Spatial-Temporal Graph Neural Networks combine graph-based learning with temporal modeling to address vanishing gradients and static graph issues, providing a comprehensive framework for forecasting complex financial systems.

### Trading Simulation

This study explored trading strategies, applying threshold-based predictions and intraweekly swing trades while managing risk through maximum drawdown limits for improved profitability in simulated financial scenarios.

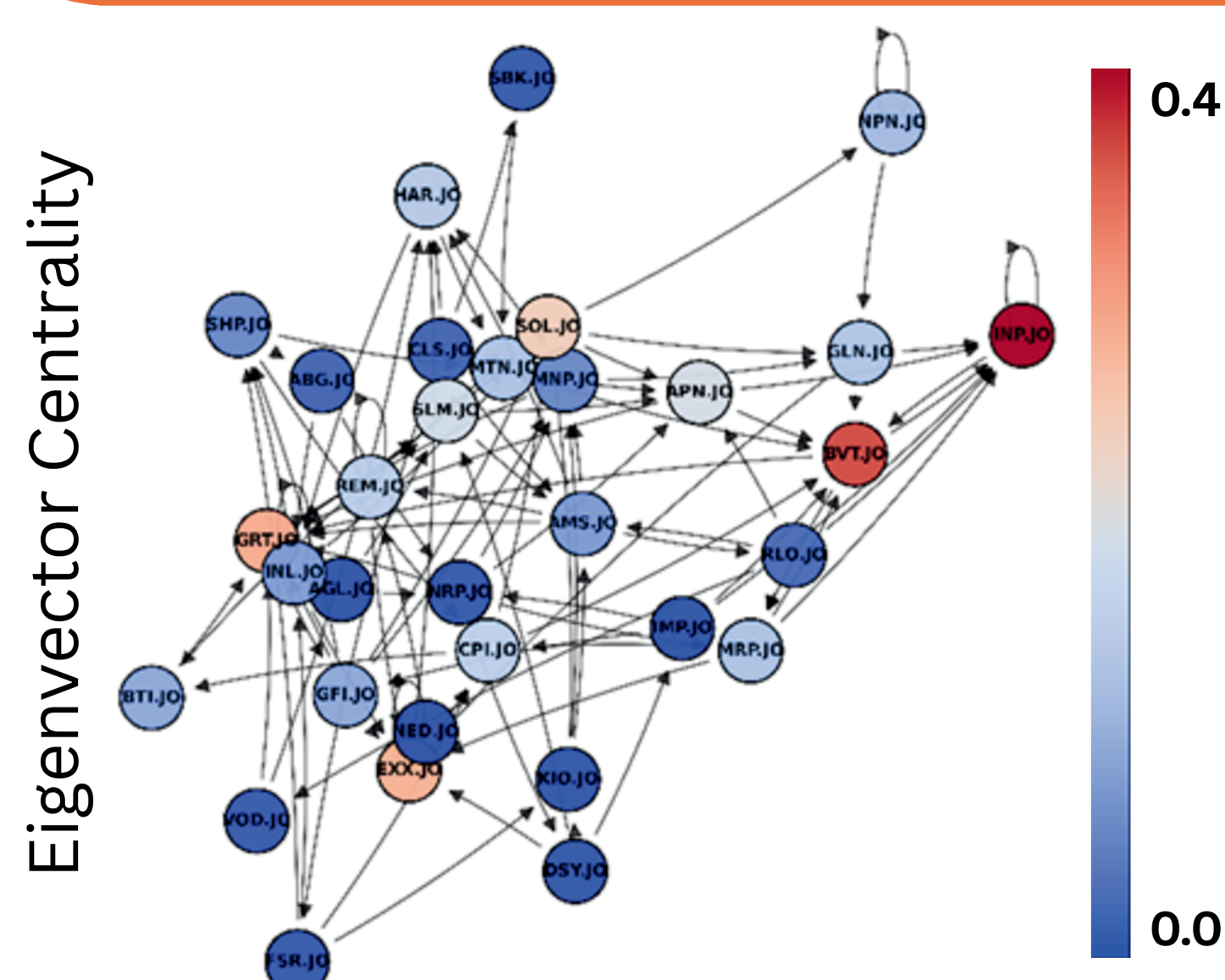
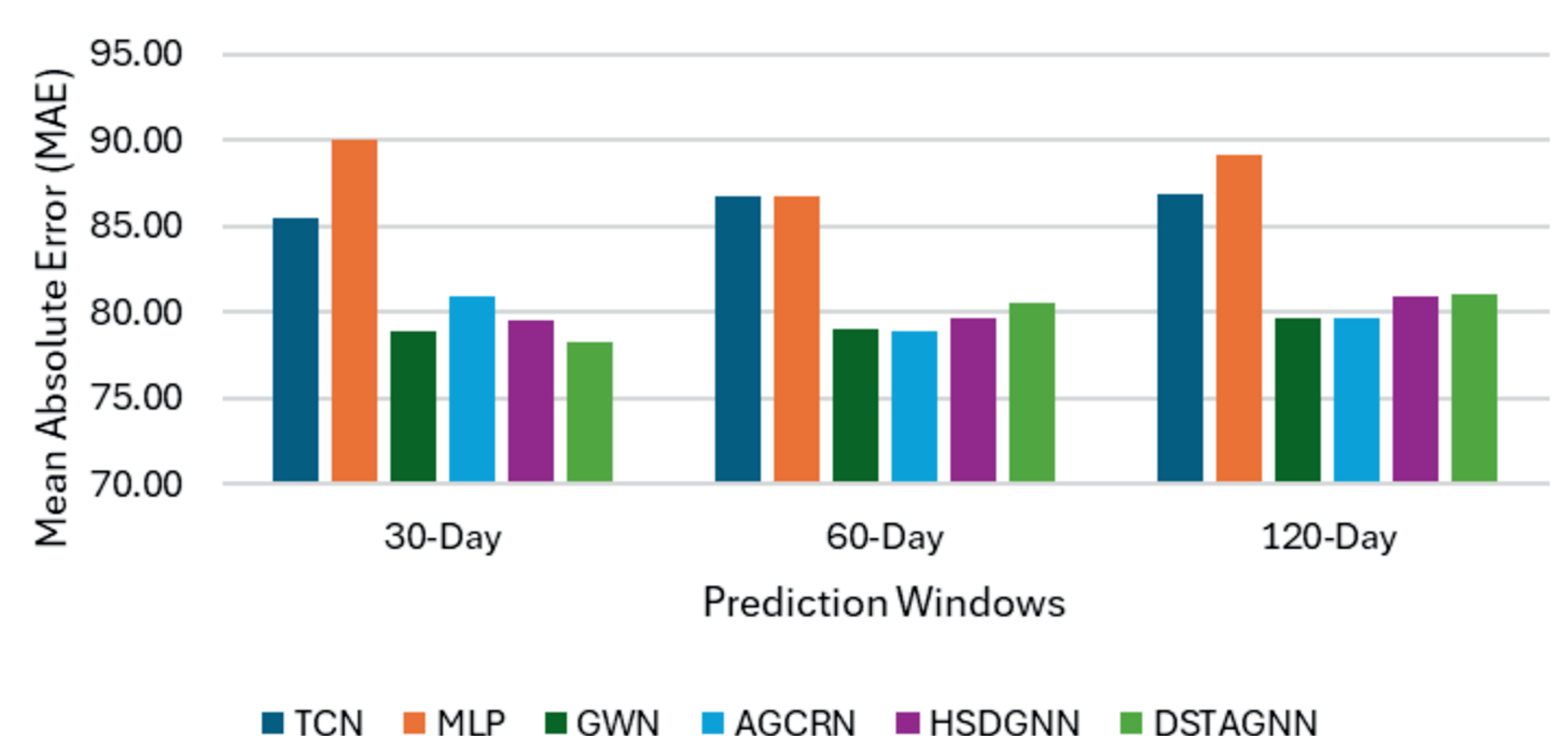
### Network Analysis

Visualizing learned adjacency matrices enhances interpretation of ST-GNNs, revealing influence pathways and systemic structures in equities, while uncovering contagion channels, sectoral dependencies, and meaningful stock relationships.

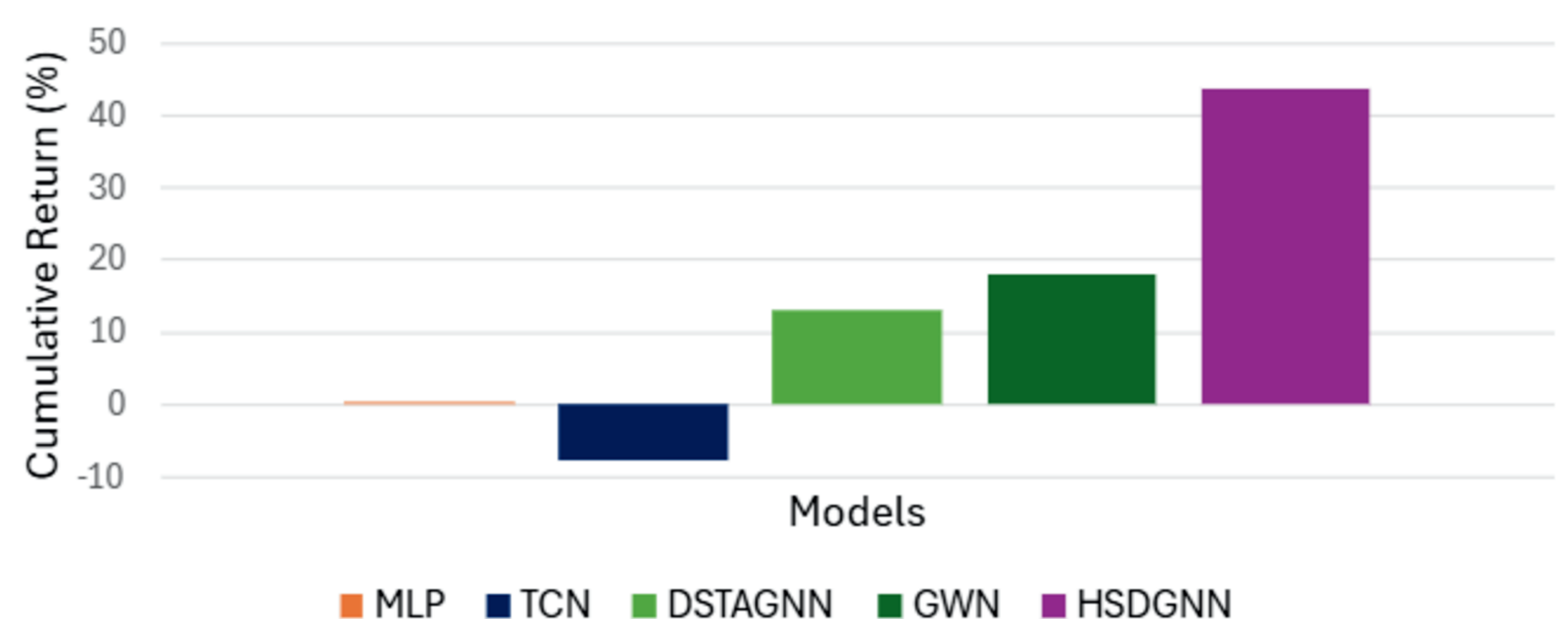
## Results

Sequence-based models like DNNs and TCNs excelled in point price prediction, while ST-GNNs were effective in trend-line prediction. Network analysis highlighted key equities and validated economic links, with trendline trading strategies yielding higher profitability and effective risk management through drawdown constraints.

Slope MAE Performance of Forecasting Models Across Prediction Windows



Model Comparison for the Trendline Prediction Task



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