Enhancing Financial Market Forecasting through Human-Centered LLMs:

A Multimodal Integration Framework

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Abstract. This research proposes an innovative approach to financial market forecasting by integrating Large Language Models (LLMs) with multimodal data analysis. The project aims to develop a human-centered AI framework that combines real-time textual data analysis with structured financial data to enhance predictive accuracy while maintaining transparency and ethical considerations. Through this integration, we seek to provide investors and analysts with more comprehensive and interpretable market insights.

INTRODUCTION

Financial markets are dynamic systems influenced by numerous factors, including economic indicators, market sentiment, and corporate performance. While traditional forecasting models primarily rely on historical numerical data, they often miss crucial signals from unstructured sources. Our research leverages LLMs to process both structured and unstructured data, creating a comprehensive framework for market prediction.

Fig. 1. AI in Finance

LITERATURE REVIEW

Recent research has demonstrated significant advancements in financial market forecasting:

Sentiment Analysis: Studies show machine learning effectiveness in analyzing market sentiment and its impact on asset prices [1].

Multimodal Integration: Advanced techniques combining structured and unstructured data for robust financial predictions [2].

LLM Applications: Emerging research on LLMs' capability to extract meaningful insights from financial texts [3].

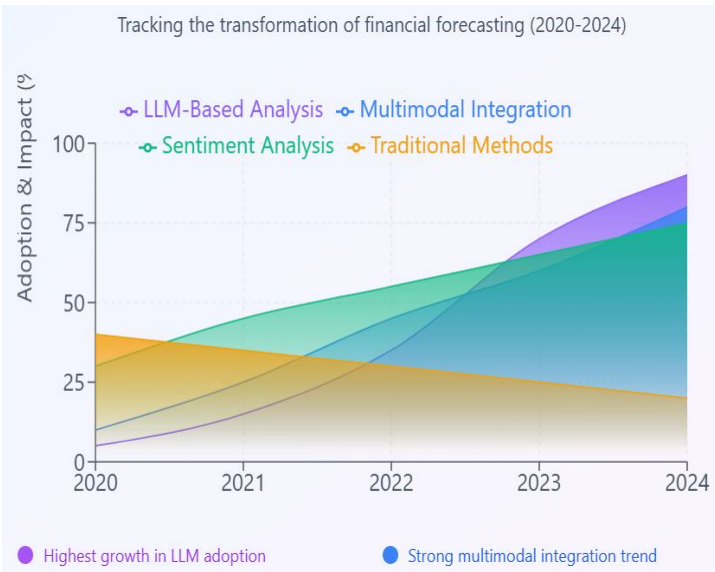

Fig. 2. Evolution of AI-Based Market Forecasting.

AI Transparency: Development of ethical frameworks enhancing model interpretability and trust [4].

Real-Time Data Integration: The role of real-time processing in capturing dynamic market changes has been emphasized as a critical component of predictive accuracy [5].

RESEARCH METHODOLOGY

Research Methodology Framework Development: Develop a multimodal AI model integrating LLM-based text analysis with structured data. Utilize real-time data from sources such as news articles, social media posts, and financial statements.

Data Collection: Collect text data (news and social media) and structured data (financial statements, transaction records).

Model Design: Incorporate sentiment analysis and trend detection using LLMs. Ensure explainability through interpretable visualizations and explanations.

Evaluation: Compare model performance using metrics like prediction accuracy, bias detection, and user trust.

Fig. 3. Data preprocessing for LLMs steps.

Expected Outcomes

Technical Achievements: The findings will lead to interpretable investment decision tools, advanced risk assessment frameworks, and market trend analysis systems. These tools will provide actionable insights and transparency for investors and analysts.

Practical Applications: The findings will lead to interpretable investment decision tools, advanced risk assessment frameworks, and market trend analysis systems. These tools will provide actionable insights and transparency for investors and analysts.

Research Contribution: This study introduces a novel methodology for multimodal financial forecasting and establishes an ethical AI framework for finance. It validates a human-centered approach, emphasizing transparency, fairness, and user-centric design.

Conclusion / Improvements

This research addresses the critical need for more sophisticated and transparent financial market forecasting tools. By combining LLMs with traditional financial data analysis while emphasizing human-centered design principles, we aim to create a more reliable and trustworthy framework for market prediction. Future improvements will focus on expanding data sources, enhancing LLM capabilities, and exploring cross-market applications.

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