

TickerMind

Senior Engineering Project

SFWRTECH 4FD3

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ENGINEERING

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**McMaster School of Engineering Practice and Technology, Hamilton
May 2025**

TickerMind

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Keywords— *Mathematics Education, Learning Progress, Key Concepts, Self-Reflection, Educational Insights, Professional Application, Mathematical Competence, Scholarly Development, Mathematical Foundations, Course Experience, Analytical Skills, Real-world Applications, Problem-solving, Integration of Knowledge, Dedication and Commitment, Collaborative Learning, Practicality of Mathematics, Future Growth and Development*

TABLE OF TABLES

Table 1: Project activity schedule.....3

TABLE OF FIGURES

Figure 1: UML of project Architecture4

TABLE OF CONTENTS

Table of Tables	2
Table of Figures	2
Table of Contents	2
1. Introduction.....	2
2. Objectives.....	2
3. Solution Methodology.....	2
4. Validation Strategy.....	3
5. Ethics and Sustainability Considerations.....	3
6. Commercialization	3
7. Proposed Timeline	3

1. INTRODUCTION

The financial markets, such as stocks, cryptocurrencies, and forex, are dynamic, data-intensive, and real-time, and thus traders and investors must rapidly process vast amounts of information. Existing market analysis tools do not have real-time sentiment analysis or are centralized, subscription-based models, which are limiting in their access.

Our senior engineering project aims at developing a stock scanner integrating latest market information and sentiment from a local large language model (LLM) as well as varied news feeds. The software will empower retail investors and small-sized

traders by providing actionable information, making sophisticated market analysis inclusive, and democratizing its availability. Its benefits will be enhanced decision-making, lower analysis cost, and access-oriented design emphasizing inclusivity and ease of accessibility.

2. OBJECTIVES

- Develop a stock scanner that aggregates real-time information for stocks, cryptocurrencies, and forex.
- Use a local LLM to perform sentiment analysis of news feeds and social media posts.
- Integrate multiple data sources (e.g., news APIs, market data feeds) to provide end-to-end market analysis.
- Develop an easy-to-use, intuitive user interface for retail investors.
- Make ethical use, data privacy, and accessibility part of the system design and implementation.

3. SOLUTION METHODOLOGY

The stock scanner will be a software application with the following modules:

Data Aggregation Module	Fetches real-time market data (e.g., stock prices, crypto prices, forex rates) via APIs like Alpha Vantage or Binance.
Sentiment Analysis Module	A local LLM (e.g., LLaMA or a fine-tuned open-source model) examines news articles and social media posts to ascertain market sentiment.
User Interface	A web-based dashboard built with React and Tailwind CSS for usability and accessibility.
Backend	A Python-based server with FastAPI for data processing and LLM inference.
Software	Python, React, FastAPI, PostgreSQL (for data storage), Hugging Face Transformers (for LLM), news APIs (e.g., NewsAPI), market data APIs.
Hardware	A mid-range GPU (e.g., NVIDIA RTX 3060) for local LLM inference, standard development laptops, and a server for deployment.
Development Tools	Version control system Git, containerization using Docker, and testing using pytest.

4. VALIDATION STRATEGY

System performance will be tracked through:

Quantitative Metrics	Sentiment analysis accuracy (e.g., precision, recall, F1-score vs. labeled data). Data aggregation and LLM inference latency (target: <2 seconds for real-time updates). System uptime and reliability (target: 99.9% uptime in testing).
Qualitative Metrics	Accessibility conformity (e.g., WCAG 2.1 standards).
Validation Stages	Week 8: Prototyping testing of data aggregation and UI functionality. Week 9: Sentiment analysis validation with initial samples. Week 13: Real-time data and user feedback full system testing. Week 14: Final check against all performance criteria.

5. ETHICS AND SUSTAINABILITY CONSIDERATIONS

Ethical Design	Maintain data privacy by employing a local LLM, eschewing external data sharing. Employ clear sentiment analysis algorithms transparently to eliminate bias.
Ethical Usage	Offer straightforward user instructions to avert misuse (e.g., manipulative trading). Feature disclaimers on financial risks.
Ethical Usage	Create UI for varied users, such as visual or motor-impaired users, with high-contrast themes and keyboard navigation.
Human-Centric Design	Provide the tool as an open-source project for affordability reasons. Provide support for multiple languages in the UI to accommodate global users.
Equity And Inclusivity	Redistribute inference energy consumption of LLM. Use cloud providers that are dedicated to renewable energy for hosting.

6. COMMERCIALIZATION

Importance to Users	Rated 8/10. The scanner provides critical insights for retail investors, enhancing
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	financial decision-making, though not a matter of survival.
Uniqueness	Rated 6/10. While other tools (e.g., TradingView, Bloomberg) exist, our focus on local LLM-based sentiment analysis and open-source accessibility is distinctive.
Competitive Advantages	Cheaper: Free or low-cost compared to premium subscription-based tools. Easier to Use: Intuitive UI designed for non-expert users. Performs Better: Local LLM reduces latency and enhances privacy compared to cloud-based solutions.

7. PROPOSED TIMELINE

Table 1: Project activity schedule

No.	Activity	Week
1	Research and suitability analysis	2
2	Project specification and architecture design	3
3	Data pipeline and UI/UX design	4
4	LLM fine-tuning and backend design	5
5	Prototype integration and testing	6
6	Midterm recess	7
7	Prototype discussion and midterm submission	8
8	Sentiment analysis validation and UI refinement	9
9	Data aggregation module development	10
10	Sentiment analysis and backend development	11
11	Full system integration and optimization	12
12	Final testing and user feedback	13

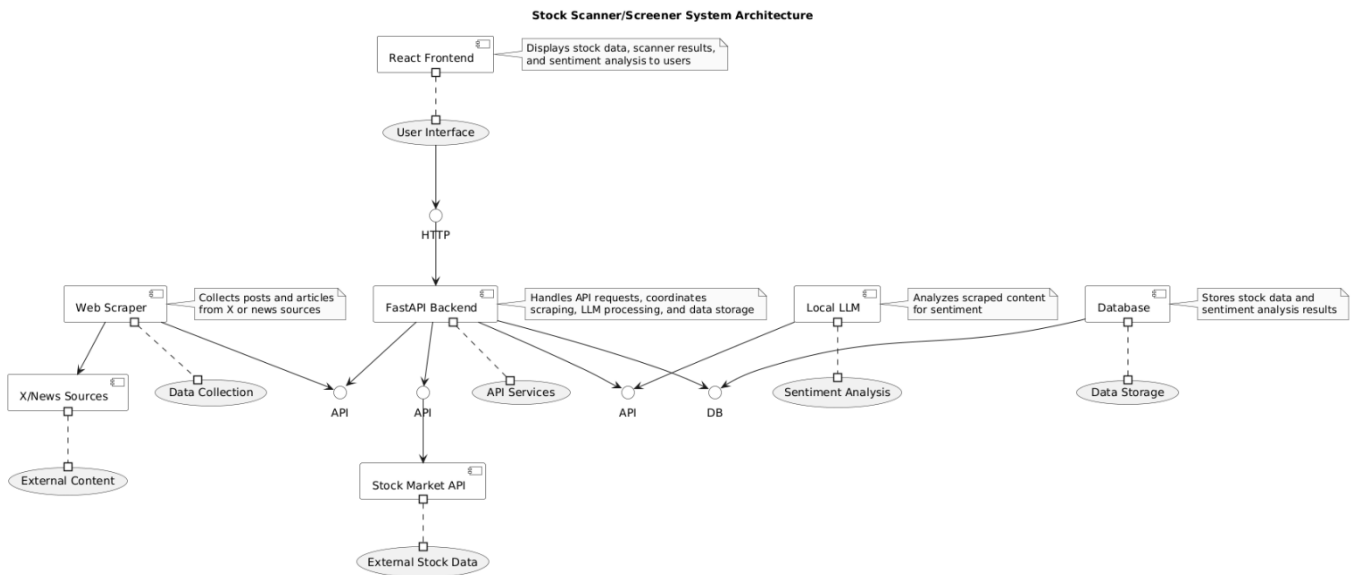


Figure 1: UML of project Architecture