

Project Number: 32

Project Title: Financial Market Analytics Application

Project Clients: Hiran Rezaei

Project specializations: Software Development; Web Application Development; Mobile Application Development; Artificial Intelligence (Machine/Deep Learning, NLP); Big data Analytics and Visualization;

Number of groups: 2 group

Main contact: Hiran Rezaei

Background:

Modern financial markets generate a wealth of data from diverse sources, including fundamental financial metrics and sentiment data from news, social media, and analyst reports. Investors require tools that not only consolidate this heterogeneous data but also analyze it to reveal actionable insights. Advances in AI—especially in LLMs—offer promising approaches to parsing the complex language of financial texts. This project challenges students to build an integrated application that automates data gathering, processing, and sophisticated analytics, while deploying the solution using Docker for ease of setup and reproducibility.

Project Goals:

- Develop an application that aggregates data from multiple financial APIs, collecting both fundamental metrics (e.g., earnings, ratios, balance sheets), sentiment data (news articles, social media feeds) and some technical indicators (like RSI, moving average)
- Design and implement a robust data pipeline to process, clean, and store the ingested data using a containerized database solution (e.g., Dockerized PostgreSQL or MongoDB).
- Perform in-depth analysis using machine learning techniques—emphasizing LLMs for domain-specific sentiment analysis—and explore other analytical models to gain insights into stock performance. (Fine-tuned LLMs are preferred)
- Create an interactive, user-friendly dashboard (web or mobile) to visualize trends, generate insights, and optionally trigger real-time alerts based on significant market changes.
- Package the entire application (data pipeline, ML models, and user interface) within Docker containers, using Docker Compose for orchestration to ensure easy deployment and portability.

Requirements and Scope:

- Develop an application that aggregates financial data—both fundamental metrics and sentiment insights—from multiple external APIs.
- Process and clean the collected data, then store it in a containerized database environment.
- Analyze the data using machine learning, with an emphasis on large language models for domain-specific analysis and incorporating other analytical models.
- Provide an interactive dashboard (web or mobile) that visualizes trends, displays insights, and may generate alerts for significant market changes.
- Deploy the entire solution using Docker with Docker Compose for ease of setup, reproducibility, and local/institutional deployment.

Required Knowledge and skills:

- API Integration:
 - Connect to multiple financial data providers (e.g., Yahoo Finance, Alpha Vantage, Google News API) to collect both structured and unstructured financial data.
- Data Pipeline & Storage:
 - Build an automated ETL pipeline to extract, transform, and load data into a Dockerized database solution (such as PostgreSQL or MongoDB).
 - Ensure data integrity and security within the deployed environment.
- Machine Learning & Analysis:
 - Fine-tune large language models on a curated corpus of financial texts for analysis.
 - Evaluate these models against off-the-shelf alternatives and consider incorporating predictive analytics for stock trend forecasting.
- User Interface:
 - Develop a responsive front-end (web or mobile) that displays analytics, trends, and alert mechanisms, with interactive features for user customization.
- Deployment & Infrastructure:
 - Containerize all components of the application (API, database, ML modules, and user interface) using Docker.
 - Provide a docker-compose configuration to orchestrate multi-container deployment on any system supporting Docker.
 - Explore real-time data streaming (e.g., via Kafka) for live market tracking and alerts.

– Maintain a modular system design to facilitate the integration of additional data sources or future analytical tools.

Expected outcomes/deliverables:

- A fully functional Financial Market Analytics Application (accessible via web or mobile) that aggregates and processes real-time financial data.
- An automated and secure data pipeline integrated with multiple APIs and deployed using containerized services.
- An analysis module leveraging LLMs alongside other analytical models to provide actionable insights on different stocks.
- An interactive dashboard featuring visualizations, trend analysis, and alert mechanisms.
- Docker configuration (Dockerfiles and docker-compose file) ensuring that the entire application can be deployed and tested locally or on institutional infrastructure.
- Comprehensive documentation including a user guide, technical architecture overview, and source code repository.