A

Mini Project Report

on

Quantamental - The Quant platform

Submitted in partial fulfillment of the requirements for the

degree

Third Year Engineering – Computer Science Engineering (Data Science)

by

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CERTIFICATE

This to certify that the Mini Project report on Quantamental - The Quant platform has been Submitted by Chitresh Poojary (22107010),Gaurav Shetty(23107127),Shlok Sawant(23107142),Manish Sharma(23107058) who are bonafide students of A. P. Shah Institute of Technology, Thane as a partial fulfillment of the requirement for the degree in Computer Science Engineering (Data Science), during the academic year 2025-2026 in the satisfactory manner as per the curriculum laid down by University of Mumbai.

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TABLE OF CONTENTS

ABSTRACT

Quantamental investing is an emerging strategy that combines quantitative models with fundamental analysis to enhance investment decision-making. Traditional fundamental analysis focuses on company- specific metrics such as earnings, revenue growth, and financial ratios, while quantitative analysis relies on statistical models, algorithms, and big data to identify patterns and forecast trends. By integrating these approaches, quantamental investing seeks to leverage the objectivity and scale of quantitative methods with the insight and contextual understanding of fundamental research. This hybrid strategy enables investors to capture both macro-level market signals and micro-level company insights, leading to more informed portfolio construction and risk management. As technology, artificial intelligence, and data availability continue to advance, quantamental investing is becoming a key tool for asset managers seeking alpha in increasingly complex financial markets.

Chapter 1

Introduction

In an era where **financial markets move with unprecedented speed and complexity**, investors are constantly challenged to make decisions that balance **accuracy, timeliness, and personalization**. Traditional investment methods, while reliable in their own right, often fall short when applied in isolation. Fundamental research provides deep insights into company performance and industry outlooks, whereas quantitative analysis uncovers statistical patterns and market signals. Yet, each approach has limitations when used independently, creating a gap in achieving holistic decision-making.

Recognizing this challenge, we introduce **Quantamental**, an innovative platform that integrates the **rigor of quantitative models** with the **contextual depth of fundamental research**. Designed to support both institutional and individual investors, Quantamental offers an **all-in-one investment decision framework** that brings advanced market analysis tools into a unified and accessible system.

Quantamental leverages **real-time market data aggregation**, drawing from diverse and reputable financial sources to ensure a comprehensive view of the market landscape. Users can interact with the platform through a **command-line interface (CLI)**, enabling them to efficiently track stock prices, market indicators, and investment signals. This user-focused approach ensures that investors can explore financial data in ways that align with their specific goals and strategies.

What sets Quantamental apart is its **AI-powered personalization** and **machine learning–driven analytics**. The system continuously adapts to user profiles, age groups, and portfolio characteristics, refining its recommendations as users engage with the platform. By doing so, Quantamental delivers **dynamic, tailored investment insights** that evolve with changing user behavior and market conditions.

This report explores the foundation of Quantamental, its architectural framework, and the methodologies that drive its **hybrid recommendation engine** for financial decision-making. By combining advanced analytics with a user-centric design, Quantamental seeks to

democratize sophisticated investment strategies, providing individuals and small investors access to tools that were once the privilege of large financial institutions.

1.1 Purpose

The purpose of **Quantamental** is to transform the way investors analyze, interpret, and act upon financial market information. In today's **volatile and fast-paced financial environment**, making sound investment decisions requires not only **timely access to data** but also the ability to combine multiple analytical approaches. Traditional methods—quantitative analysis and fundamental research—offer value in isolation but fall short of delivering a **comprehensive perspective** when applied independently.

Quantamental bridges this gap by providing a **unified investment decision-making platform** that integrates the strengths of both approaches. Through a combination of **real-time market data aggregation, AI-driven personalization, machine learning–based predictive analytics, and an intuitive command-line interface (CLI)**, Quantamental continuously refines its recommendations to align with investors' evolving needs and portfolio characteristics.

The core purpose of Quantamental is to **empower both individual and small-scale investors** with advanced financial tools that were once restricted to large institutions. By democratizing access to sophisticated analytics, Quantamental enables investors to make **data-driven, personalized, and strategic decisions**. Its user-centric design ensures that investment research is not only more efficient but also more **reliable, adaptive, and actionable** in an increasingly complex financial ecosystem.

1.2 Problem Statement

The problem statement for Quantamental revolves around the **limitations of existing investment decision-making methods**, which fail to deliver holistic, personalized, and efficient insights for modern investors. Current approaches often force investors to choose between **data-driven models** (quantitative analysis) and **contextual research** (fundamental

analysis), without offering a seamless integration of both. This leads to inefficiencies, incomplete perspectives, and missed opportunities in financial markets.

Key challenges that **Quantamental** seeks to address include:

1. **Lack of Integration**: Existing tools often treat quantitative and fundamental analysis as separate domains, leaving investors without a comprehensive, unified view of markets.

2. **Limited Personalization**: Many platforms provide generic recommendations, failing to account for investor-specific factors such as risk tolerance, age, or portfolio structure.

3. **Time Constraints**: Investors with limited time struggle to analyze vast amounts of data across different sources, hindering timely decision-making.

4. **Predictive Limitations**: Traditional systems often lack machine learning capabilities to forecast trends, limiting their ability to provide forward-looking recommendations.

5. **Accessibility Gaps**: Advanced analytical tools remain concentrated within large financial institutions, leaving retail and small investors at a disadvantage.

6. **Information Overload**: With the vast volume of market data available, investors risk being overwhelmed, making it difficult to filter relevant insights from noise.

7. **Reliability and Trustworthiness**: Without mechanisms to validate data and provide context, investors face the challenge of distinguishing between **credible insights** and **unreliable signals**.

By addressing these challenges, **Quantamental** positions itself as a **next-generation investment platform** that not only enhances decision-making efficiency but also **levels the playing field** for all types of investors.

1.3 Objectives

The primary objective of **Quantamental** is to create a next-generation investment platform that bridges the gap between **quantitative analysis** and **fundamental research**. By combining advanced machine learning algorithms, real-time market data, and user-centric features, the platform aims to deliver smarter, faster, and more reliable investment decision-making capabilities. These objectives are designed not only to assist professional investors but also to empower individual and small-scale users with institutional-grade tools in a simplified interface.

The specific objectives of Quantamental are as follows:

1. **Integration of Analytical Approaches**: To provide a platform that combines quantitative analysis and fundamental research for smarter investment decision-making.

2. **Portfolio Optimization**: To assist users in constructing and managing optimized investment portfolios using machine learning algorithms such as **LSTM, Bollinger Bands, and Moving Averages**, supported by market data from **yfinance**.

3. **Simplified Financial Research**: To streamline research by aggregating financial news, market analysis, mathematical tools, a recommendation system, and chatbot-based advisory support within one unified interface.

4. **Real-Time Predictive Analytics**: To integrate real-time market data and predictive models, enabling users to make **timely, data-driven investment decisions** with greater precision and confidence.

1.4 Scope

The scope of Quantamental is to develop a comprehensive investment platform that combines quantitative analysis with fundamental research, providing users with actionable insights and portfolio management tools. The platform is designed to cater to a wide range of users—from retail investors to professional analysts—while ensuring scalability and reliability. The specific scope of Quantamental is as follows:

1. **Target Users:** To serve retail investors, traders, financial analysts, and finance students, offering both simplified and advanced tools for investment analysis.

2. **Feature Integration:** To provide a unified platform encompassing stock dashboards, news aggregation, portfolio tracking, AI-powered advisory systems, and CLI tools for automated analysis.

3. **Technology Implementation:** To leverage a robust technology stack including Go for backend processing, Rust for CLI tools, React + TypeScript for frontend development, Python for machine learning models, and Bash for automation tasks.

4. **Scalability:** To design the platform to support growth from individual, personal use to enterprise-level adoption, ensuring performance and reliability at scale.

5. **Limitations:** To acknowledge that ML-based recommendations are dependent on the quality and availability of financial data, and that investment predictions are probabilistic, not guaranteed.

Chapter 2

Literature Review

Quantamental is designed as an all-in-one platform. [1]Tadoori (2020) proposed an ML-based quantamental investing system that combined quantitative strategies, such as factor models and technical indicators, with fundamental research, including financial ratios and company performance. The study demonstrated improved risk-adjusted returns but highlighted limitations in interpretability and explainability, making it difficult for individual investors to fully understand the decision-making process of the model.

[2] Guo, Zhang, and Singh introduced Quant 4.0, which embedded explainability and automation into quantamental investing using explainable AI tools like SHAP and LIME. Their research improved the transparency of machine learning-driven investment recommendations but also identified practical deployment challenges for real-time trading systems, especially for small-scale or retail investors.

The [3] Robeco Research Team explored the adoption of quantamental strategies in emerging markets. Their study found that blending factor-based models with fundamental overlays enhanced stock selection and portfolio performance, demonstrating the effectiveness of combining quantitative and fundamental approaches. However, the research also noted that such platforms are often expensive and less accessible to individual investors.

[4] Li, Chen, and Kumar investigated hybrid ML-fundamental investment strategies, showing that combining LSTM-based predictive models with traditional fundamental analysis improved portfolio optimization and reduced downside risk. Their findings emphasize the potential of integrating advanced machine learning techniques with fundamental research to achieve better investment outcomes.

[5] Zhao and Wang focused on explainable AI in financial recommendations, applying LIME and SHAP to enhance transparency and user trust in AI-driven stock selection tools. Their study highlighted the importance of making machine learning recommendations understandable for users, which is essential for the practical adoption of quantamental investing platforms by retail investors.

Gap Identified: Existing platforms are often theoretical, fragmented, or expensive. There is a clear need for a practical, scalable, affordable, and explainable quantamental investment system designed for individual users**.**

Chapter 3

Proposed System

The proposed system for Quantamental aims to transform the way users make investment decisions by combining quantitative analysis with fundamental research. By integrating real-time market data, machine learning models, and personalized portfolio recommendations, Quantamental offers an intelligent and user-centric platform for investors. With its innovative approach, it seeks to empower both retail and professional investors with actionable insights, improving portfolio management and investment outcomes.

1. **Market Data Aggregation:** Quantamental employs APIs such as yfinance and web scraping techniques to gather financial data from stock exchanges, news portals, and company reports. This ensures a comprehensive and up-to-date dataset for analysis, including stock prices, market trends, financial ratios, and news updates.

2. **User Registration and Preferences:** Users can create accounts on Quantamental to personalize their experience. During registration, they can specify investment preferences such as risk tolerance, sectors of interest, and investment goals, enabling the platform to tailor recommendations and insights to individual profiles.

3. **Portfolio Tracking and Recommendations:** Quantamental provides personalized portfolio management tools, including risk assessment, asset allocation suggestions, and performance tracking. The system analyzes user portfolios along with market trends to deliver recommendations aligned with the user's investment strategy.

4. **Hybrid Analytical Model:** Quantamental leverages a hybrid model combining quantitative analysis (technical indicators, moving averages, Bollinger Bands) and fundamental research (financial statements, company valuation metrics). Machine learning algorithms such as LSTM are used to predict stock trends, while explainable AI techniques like SHAP and LIME provide transparency in recommendations.

5. **User Interface Design:** The platform features an intuitive and interactive interface built with React and TypeScript, providing dashboards for stock monitoring, news

feeds, portfolio visualization, and AI-driven advisory insights. The interface emphasizes usability, visual clarity, and seamless navigation to enhance user engagement.

By implementing these features, Quantamental aims to provide a comprehensive, explainable, and user-focused platform for smarter investment decision-making, accessible to both individual and professional investors.

3.1 Features & Functionality

The proposed **Quantamental** platform integrates a rich set of features designed to support investors, traders, and analysts with actionable insights, usability, and transparency. Its functionality spans real-time data monitoring, intelligent recommendations, and advanced analytical tools, ensuring both accessibility for retail users and flexibility for professionals. The key features are as follows:

- **Real-Time Stock Price Monitoring:** Provides up-to-date stock prices, market indices, and trend visualization to help users track performance and make timely decisions.
- **Command-Line Interface (CLI):** A Rust-based CLI allows power users and developers to quickly run financial commands, perform analysis, and access data without relying solely on the graphical interface.
- **AI-Powered Personalized Recommendations:** Employs machine learning models (LSTM, Bollinger Bands, Moving Averages) combined with explainable AI methods (SHAP, LIME) to deliver tailored investment suggestions.
- **Portfolio Optimization & Risk Management:** Enables users to construct and manage optimized portfolios with insights into diversification, risk exposure, and performance evaluation.
- **News Aggregation and Sentiment Analysis:** Integrates financial news and sentiment analysis to provide context-aware recommendations influenced by market trends and investor sentiment.

- **Developer Tools for Custom Model Building:** Offers APIs and utilities for researchers and developers to experiment with custom predictive models, extending the platform's functionality beyond default ML models.

Chapter 4

Requirements Analysis

The development of Quantamental requires a clear specification of both functional and non-functional requirements to ensure that the platform delivers robust performance, user satisfaction, and scalability.

Functional Requirements:

- **Fetch Real-Time Stock and News Data:** The system must integrate APIs (e.g., yfinance, financial news feeds) and web scraping techniques to retrieve live stock prices, financial indicators, and market news.
- **Display Interactive Dashboards and Charts:** The frontend should provide visually rich dashboards with charts, graphs, and tables for market insights, portfolio analysis, and predictive analytics.
- **Provide Personalized Recommendations:** The system must leverage machine learning models (LSTM, Bollinger Bands, Moving Averages) and explainable AI (SHAP, LIME) to deliver customized investment advice.
- **Support CLI-Based Operations**: A Rust-based CLI should allow users to execute financial queries, analyze data, and automate tasks directly from the command line.
- **Portfolio Management:** The platform should allow users to build, track, and optimize portfolios with risk management tools.
- **News Sentiment Analysis:** The system must analyze aggregated financial news and provide sentiment-based insights for investment decisions.

Non-Functional Requirements:

- **Scalability:** The platform must support both individual investors and enterprise-level adoption by efficiently handling increasing user loads and data requests.

- **Performance:** Real-time stock monitoring, recommendations, and news aggregation should be delivered with minimal latency for timely decision-making.
- **Security:** All communications with APIs and user data must be encrypted; role-based access control should be implemented for secure operations.
- **Usability:** The system should feature an intuitive, responsive, and user-friendly interface with clear navigation, ensuring accessibility for both novice and expert users.
- **Reliability:** The platform must ensure high availability and fault tolerance to maintain consistent service delivery.
- **Maintainability:** Modular architecture should be adopted to allow easy updates, integration of new models, and bug fixes.

Chapter 5

Project Design

5.1 Case Diagram:

The use case diagram illustrates the primary interactions between the **user** and the **Quantamental system**. It highlights how users can access different functionalities such as fetching stock prices, retrieving financial news, performing computations, obtaining stock recommendations, and receiving investment advice. The diagram also shows the integration of external APIs and AI models (e.g., Finnhub API, News API, OpenRouter + DeepSeek) that power these functionalities.

This diagram serves as a blueprint to understand the **system requirements** and **user interactions**, ensuring that both functional and non-functional requirements are addressed in the system's architecture.

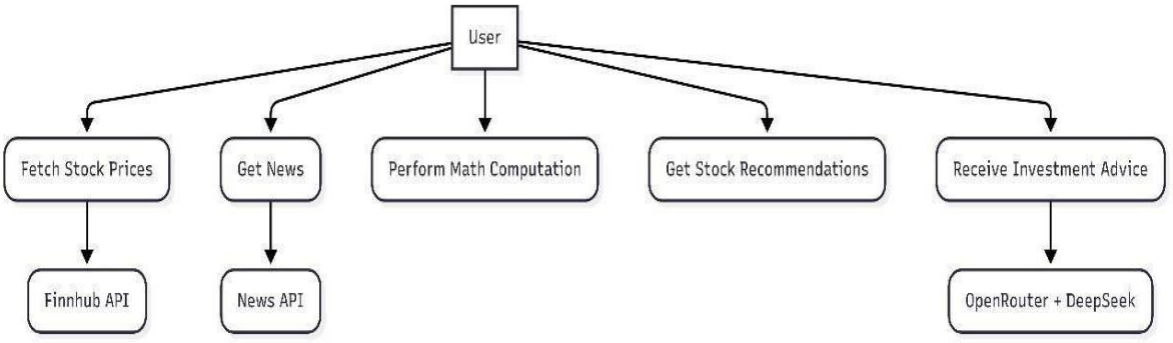


Figure 5.1 : Case Diagram for Quantamental

5.2 DFD (Data Flow Diagram):

Before presenting Figure 5.2.1, it is important to provide an introduction to the Data Flow Diagram (DFD) used in this system. A DFD is a graphical representation that illustrates how data flows within a system, showing the interaction between different components such as users, processes, and outputs. It helps in understanding the logical structure of the system by highlighting the movement of data, inputs, and outputs. In the context of the Quantamental System, the DFD explains how users interact with the system by providing queries or requests, how these inputs are processed, and how meaningful outputs such as stock prices, mathematical tools, news, recommendations, and advice are delivered back to the user. This visualization ensures clarity in understanding the system's workflow and its functional components, as depicted in **Figure 5.2.1**.

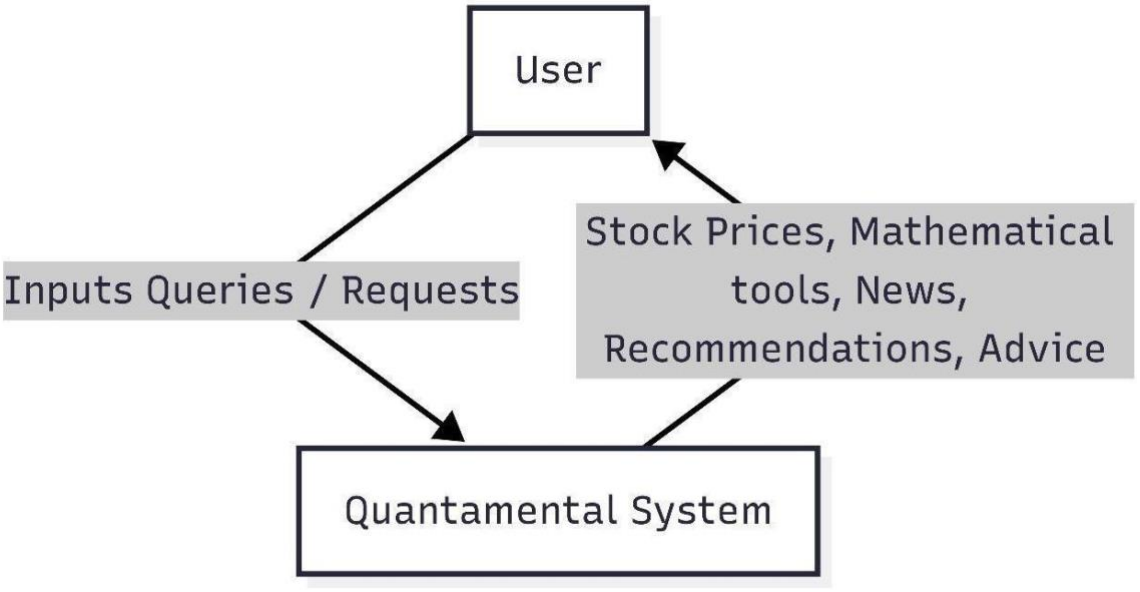


Figure 5.2.1: Level [0] Data Flow Diagram of Quantamental System

The Level 1 Data Flow Diagram (DFD) provides a detailed view of the Quantamental System by breaking down the single process shown in Level 0 into multiple sub-processes. It illustrates how different services within the system interact with external entities and data sources. The User interacts with various components such as the Investment Advisor, News Service, Mathematical Suite, Stock Recommendations, and Stock Price Fetcher. Each of these sub-processes communicates with external APIs (Finnhub API, NewsAPI, and OpenRouter + DeepSeek) to fetch real-time data, perform analysis, and deliver actionable insights back to the user. This level highlights the modular design of the system, ensuring scalability, flexibility, and efficient data processing.

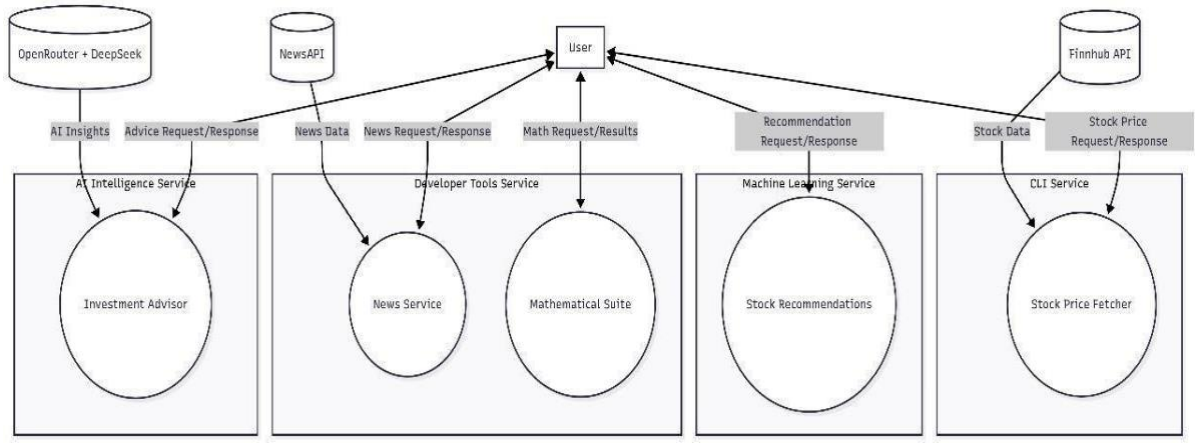


Figure 5.2.2: Level [1] Data Flow Diagram of Quantamental System

The figure 5.2.3 provided serves as a Level 2 Data Flow Diagram (DFD) detailing the architecture of a Quantamental System, which integrates quantitative, data-driven analysis with fundamental, human- centric financial insight to guide investment decisions. This modular system breaks down into five key sub-systems—Investment Advisor, Stock Recommendations, Mathematical Suite, News Service, and CLI Service—all centered around a single User. The system's power is derived from its ability to ingest data from external APIs like OpenQuantar + DeepSeek, NewsAPI, and Finnhub API, process this data through specialized internal components like the AI Advisor, ML Algorithms, and Computation Engine, and manage data persistently in dedicated stores like the News Repository and Stock Data Store, thereby generating comprehensive outputs such as Investment Guidance, Recommendation Reports, and Stock Prices for the user.

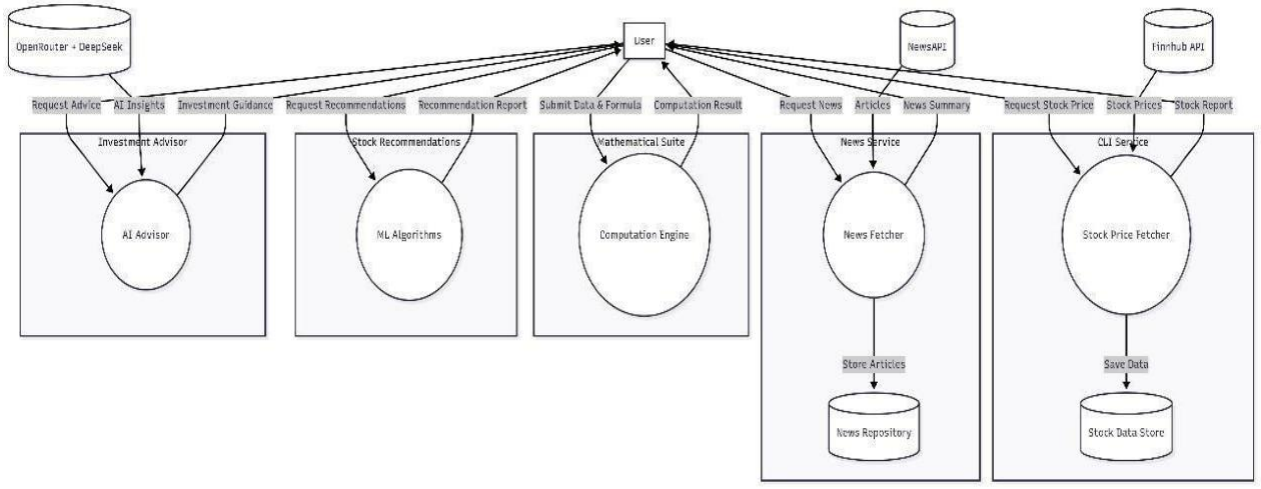


Figure 5.2.3: Level [2] Data Flow Diagram of Quantamental System

5.3 System Architecture:

Figure 5.3.1 illustrates the high-level system architecture of the Quantamental Analysis Platform, defining the separation between the user interface and the backend processing. The architecture is structured into two main layers: the Frontend Dashboards and the Core Services Layer. The Frontend Dashboards provide specialized user interfaces, including a CLI (Command Line Interface), a Developer Tools Portal, an ML Analytics Dashboard, and an AI Investment Dashboard, catering to different user needs. This layer communicates directly with the Core Services Layer, which is composed of five distinct, domain-specific microservices: CLI Service, News Service, Mathematical Suite, Machine Learning Service, and AI Intelligence Service. Each core service is implemented using a modern technology stack (e.g., Rust, Go, Python with FastAPI/Streamlit) and integrates with external financial data providers like Finnhub API, NewsAPI, and OpenRouter + DeepSeek to execute all quantamental analysis, data fetching, and computational logic.

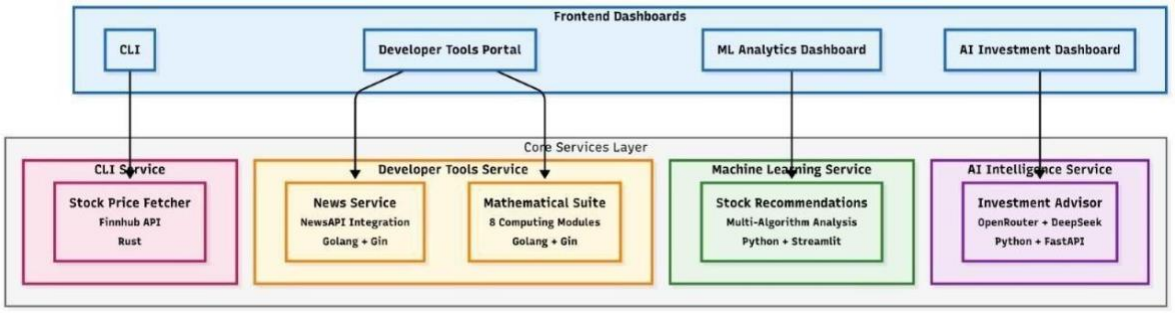


Figure 5.3: System Architecture Quantamental System

5.4 Implementation:

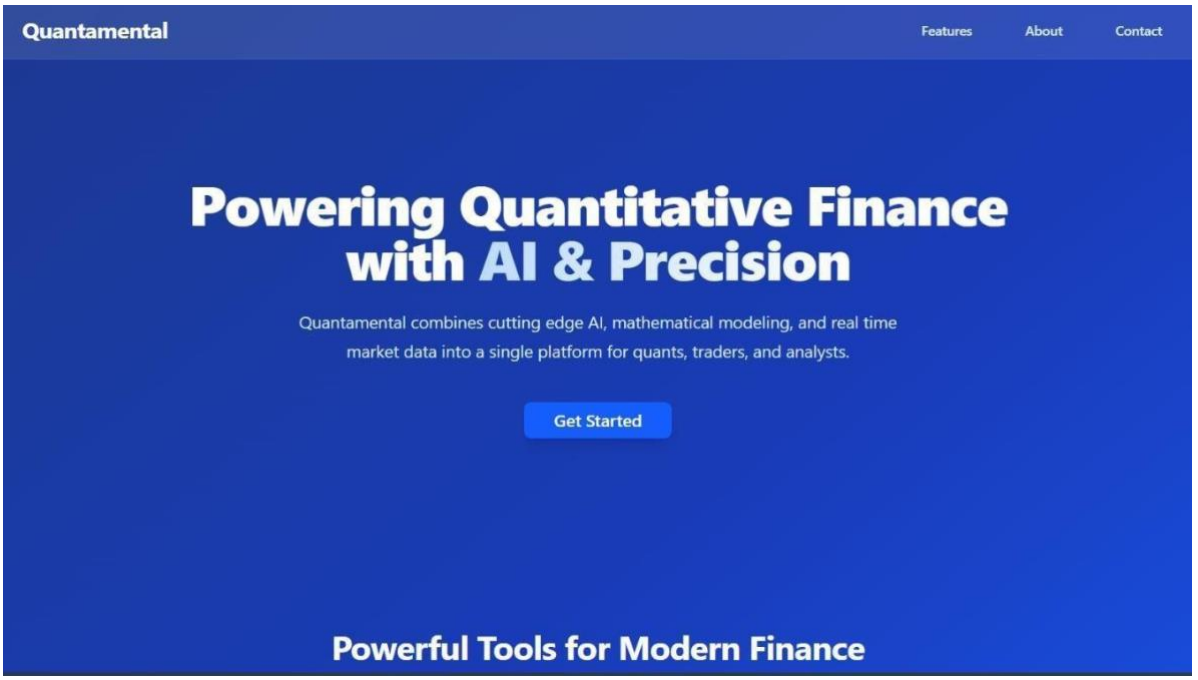


Figure 5.4.1:Landing Page

Figure 5.4.1 presents the compelling homepage for the Quantamental platform, which serves as the primary visual entry point for users. The interface immediately communicates the system's core value proposition through its bold headline: "Powering Quantitative Finance with AI & Precision." The accompanying descriptive text clearly defines the system's function, highlighting its ability to combine cutting-edge Artificial Intelligence, robust mathematical modeling, and real-time market data into a unified platform. This design choice strategically targets the professional audience of quants, traders, and analysts, establishing the platform's focus on sophisticated, data-driven investment tools.

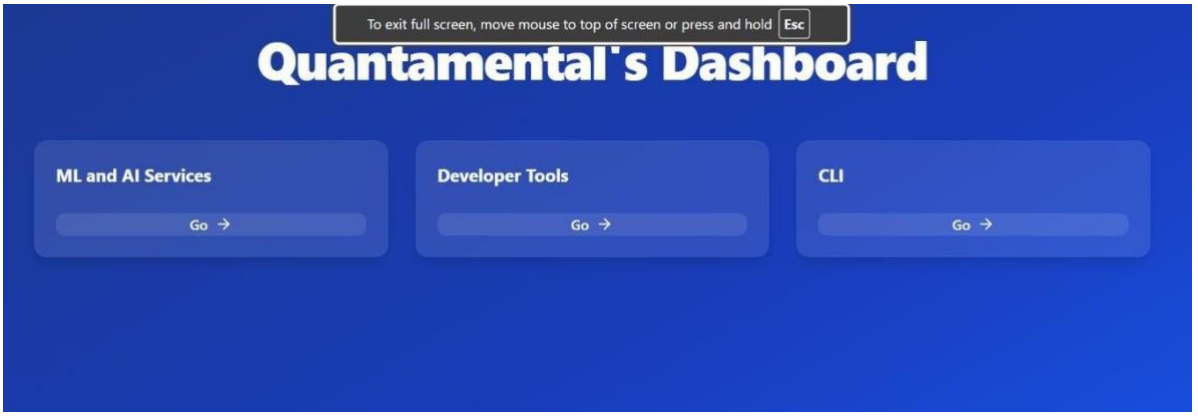


Figure 5.4.2 : Dashboard

Figure 5.4.2 displays the central navigation hub for the Quantamental's Dashboard, serving as the gateway to the system's specialized functionalities. This clean, modular interface organizes the platform's features into three distinct access points: ML and AI Services, Developer Tools, and CLI. This strategic layout allows the user to efficiently select the appropriate module for their task, whether they are generating stock recommendations, utilizing the mathematical computation suite, or retrieving direct financial data, ensuring a streamlined and targeted user experience.

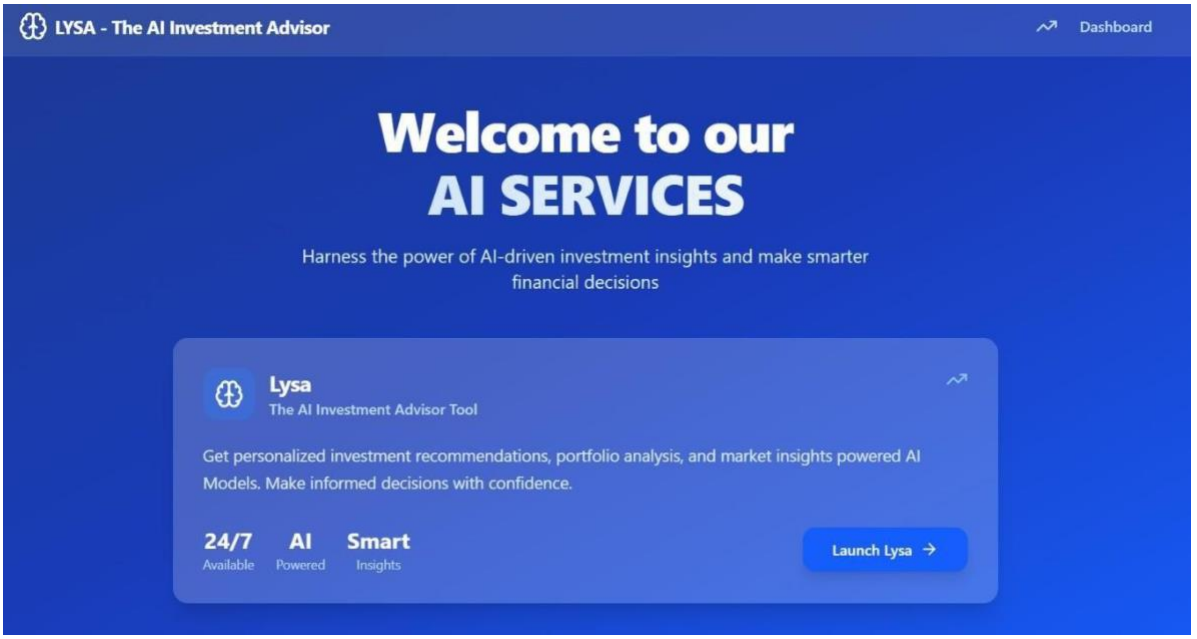


Figure 5.4.3:AI Serices

Figure 5.4.3 showcases the dedicated entry interface for the AI Services component of the Quantamental Platform, which is accessed via the main dashboard. This page, titled "Welcome to our AI SERVICES," is focused on the intelligence-driven capabilities of the system. The central element

is the Lysa - The AI Investment Advisor Tool, which serves as the primary gateway to receiving AI-driven investment insights. The interface highlights the tool's core benefits, promising personalized investment recommendations, portfolio analysis, and market insights powered by advanced AI Models, reinforcing the platform's commitment to delivering 24/7 Available, AI Powered, Smart Insights to aid in making informed financial decisions.

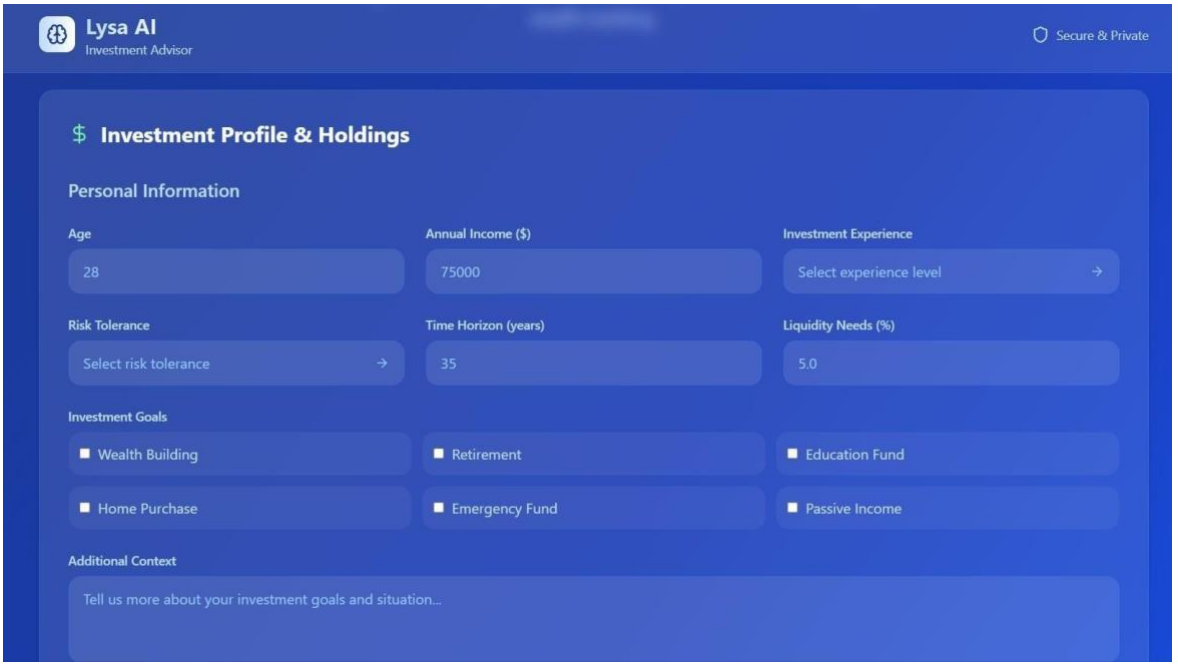


Figure 5.4.4 : Lysa AI page

Figure 5.4.4 displays the **Investment Profile & Holdings** form, which is the crucial initial step in utilizing the **Lysa AI Investment Advisor Tool**. This interface is dedicated to gathering the **fundamental** data necessary for the AI to generate personalized, risk-adjusted financial recommendations. The form systematically captures essential **Personal Information** (Age, Annual Income, Investment Experience), key quantitative metrics (Risk Tolerance, Time Horizon, Liquidity Needs), and explicitly defined **Investment Goals** (e.g., Wealth Building, Retirement). By collecting these data points, the system bridges the gap between the user's qualitative financial needs and the quantitative models, ensuring the resulting AI insights are highly relevant and tailored.

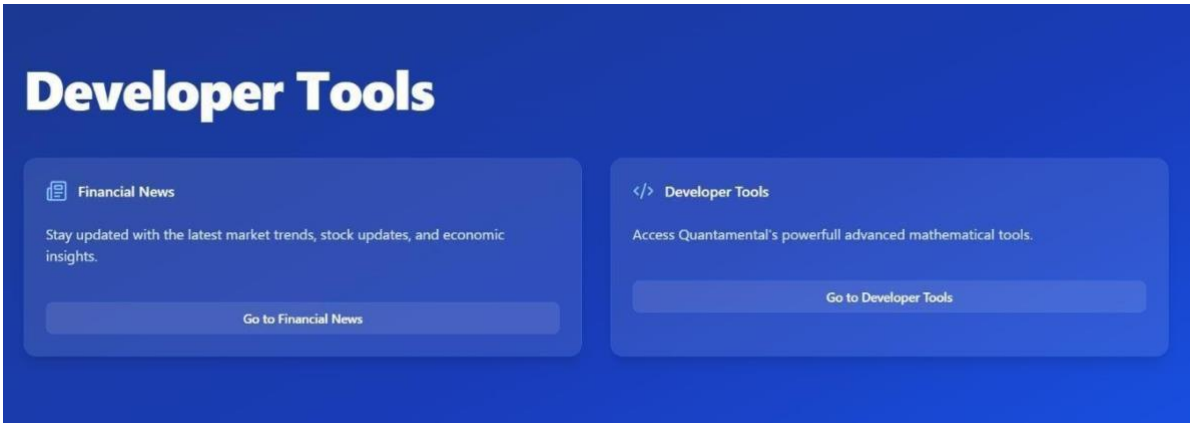


Figure 5.4.5:Developer Tools Page

Figure 5.4.5 presents the selection menu for the Developer Tools portal, providing users with access to the system's foundational data and mathematical capabilities. This interface divides the portal's function into two key areas. The "Financial News" card serves as the gateway to the system's News Service, allowing users to access the latest market trends, stock updates, and economic insights. The "Developer Tools" card grants direct access to the Mathematical Suite & Computing Modules, which house Quantamental's advanced mathematical tools and computational functionality, thus serving the needs of users requiring raw data access and complex *ad hoc* calculations.

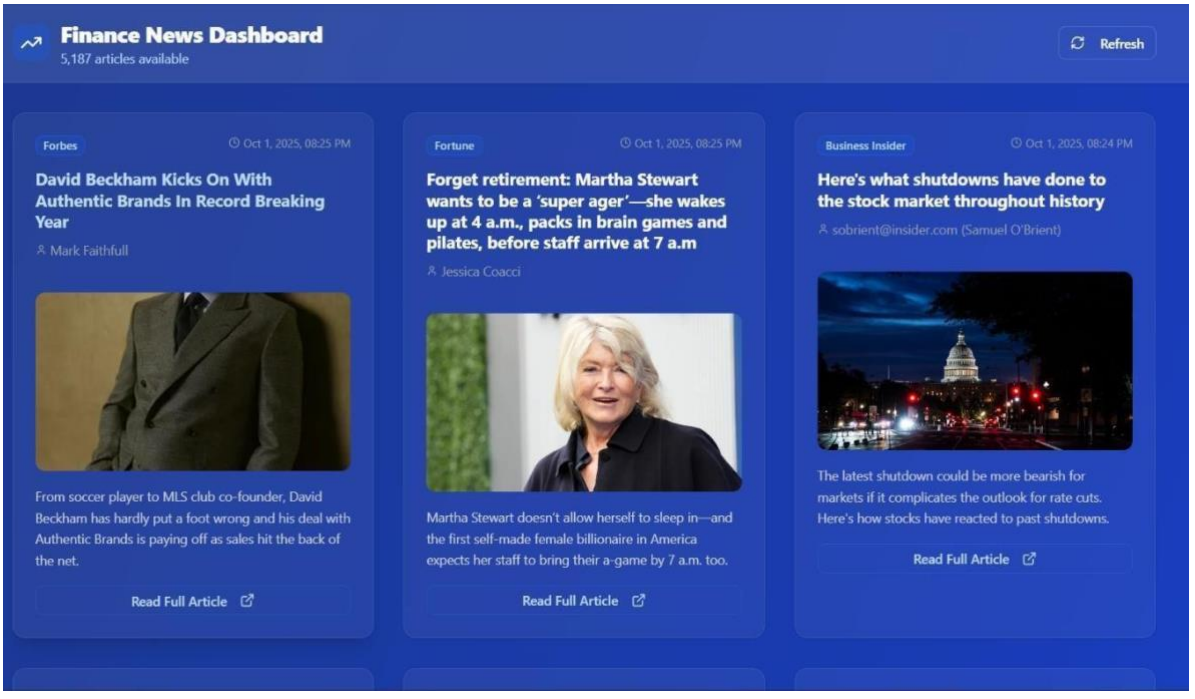


Figure 5.4.6:Finance News Page

Figure 5.4.6 displays the Finance News Dashboard, which is the dedicated interface for the system's News Service component, accessed via the Developer Tools main menu. This dashboard is essential for the *fundamental* side of quantamental analysis, providing a real-time feed of market intelligence, stock updates, and economic insights. The interface is designed for immediate readability, prominently showing the total number of articles available and presenting key stories from various financial publications (e.g., *Forbes*, *Fortune*, *Business Insider*). This feature ensures users can quickly scan the macro- and micro-financial landscape, thereby integrating qualitative news flow directly into their quantitative models.

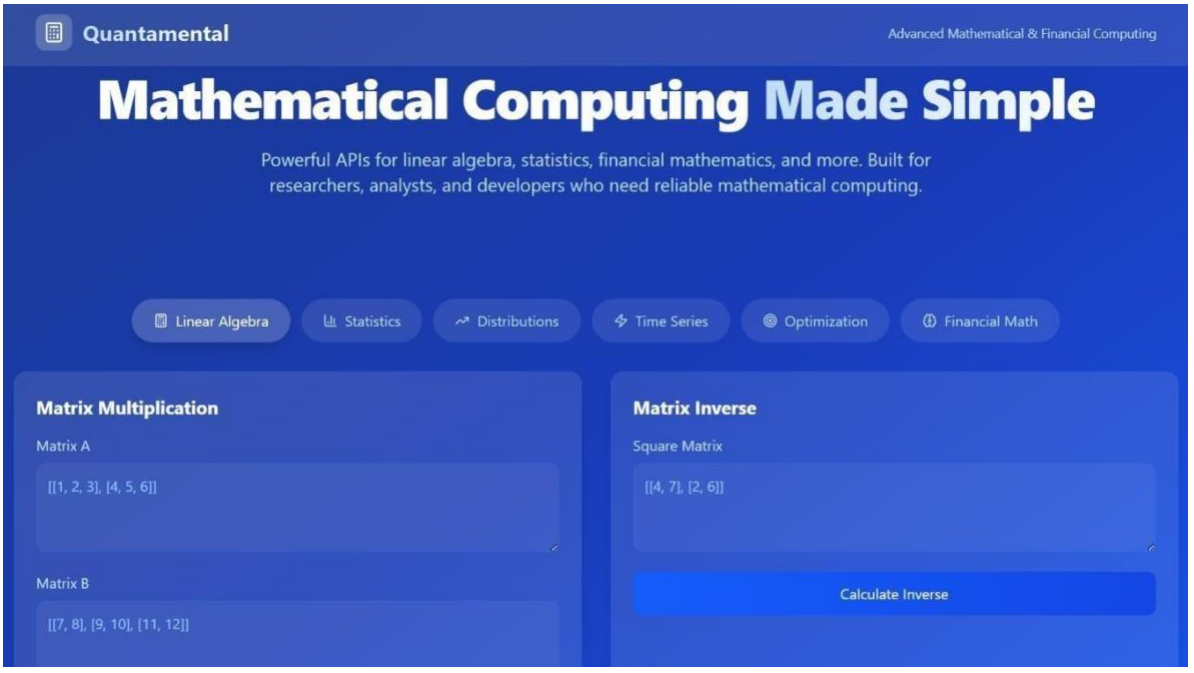


Figure 5.4.7:Mathematical Computing Page

Figure 5.4.7 displays the main interface for the Mathematical Suite, titled "Mathematical Computing Made Simple," which is the core of the system's quantitative capabilities. This page serves researchers, analysts, and developers by providing access to powerful APIs for various numerical tasks. The interface is organized into key computational domains, including Linear Algebra, Statistics, Time Series, and Financial Math. The screenshot further illustrates the functionality by presenting specific calculation modules like Matrix Multiplication and Matrix Inverse, demonstrating how the system enables users to perform complex financial and mathematical computations directly and reliably within the platform.

Chapter 6

Technical Specification

The technical specifications of Quantamental describe the core technologies, tools, and frameworks used to build and operate the platform. This section outlines the system architecture, data management approach, algorithms, and deployment setup that enable Quantamental to deliver real-time financial insights and intelligent investment recommendations.

Tech Stack

Backend:

- Go (Golang) – Handles backend logic, APIs, and real-time data processing with high performance and scalability.

CLI Tools:

- Rust – Used for command-line utilities such as data ingestion, automation, and system monitoring due to its speed and reliability.

AI & Machine Learning Services:

- Python – Powers the machine learning and AI components for stock prediction, portfolio optimization, and sentiment analysis using libraries like TensorFlow and Scikit-learn.

Frontend:

- **TypeScript (React + Next.js)** – Provides a responsive and dynamic user interface for dashboards, charts, and live market updates.

Scripting & Automation:

- **Bash** -Used for automating deployment, build processes, and maintenance scripts.

APIs Used:

- **Finnhub API –** For real-time financial and stock market data.
- **News API –** For fetching and analyzing market-related news articles to support fundamental analysis.

Database & Data Management

- **PostgreSQL –** For storing structured financial data and user information.
- ETL Pipelines – Implemented using Python and Bash for data extraction, transformation, and loading from external APIs.

Deployment

- Backend: Deployed on Render for handling API requests and background services.
- Frontend: Deployed on Vercel for fast and reliable web hosting with automatic build and deployment pipelines.
- AI Services: Containerized using Docker for modular and scalable deployment.

Chapter 7

Project Scheduling

In project management, a schedule is a listing of a project's milestones, activities, and deliverables. A schedule is commonly used in project planning and project portfolio management. The project schedule (Table 7.1) links the tasks to be performed with the group members responsible for completing them and the time duration allocated.

Sr.no	Group Members	Duration	Task Performed
1.	Gaurav Shetty Shlok Sawant Chitresh Poojary Manish Sharma	2nd Week of January	Group formation and topic finalization. Identifying the scope and objectives of the project "Quantamental." Discussing the project idea and preparing a basic paper prototype.
		1st Week of January	Researching existing investment analysis platforms and identifying functional requirements for Quantamental.
2.	Chitresh Poojary Manish Sharma	2nd Week of February	Developing the backend structure using Go (Golang) for handling APIs and server-side logic.
3.	Manish Sharma	3rd Week of February	Implementing the AI and ML models using Python for stock prediction and sentiment analysis**.**
4.	Gaurav Shetty Chitresh Poojary	4th Week of February	Designing the frontend interface using TypeScript (React + Next.js) and integrating visualization components for financial data**.**
5.	Gaurav Shetty Manish Sharma	1st Week of March	Connecting the backend with the AI models and APIs (Finnhub and News API) for real-time data processing.

6.	Gaurav Shetty Chitresh Poojary	2nd Week of March	Integrating all modules and testing the system for functionality, performance, and data consistency.

Table 7.1:Project Task Distribution

A Gantt chart is a type of bar chart that illustrates a project schedule. This chart lists the tasks to be performed on the vertical axis, and time intervals on the horizontal axis. Gantt chart (Fig 7.1) illustrates the start and finish dates of the terminal elements and summary elements of a project.

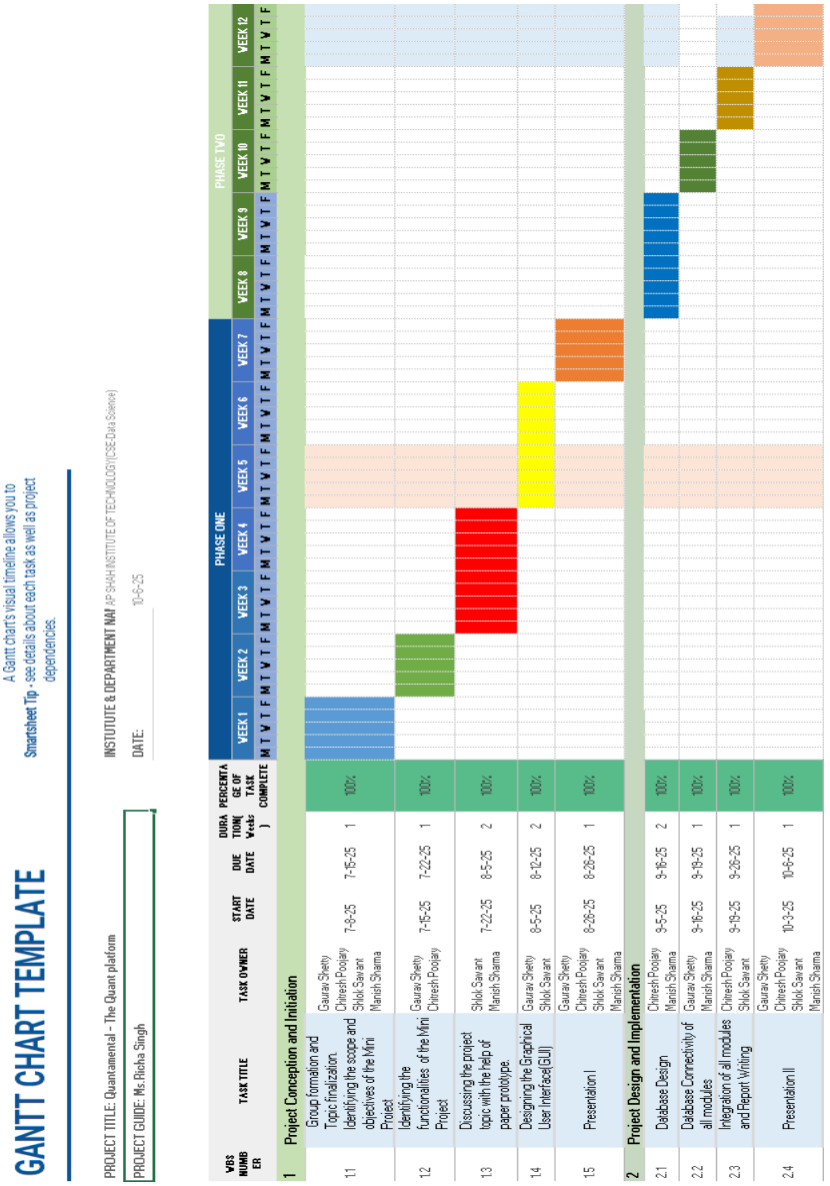


Figure 7.1:Gant Chart

Chapter 8

Results

The Results section demonstrates the key outcomes of the Quantamental project. The first image (Fig 8.1) shows the developer tool used to calculate Moving Average (SMA) and Exponential Moving Average (EMA) for sample stock prices, helping identify trends effectively. The second image (Fig 8.2) illustrates the AI module analyzing a user's portfolio and providing future investment recommendations based on historical and predictive data. The third image (Fig 8.3) displays the CLI command used to fetch real-time stock prices, ensuring that all analyses and recommendations are based on up-to-date market information. Together, these results highlight the platform's ability to combine technical analysis, AI insights, and live data for informed decision-making.

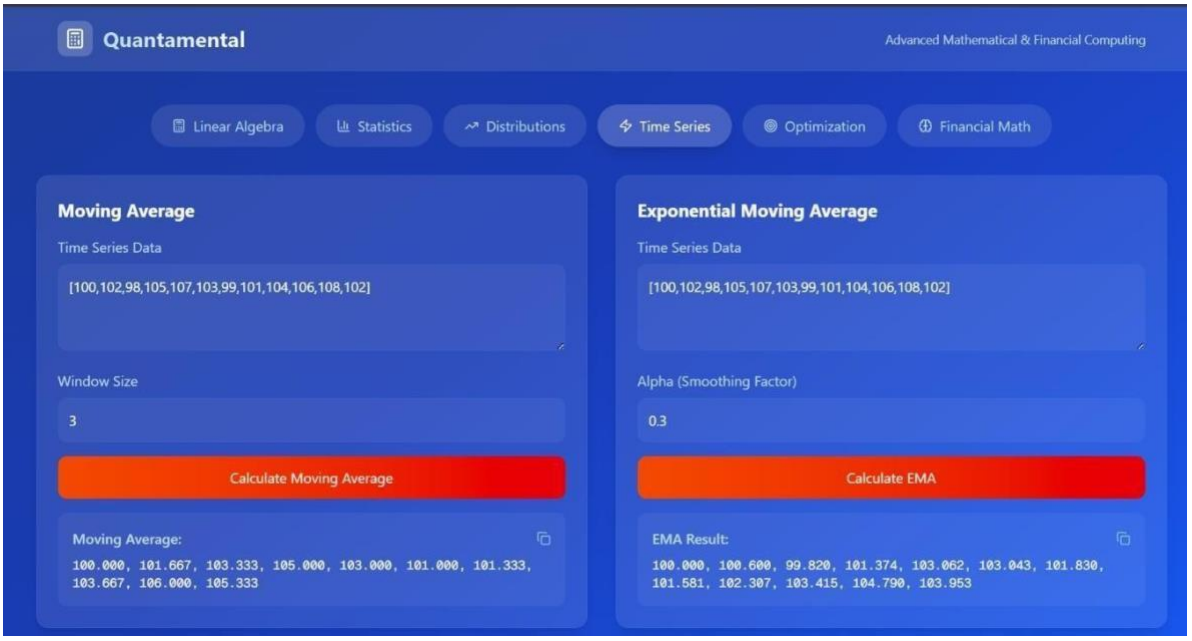


Figure 8.1:Developer Tool

The figure (Fig 8.1) shows the calculation of Moving Average (SMA) and Exponential Moving Average (EMA) for sample stock prices. Each row represents a day's closing price, and the corresponding SMA and EMA values are calculated for a fixed period. The visualization highlights how the SMA smooths out short-term price fluctuations, while the EMA reacts more quickly to recent changes. This comparison provides a clear understanding of trend-following indicators and their usefulness in analyzing stock price movements.

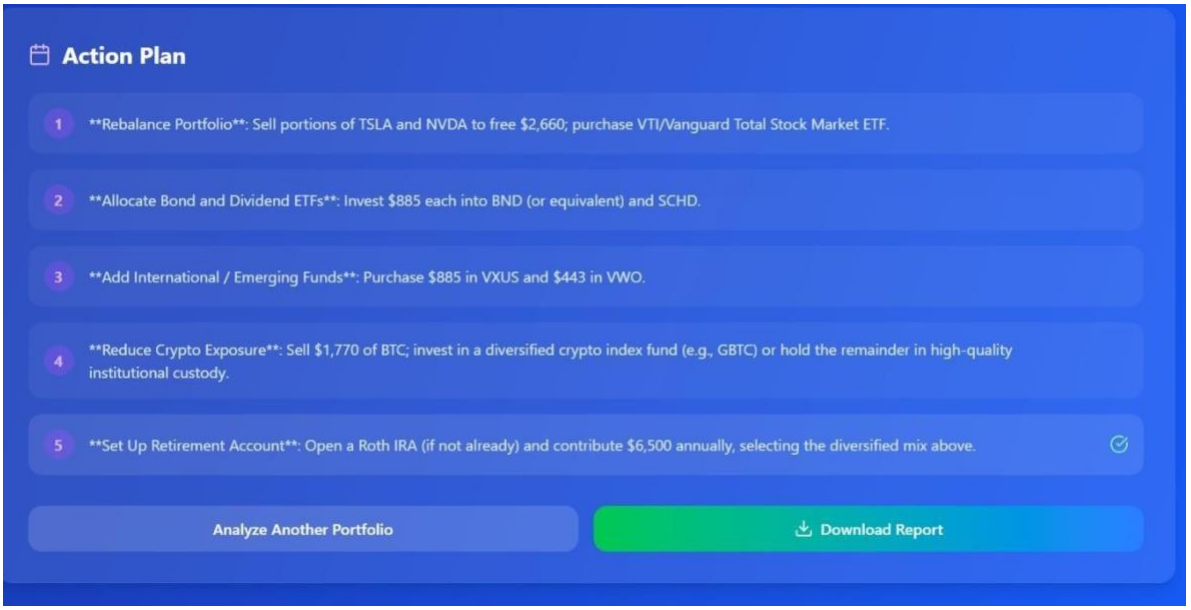


Figure 8.2:AI-Analysis

The platform integrates a sophisticated AI-based module designed to perform in-depth portfolio analysis by evaluating key financial factors such as risk exposure, expected returns, asset correlations, and historical performance trends. This module leverages advanced predictive analytics and machine learning algorithms to identify emerging market patterns and forecast potential investment outcomes with a high degree of accuracy. Beyond basic analysis, the AI continuously learns from user behavior and market fluctuations, adapting its recommendations to align with the user's financial goals, risk appetite, and investment horizon. It generates dynamic insights, highlighting underperforming assets, diversification opportunities, and optimal reallocation strategies to enhance portfolio efficiency.

Furthermore, the AI module translates complex data into clear, actionable insights through intuitive visualizations and performance metrics. It enables users to simulate different investment scenarios, compare predicted returns, and assess potential risks before making any financial decisions. As illustrated in Figure 8.2, the system presents this information in an interactive dashboard format—combining data-driven insights with practical investment advice—to empower users with smarter, evidence-based decision-making capabilities.

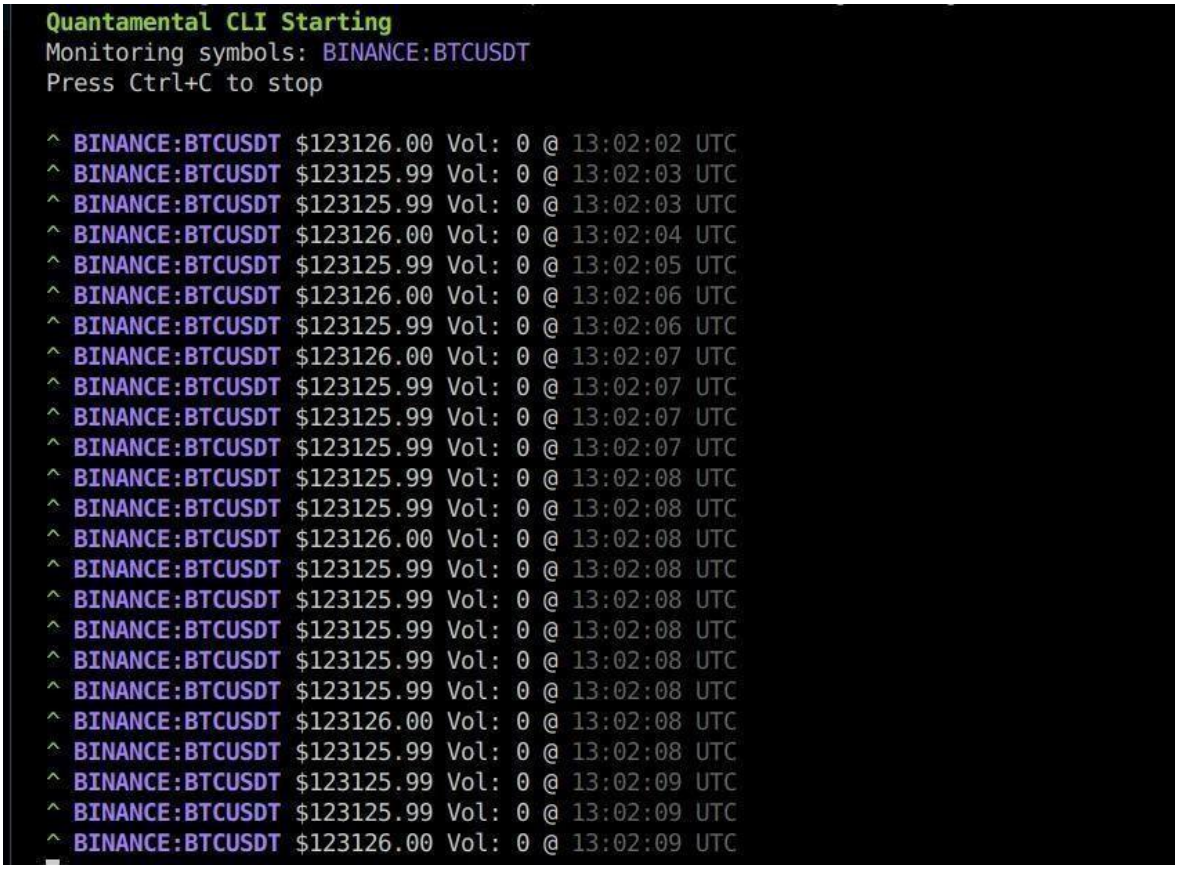
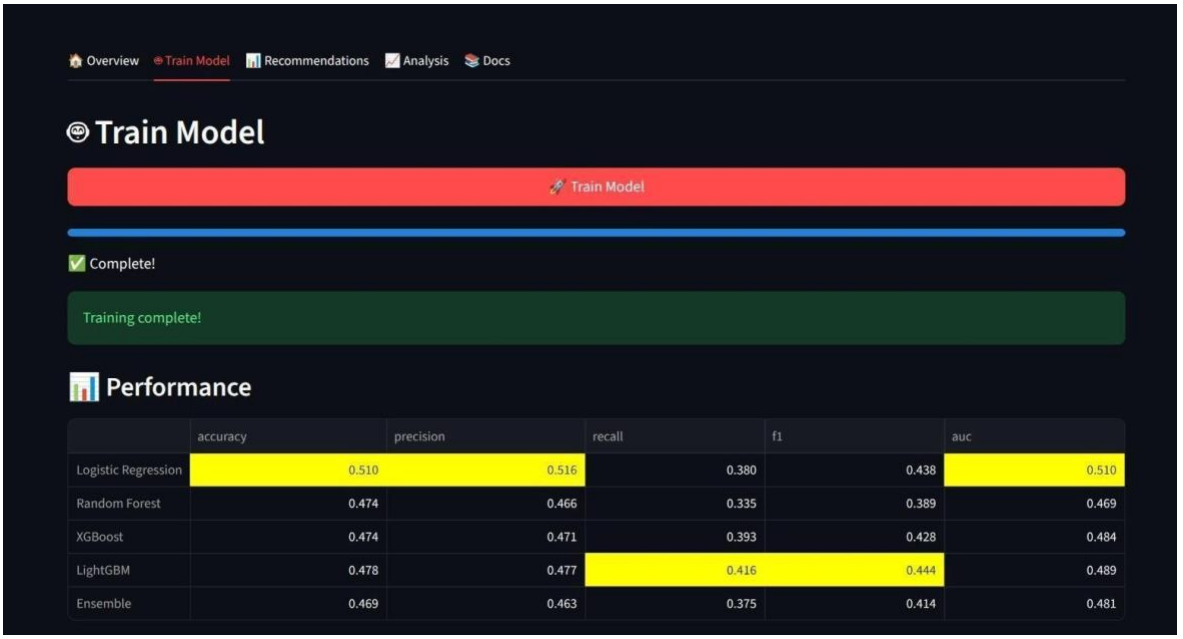


Figure 8.3:CLI

The platform features a robust Command-Line Interface (CLI) that empowers users to interact directly with live financial data through seamless integration with real-time market data APIs. This interface enables users to instantly fetch up-to-date stock prices, eliminating delays associated with manual data retrieval or reliance on third-party dashboards. By accessing the latest market information, users can ensure that all portfolio analyses, performance evaluations, and investment recommendations are grounded in current and accurate data.

The CLI is designed for both speed and efficiency, offering a lightweight yet powerful alternative to traditional graphical interfaces. It supports a range of commands that allow users to query specific stocks, compare market movements, and even automate routine data-fetching or analysis tasks through scripts. This level of automation and flexibility makes it particularly valuable for advanced users, financial analysts, and developers who prefer direct control over their workflows.

As shown in Figure 8.3, the CLI output presents live stock prices in a structured, easy-to-read format, displaying key metrics such as symbol, price, percentage change, and timestamp. This streamlined access to essential data not only enhances decision-making efficiency but also ensures that users operate with the most relevant and timely market insights available.



	accuracy	precision	recall	f1	auc
Logistic Regression	0.510	0.516	0.380	0.438	0.510
Random Forest	0.474	0.466	0.335	0.389	0.469
XGBoost	0.474	0.471	0.393	0.428	0.484
LightGBM	0.478	0.477	0.416	0.444	0.489
Ensemble	0.469	0.463	0.375	0.414	0.481

Figure 8.4:Train Model

Figure 8.4 showcases a comprehensive performance comparison of multiple machine learning models following the completion of their training, as indicated by the "Complete!" status. The table summarizes critical evaluation metrics, including accuracy, precision, recall, F1-score, and AUC (Area Under the Curve), for five different models— Logistic Regression, Random Forest, XGBoost, LightGBM, and an Ensemble model. This comparative analysis enables a clear understanding of how each algorithm performs across various aspects of predictive capability and reliability.

Among the models, Logistic Regression emerged as the top performer in terms of accuracy (0.510), precision (0.516), and AUC (0.510), demonstrating its strength in overall predictive stability and classification accuracy. On the other hand, LightGBM achieved superior results in recall (0.416) and F1-score (0.444), indicating its effectiveness in correctly identifying positive cases and maintaining a balanced trade-off between precision and recall. The inclusion of ensemble modeling further contributes to understanding how combining multiple algorithms may enhance predictive robustness.

Overall, Figure 8.4 provides a clear and insightful summary of model performance across multiple evaluation dimensions, helping identify which machine learning techniques deliver the most reliable results for the dataset in question. This comparative view supports data-driven decision-making in model selection and highlights the strengths and trade-offs inherent in different learning approaches.

Figure 8.5: Machine Learning Model Performance

Figure 8.5, titled “Best: Logistic Regression,” provides a detailed visual comparison of the performance of various machine learning models, emphasizing the superior results achieved by Logistic Regression. The figure highlights key evaluation metrics—Accuracy (51.0%), Precision (51.6%), Recall (38.0%), and AUC (0.510)—demonstrating the model’s balanced and consistent performance across multiple criteria. These results reaffirm Logistic Regression’s reliability and stability as the most effective model among those tested.

The lower section of the figure, labeled “Model Comparison,” visually contrasts the same performance metrics for all evaluated models, including Logistic Regression, Random Forest, XGBoost, LightGBM, and Ensemble. Through the use of color-coded bar graphs, this section allows for quick, intuitive comparison of each model’s strengths and weaknesses across different performance dimensions. By visually distinguishing variations in accuracy, precision, recall, and AUC, the figure makes it easier to interpret the comparative efficiency of each algorithm at a glance.

Overall, Figure 8.5 not only underscores the dominance of Logistic Regression in this analysis but also provides a clear, data-driven visualization of model performance, enabling users to assess trade-offs and make informed decisions when selecting machine learning techniques for predictive tasks.

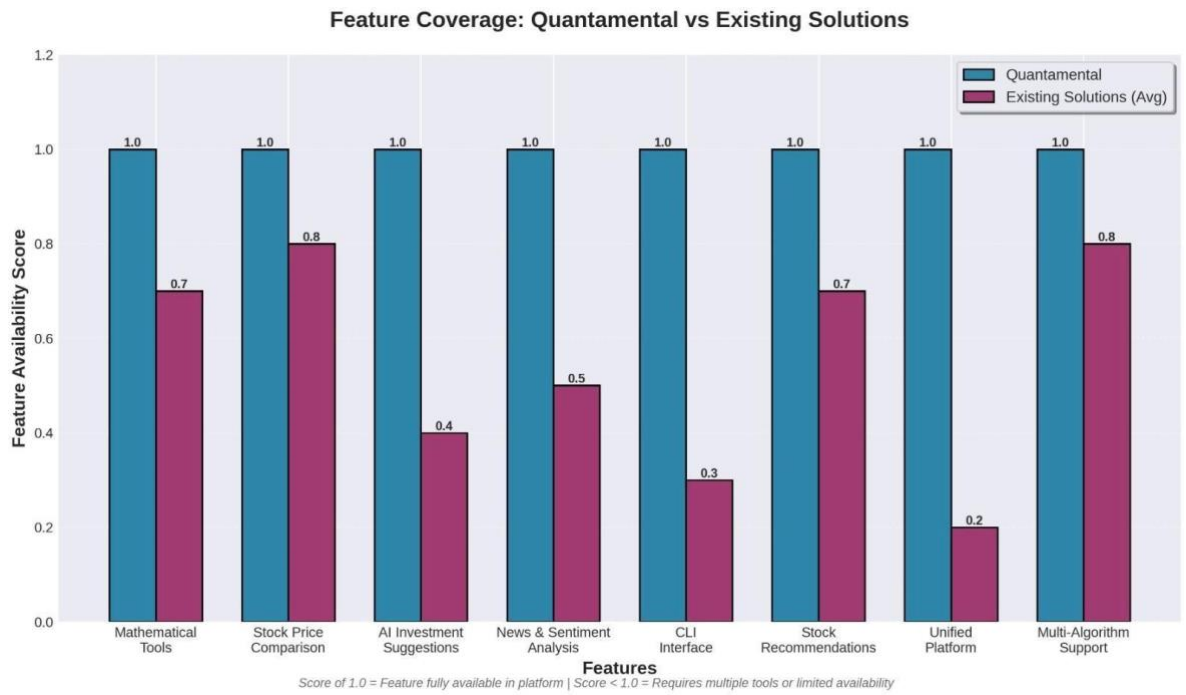


Figure 8.6: Feature Coverage Comparison - Quantamental vs Existing Solutions

This grouped bar chart compares the feature availability of Quantamental (blue bars) and existing market solutions (maroon bars) across six key functional categories. The y-axis shows the Feature Availability Score, ranging from 0 to 1.2. A score of 1.0 means the feature is fully available within a single platform, while scores below 1.0 indicate partial or limited availability that requires multiple tools.

Quantamental demonstrates a strong competitive advantage through its fully integrated platform, outperforming other solutions in several key areas. The largest performance gaps are seen in the Unified Platform (0.8 difference), where Quantamental effectively combines multiple tools into one; the CLI Interface (0.7 difference), which enables automation through the command line an uncommon feature among competitors; and AI Investment Suggestions (0.6 difference), where Quantamental offers built-in AI capabilities instead of relying on separate services. On average, existing solutions score around 0.47, indicating that users typically need multiple platforms to achieve what Quantamental provides in a single, unified system. By simplifying workflows, reducing costs, and delivering a more complete end-to-end experience, Quantamental stands out as a superior all-in-one solution.

Chapter 9

Conclusion

In conclusion, Quantamental represents a significant advancement in the domain of investment analysis and portfolio management. By seamlessly integrating quantitative analysis, technical indicators, and AI-driven insights, the platform ushers in a new era of data-driven decision-making, surpassing the limitations of traditional investment tools.

This innovative system not only simplifies the complexity of financial research but also enhances user engagement by providing personalized recommendations, predictive analytics, and trend insights tailored to individual investment goals. Empowered by real-time market data, intuitive interfaces, and algorithmic intelligence, Quantamental enables users to explore, evaluate, and optimize their portfolios with confidence.

Moreover, Quantamental transcends being merely an analytical tool, evolving into a trusted companion for informed investment decisions. Its continuous learning from market data and user interactions ensures that recommendations remain adaptive, accurate, and actionable. This transformative approach cultivates a deeper understanding of market dynamics, equipping users to make strategic decisions while fostering financial literacy and long-term growth.

In essence, Quantamental stands as a comprehensive platform that guides users through the complexities of modern financial markets, empowering them to achieve smarter, data-driven investment outcomes with confidence and clarity.

Chapter 10

Future Scope

The Quantamental platform has significant potential for expansion and enhancement in the field of investment analysis and portfolio management. Future developments could include:

1. Integration of Advanced AI Models – Incorporating deep learning techniques, reinforcement learning, or sentiment analysis from financial news and social media to improve prediction accuracy and portfolio recommendations.

2. Support for Multiple Asset Classes – Extending the platform to analyze cryptocurrencies, commodities, ETFs, and international stocks for diversified portfolio optimization.

3. Real-Time Risk Management – Implementing dynamic risk assessment tools that monitor market volatility and automatically adjust portfolio allocations to minimize potential losses.

4. Mobile and Web App Development – Creating cross-platform mobile and web applications for on-the-go portfolio monitoring and real-time alerts.

5. Customizable Dashboards – Allowing users to personalize visualizations, technical indicators, and performance metrics for a more interactive and user-centric experience.

6. Automated Trading Integration – Linking with brokerage APIs to enable automated execution of buy/sell orders based on AI-driven strategies and user-defined rules.

7. Educational Insights and Recommendations – Providing users with detailed explanations of predictions, technical indicators, and investment strategies to enhance financial literacy.

By implementing these enhancements, Quantamental could evolve into a comprehensive, intelligent investment platform that combines advanced analytics, predictive modeling, and real-time insights, empowering users to make smarter, data-driven financial decisions

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