

# Crypto Portfolio Tracker

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**Abstract:** - The rapid expansion of cryptocurrency trading has created an urgent need for reliable tools that can monitor volatile market movements in real time and assist investors in making informed decisions. This paper presents the design and implementation of a unified Crypto Portfolio Tracker capable of consolidating a user's holdings across multiple exchanges, calculating profit and loss with an accuracy of over 96%, and continuously updating asset prices using public cryptocurrency APIs. The system integrates Django Celery and Redis to perform high-speed background processing, enabling uninterrupted live tracking and instant WhatsApp notifications during sudden market fluctuations. By combining decentralized financial data, automated scheduling, and a responsive user interface, the proposed system significantly reduces manual monitoring effort, improves decision-making accuracy, and provides a secure and scalable platform for digital asset management.

**Keywords:** Cryptocurrency, Portfolio Management, Blockchain, Django Celery, Redis, WhatsApp Notification, Real-Time Monitoring.

## 1. Introduction

The rapid expansion of crypto currency markets has significantly transformed the global financial ecosystem, attracting widespread attention from researchers, developers, investors, and financial analysts. Crypto currencies operate in decentralized environments where transactions occur without intermediaries and are recorded on blockchain-based distributed ledgers. Unlike traditional financial markets, crypto currency markets operate continuously, exhibit extreme price volatility, and are influenced by global sentiment, technological developments, and decentralized trading platforms [1]. These unique characteristics create new challenges for investors who require accurate, real-time information to manage their digital assets effectively.

As crypto currency adoption has increased, the number of tradable digital assets and participating exchanges has grown substantially. Investors often distribute their holdings across multiple exchanges and wallets to reduce risk, improve liquidity, and access diverse trading opportunities. While diversification is a common investment strategy, it introduces complexity in portfolio tracking and performance evaluation. Research indicates that effective portfolio management is essential for understanding asset allocation, profit and loss, and overall investment performance in highly volatile markets [2].

During the early stages of cryptocurrency adoption, investors primarily relied on manual tracking mechanisms, particularly Microsoft Excel spreadsheets and basic financial applications, to record transaction histories, asset quantities, and price information [3]. Although spreadsheets offered flexibility and customization, they required continuous manual updates and depended on static or delayed price inputs. Studies highlight that manual tracking methods are prone to human error, data inconsistencies, and delayed calculations, making them unreliable during periods of rapid market

movement [4]. As transaction volumes increased and portfolios expanded across multiple exchanges, spreadsheet-based approaches became increasingly inefficient and unsuitable for real-time decision-making.

To overcome these limitations, recent research emphasizes the adoption of automated, API-based systems for cryptocurrency data collection. Public and exchange-provided APIs, such as those offered by CoinMarketCap, Binance, and Coinbase, allow applications to retrieve real-time prices, historical data, market capitalization, and trading volumes automatically [5]. API-driven approaches significantly improve accuracy, reduce manual effort, and enable continuous portfolio updates. However, while API integration improves data availability, it does not fully address challenges related to scalability, background processing, and instant user notification in volatile market environments

## 1.2 Key Contributions of the Study

**Real-Time Cryptocurrency Portfolio Tracking System Design:** This paper argues about having a centralized platform that can trace the cryptocurrency holdings of various exchanges and wallets in real time to allow a user to have a centralized understanding of the digital currency he / she possesses.

**Automated Portfolio Updates by API-Based Market Data Integration:** The system uses the CoinGecko API to fetch real time market data on the cryptocurrency such as prices, market capitalization as well as trading volumes thus enabling one to ensure that their portfolio is valued in real time in its accurate form without the need to update it manually.

**Background processing Asynchronous background processing should be implemented**

The suggested system has used Django Celery and Redis as the message broker to do some background firing like periodic price acquisition, portfolio re-calculation and evaluation of alerts to have an efficient system operation and scalability.

**Autonomic Profit and Loss Citadel Process :** The system automatically calculates real-time profit and loss by comparing the prevailing market prices and the historical transaction data obtained in the portfolio database thus enhancing accuracy in calculation and minimizing human errors.

**Real-Time Alert Notification System:** The system will build in real time WhatsApp notifications, which attempt to tell the user when predefined price limits or portfolio criteria are reached, to alert an investor to react rapidly to abrupt market changes.

**Portfolio Visualization Dashboard with easy controls:** The site offers a user-friendly web-based dashboard that presents portfolio composition, transaction history, asset allocation, and metrics of performance in a graphical format that can be represented by charts and tables.

**Safe and Scalable Financial applications architecture:** The system structure has a secured authentication system, restricted access to the API and encrypted data warehousing controls to safeguard against the vulnerability to sensitive portfolio and transaction data.

## 2. Literature Review

Recent literature highlights that crypto currency portfolio management systems must operate under conditions of continuous market activity, high volatility, and decentralized trading environments. Studies published between 2023 and 2025 emphasize that traditional financial portfolio management tools are poorly suited for digital assets due to limited real-time capabilities and lack of integration with crypto currency exchanges [2]. These limitations have motivated the development of specialized tools designed specifically for managing digital asset portfolios.

Earlier research identifies spreadsheet-based portfolio tracking as one of the most widely used methods during the initial growth of crypto currency markets. Excel-based models allowed investors to manually store transaction records, calculate profits, and analyze portfolio performance [3]. However, researchers consistently report significant drawbacks associated with these methods,

including high maintenance effort, susceptibility to human error, lack of automation, and inability to process real-time price changes efficiently [4]. During periods of sudden market fluctuations, these shortcomings often resulted in outdated valuations and delayed investment decisions.

To address automation challenges, multiple studies propose API-driven crypto currency portfolio tracking systems that retrieve live market data directly from exchanges and aggregators. Research demonstrates that API-based systems eliminate delays associated with manual updates and provide more accurate and timely portfolio valuations [5]. Despite these improvements, literature also notes that many existing implementations rely on synchronous processing models, which struggle to handle frequent price updates, complex calculations, and multiple user portfolios simultaneously [6]. This often leads to performance degradation during peak market activity.

Blockchain technology itself has been extensively studied for its role in ensuring transaction transparency, immutability, and trustless execution. Distributed ledger technology guarantees that once a transaction is recorded, it cannot be altered without network consensus, thereby enhancing security and trust [7]. However, several studies clarify that blockchain primarily addresses transaction integrity and does not inherently provide solutions for portfolio visualization, performance analytics, or real-time market monitoring [8]. As a result, external systems are required to manage and analyze crypto currency investments effectively.

Web-based crypto currency portfolio management platforms have been proposed as an improvement over manual tracking methods. These platforms typically offer dashboards that display asset balances, current prices, and basic performance metrics, often supported by visual elements such as charts and tables [9]. While these systems improve usability, recent studies indicate that many rely on static dashboards or periodic refresh intervals, limiting their effectiveness in fast-moving markets [10]. Even short delays in data updates can significantly impact investment outcomes in highly volatile environments.

Another major limitation identified in recent literature is the lack of instant and context-aware alert mechanisms. Although some platforms provide email-based notifications or configurable alerts, studies show that these alerts are often delayed and insufficient during rapid price changes [11]. Investors require immediate notifications to respond to sudden market crashes, price surges, or threshold breaches without continuously monitoring dashboards. The absence of real-time alert delivery reduces the practical effectiveness of many existing systems.

Commercial crypto currency portfolio tools attempt to address these issues; however, research indicates that many focus on individual exchanges and fail to provide a centralized view across multiple platforms [12]. Investors who diversify their holdings must therefore rely on multiple applications, resulting in fragmented information and increased cognitive load. This fragmentation contradicts the fundamental objective of portfolio management, which is to provide a unified overview of total investment performance.

A clear research gap emerges from the analysis of existing systems. While prior solutions address isolated functionalities such as price tracking, visualization, or alerts, they lack a fully integrated architecture that combines real-time data acquisition, scalable background processing, centralized portfolio visibility, and instant user notification [6][10]. Recent studies emphasize that real-time financial applications require asynchronous task execution and efficient data handling to maintain responsiveness under heavy workloads [13].

Frameworks such as Django Celery have been identified as effective solutions for managing background tasks, including periodic price fetching, portfolio updates, and alert evaluation [14]. Additionally, Redis has been widely recommended as a high-performance in-memory data store and message broker due to its low latency and scalability [15]. Research suggests that combining

asynchronous task processing with in-memory data handling can significantly improve system performance and reliability in real-time crypto currency applications.

Overall, the literature from 2023 to 2025 demonstrates that traditional spreadsheet-based methods and existing portfolio management platforms fail to meet the demands of modern crypto currency investment. The absence of integrated background processing, centralized portfolio visibility, and instant alert mechanisms represents a significant research gap. This gap motivates the development of a comprehensive crypto portfolio tracking system that combines real-time API-based data retrieval, asynchronous background processing, high-performance data handling, and instant user notifications to support informed decision-making in volatile digital asset markets.

## 2.1 Research Gaps

Even though there is a swift development of cryptocurrency markets, cryptocurrency portfolio management solutions have its shortcomings. The initial portfolio tracking tools were very dependent on the spreadsheet tools like Microsoft excel to store the transactions and to compute the performance of the portfolio. Although these techniques were flexible, manual updates had to be done continuously and were highly vulnerable to humanistic errors and were therefore inappropriate in the highly volatile markets of cryptocurrencies [3][4]. New studies have come up with API-based cryptocurrency portfolios trackers that automatically fetch live exchange and data aggregator market information. Even though these systems enhance the availability of data and minimize manual activities, most of them make use of synchronous processing models. These architectures cannot easily manage multiple updates in prices as well as large volumes of user portfolios concurrently incorporating delays and less efficiency of the system in times of overarching market volatility [6] [10]. The second weakness that has been realized among the current portfolio tracking systems is absence of effective background computation systems to support source fetching and portfolio re-calculations in real-time. Absence of asynchronous task execution can cause system blockage in terms of performance in responding to continuous API requests and big-scale portfolio messages [13] [14]. This is a short coming on system scalability and responsiveness. Besides, most recent software on cryptocurrency portfolio management offers rudimentary visualization controls and slow notification services. Majority of systems are based on email based notifications and these are not suitable to the investors who need instant details regarding unexpected market adjustments. Research indicates the context in which real-time notification systems are required which are able to provide notifications in real-time via the use of modern communication channels [11]. Moreover, some of the available tools only cover a few cryptocurrency exchanges, which requires an investor to track their investments on many platforms. This discontinuous system does not allow the user to look at his entire cryptocurrency portfolio and adds more complexity in managing his or her portfolio [2] [5]. To this end, it is apparent that there exists a need to have a centralized cryptocurrency portfolio tracking system that will combine real-time data acquisition through API, asynchronous background operation, scalable architecture, and real-time notification capabilities. This type of system will be able to enhance accuracy of portfolio monitoring, minimize manual work, and assist investors to make timely and informed decisions in highly volatile cryptocurrency markets [6][13].

## 3. Proposed Methodology

The proposed system is designed as a comprehensive web- based application that integrates real-time data acquisition, automated background processing, and instant user notification to address the challenges of crypto currency portfolio management identified in recent studies [2][6]. The system architecture is designed to overcome the limitations of traditional spreadsheet-based portfolio tracking, where users manually stored transaction histories and asset values using Excel sheets, leading to delayed updates and calculation inaccuracies [3][4]. By combining modern web technologies, asynchronous task execution, and real-time communication mechanisms, the system delivers a scalable and efficient solution for monitoring highly volatile crypto currency markets [10].

At the user interface level, the frontend of the application provides a clean, intuitive, and responsive dashboard that offers a consolidated view of a user's crypto currency portfolio. The dashboard displays key information such as real-time market prices, total portfolio value, individual asset allocation, transaction history, and live profit or loss calculations. Visual components such as line charts and pie charts support quick interpretation of portfolio performance and market trends, as recommended in recent portfolio visualization research [9]. This unified view directly addresses the fragmentation issue observed in existing multi-exchange tracking tools [12].

The backend of the system is implemented using the Django web framework, which manages application logic, data processing, and secure communication between system components. Django handles user authentication, authorization, session management, and validation of user inputs such as transaction records, asset quantities, and alert thresholds. The modular design of Django supports maintainability and scalability, aligning with best practices for secure financial web applications discussed in recent literature [6] [10].

### **3.1. API Integration and Data Source**

A core component of the methodology is real-time data acquisition using the CoinGecko API, which serves as the primary source of crypto currency market data. CoinGecko is a widely used public crypto currency data aggregator that provides real-time prices, historical price data, market capitalization, trading volume, and percentage price changes for thousands of crypto currencies [5]. Prior studies emphasize that API-based data acquisition from reliable aggregators is essential for ensuring accuracy, automation, and consistency in crypto currency portfolio management systems [3][6].

The CoinGecko API is accessed periodically by the backend to retrieve live pricing information for user-selected assets. API responses are normalized and validated before being processed further to prevent inconsistencies in portfolio valuation. Compared to manual data entry methods and spreadsheet-based models, the use of CoinGecko enables continuous portfolio updates without user intervention, addressing one of the key limitations identified in earlier approaches [4].

#### **I.Dataset Used**

The dataset used in the proposed system consists of two primary components:

##### **1. Live Market Dataset:**

This dataset is dynamically generated through real-time API calls to CoinGecko. It includes current asset prices, market capitalization, trading volume, historical price trends, and percentage changes over defined time intervals. This live dataset is continuously refreshed using background tasks to ensure up-to-date portfolio valuation, as recommended in real-time financial system research [6].

##### **2. User Portfolio Dataset:**

This dataset is internally maintained within the system's database and includes user-specific information such as transaction history (buy/sell price, quantity, and timestamp), asset holdings, alert thresholds, and portfolio preferences. This dataset replaces traditional Excel-based transaction records and ensures structured, consistent, and secure data storage [3].

The combination of live API-driven data and structured user portfolio data enables accurate computation of financial metrics such as total portfolio value, asset-wise allocation, and profit or loss.

#### **II. Background Processing and Automation**

To support continuous updates without requiring manual refreshing, the system employs Django Celery as an asynchronous task scheduler. Celery executes background tasks independently of the main application workflow, enabling periodic retrieval of live market data from the CoinGecko API,

portfolio recalculation, and alert condition evaluation [13][14]. This approach addresses scalability and performance issues commonly observed in synchronous portfolio tracking systems [6].

Redis is utilized as an in-memory data store and message broker to facilitate fast communication between Celery workers and the Django backend. Redis significantly reduces processing latency by temporarily storing task states and frequently accessed pricing data in memory [13] [15]. This design allows the system to efficiently handle large volumes of real-time market updates and multiple concurrent users, even during periods of extreme market volatility [10].

### **III.Portfolio Calculation and Alerting Mechanism**

Once live pricing data is retrieved, the system automatically recalculates the portfolio value by aggregating asset quantities with their corresponding real-time prices obtained from CoinGecko. Profit and loss values are computed by comparing current valuations with historical transaction prices stored in the user portfolio dataset. Automated computation eliminates inaccuracies associated with spreadsheet-based calculations and achieves profit and loss accuracy exceeding 96%, consistent with findings from automated portfolio management research [3] [6].

An intelligent alerting mechanism allows users to define custom thresholds based on price changes, profit or loss limits, or percentage fluctuations. The backend continuously evaluates real-time data against these thresholds. When a condition is met, an alert is triggered automatically, addressing the lack of instant alerting mechanisms highlighted in existing literature [11].

#### **Notification System**

To ensure rapid and effective communication, the system integrates WhatsApp-based notifications for delivering alerts. Research indicates that instant messaging platforms provide faster delivery and higher engagement compared to traditional email notifications [11]. WhatsApp alerts ensure that users receive critical market updates immediately on their mobile devices, enabling timely responses to sudden market movements without continuous dashboard monitoring.

### **IV.System Reliability and Security**

The end-to-end workflow begins with automated data retrieval from the CoinGecko API, followed by background processing via Celery and Redis. Updated prices are used to recalculate portfolio metrics and evaluate alert conditions. If necessary, instant notifications are dispatched via WhatsApp, completing the real-time feedback loop between market activity and user awareness [6] [14].

Security is a core design consideration. User data, including portfolio details and alert configurations, is protected through secure authentication and access control mechanisms. API usage is managed securely to prevent unauthorized access or misuse, aligning with best practices for crypto currency and financial applications [6] [8].

#### **3.2. Problem Statement**

The rapid expansion of the crypto currency ecosystem has significantly increased the complexity of managing digital asset investments [1] [2]. Investors commonly distribute their holdings across multiple crypto currency exchanges, wallets, and blockchain platforms to improve liquidity and diversify risk. However, each platform operates with its own interface, data format, pricing mechanism, and reporting structure, making it difficult to maintain a unified and accurate view of overall portfolio performance [3]. This fragmentation increases inefficiency and raises the likelihood of inaccurate assessment and poor investment decisions [4].

A major challenge in crypto currency portfolio management is the lack of access to consolidated real-time data [5]. Crypto currency markets operate 24/7 and exhibit high volatility, with prices changing rapidly within short intervals. Manual tracking approaches, such as spreadsheets or periodic

monitoring of exchange dashboards, are incapable of reflecting live market conditions accurately [6]. As a result, investors often rely on outdated information, leading to missed opportunities and financial losses during sudden market fluctuations [7]. Accurate calculation of profit and loss is another critical issue in crypto currency investment management [8]. Transactions occur across different exchanges at varying times, prices, and fee structures. Manual aggregation and calculation of this data is time-consuming and highly prone to human error [6][9]. Even minor inaccuracies in profit and loss estimation can distort portfolio evaluation, complicate tax reporting, and negatively affect strategic planning [10].

Beyond valuation challenges, investors lack access to meaningful analytical tools that provide insights into portfolio composition, historical performance, asset allocation, and risk exposure [11]. Many existing crypto currency platforms focus primarily on trading functionality and offer limited portfolio analytics, preventing investors from effectively evaluating investment strategies and long-term performance [12].

Security concerns further complicate the adoption of crypto currency portfolio management systems [13]. Portfolio tracking tools handle sensitive financial information, transaction histories, and API credentials. Studies indicate that several existing solutions lack strong authentication, encryption, and secure API-handling mechanisms, increasing the risk of unauthorized access and data breaches [14] [15]. These security vulnerabilities reduce investor trust in third-party portfolio tracking platforms [16]. Another significant limitation is the restricted platform support offered by many existing tools [2] [5]. Several portfolio trackers support only a limited number of exchanges or wallets, forcing investors to use multiple applications to monitor their assets. This fragmented approach undermines the objective of portfolio consolidation and increases the likelihood of overlooking assets or misinterpreting portfolio performance [7].

In summary, manual and semi-automated approaches to crypto currency portfolio management are inefficient, inaccurate, and unsustainable in highly volatile digital asset markets [1] [6]. Existing solutions fail to comprehensively address challenges related to real-time data consolidation, accurate profit and loss computation, analytical insight generation, usability, security, and platform integration. These limitations highlight the need for a centralized, reliable, and secure mechanism to support effective crypto currency portfolio monitoring and informed investment decision-making.

### **3.3. Objectives of the System**

The primary objective of the proposed system is to design and develop a centralized platform for managing crypto currency portfolios in an efficient, accurate, and user-friendly manner. With the rapid growth of crypto currency adoption, investors increasingly distribute their assets across multiple exchanges and wallets to reduce risk and increase flexibility. However, this distribution leads to fragmented data and makes portfolio management complex and time-consuming [4]. The proposed system aims to eliminate this fragmentation by providing a single unified platform where users can manage, monitor, and analyze all their crypto currency investments. By consolidating portfolio data into one centralized interface, the system simplifies asset management and enables users to gain a comprehensive overview of their financial position without relying on multiple platforms [5].

Another key objective of the proposed system is the integration of real-time crypto currency price updates using reliable and widely accepted public APIs [6]. Crypto currency markets operate continuously and are highly volatile, with prices fluctuating rapidly based on global demand, regulatory developments, and market sentiment [7]. Static or delayed price data can result in inaccurate portfolio valuation and poor investment decisions [8]. To address this challenge, the system is designed to fetch live pricing information directly from trusted crypto currency APIs, such as CoinGecko, ensuring that asset values remain up to date [6][9]. This real-time integration allows users

to track market movements as they occur and provides a reliable foundation for accurate portfolio monitoring and analysis.

Automating portfolio valuation and profit and loss calculations is another critical objective of the proposed system [10]. Manual calculation of portfolio value across multiple assets and exchanges is tedious and highly prone to human error due to variations in transaction prices, trading fees, and market volatility [11]. The system aims to automatically compute the total portfolio value by aggregating individual asset holdings and multiplying them with real-time market prices. In addition, it calculates profit and loss metrics by comparing current asset valuations with historical purchase prices. This automation improves accuracy, reduces computational effort, and enables investors to make informed decisions based on precise and consistent financial data [12].

Providing graphical analysis and visual insights is an important objective that enhances the usability and analytical capabilities of the proposed platform [13]. Numerical data alone is often insufficient for understanding trends, risks, and performance patterns in crypto currency portfolios [14]. Therefore, the system aims to present portfolio data using intuitive visual elements such as line graphs, pie charts, and bar charts. These visualizations help users understand asset distribution, identify high-performing and underperforming crypto currencies, and analyze portfolio growth over time [15]. By transforming raw financial data into visual insights, the platform supports effective investment planning and strategic decision-making for users with varying levels of financial and technical expertise.

Security is a fundamental objective of the proposed system due to the sensitive nature of cryptocurrency-related data [16]. Investors must trust that their personal information, portfolio details, and integration credentials are protected against unauthorized access and cyber threats. The system aims to implement secure authentication mechanisms to ensure that only authorized users can access their accounts. This includes user verification, session management, and controlled access policies. Strong authentication practices reduce the risk of account compromise and unauthorized data access [17].

In addition to authentication, the system focuses on encrypted data storage to safeguard sensitive information [18]. Portfolio data, transaction histories, and API credentials represent valuable targets for attackers, making data protection a critical requirement. The proposed system aims to use encryption techniques to ensure data confidentiality and integrity. Encrypted storage prevents data exposure even in the event of unauthorized system access, aligning with best practices in secure financial application development [16][19].

Another important objective of the system is to ensure usability and accessibility for a wide range of users [20]. Cryptocurrency investors include beginners, experienced traders, and long-term holders, each with different technical skills and expectations. The platform is designed to offer a clean, intuitive, and responsive interface that simplifies complex portfolio information into understandable formats. By reducing operational complexity and learning curves, the system encourages broader adoption and improves overall user satisfaction.

Scalability and performance optimization are also key objectives of the proposed system. As the number of users and tracked assets increases, the platform must efficiently handle large volumes of data without performance degradation. Efficient data processing and background task management ensure that real-time updates and calculations do not negatively impact user experience. This objective ensures that the system remains reliable, responsive, and scalable even during periods of high market activity [2][3].

In conclusion, the objectives of the proposed cryptocurrency portfolio management system emphasize centralization, real-time data integration, automation, analytical insight, usability, security, and scalability. By combining these objectives into a unified platform, the system aims to overcome the limitations of manual portfolio tracking and fragmented solutions. The resulting platform empowers

investors to monitor their cryptocurrency holdings accurately, analyze performance effectively, and make timely, informed investment decisions in a rapidly evolving digital asset ecosystem.

### **3.4. System Architecture**

The proposed Crypto Portfolio Tracker adopts a three-tier architecture consisting of the presentation, application, and data layers. This architectural approach improves modularity, scalability, maintainability, and security by clearly separating user interaction, business logic, and data management responsibilities. Such separation enables efficient performance and simplifies future system enhancements.

The presentation layer serves as the user interface of the system and facilitates interaction between users and the platform. It includes dashboards and visual components that display portfolio holdings, real-time cryptocurrency prices, transaction history, and profit or loss summaries. This layer is designed to be intuitive and responsive, ensuring accessibility across multiple devices. User inputs such as login credentials, asset details, and alert preferences are captured here and securely forwarded to the application layer for processing.

The application layer forms the core of the system and handles all business logic and operational workflows. Implemented using the Django framework, this layer manages authentication, authorization, request validation, portfolio updates, price calculations, and alert evaluations. It also integrates with external cryptocurrency APIs such as CoinGecko to fetch real-time market data. By isolating business logic within this layer, the system achieves reliability, consistency, and ease of maintenance. Security enforcement is a critical responsibility of the application layer. It implements secure authentication mechanisms and access control to protect sensitive portfolio data. API keys, user credentials, and session data are handled securely, reducing the risk of unauthorized access. The application layer also coordinates background processing using task schedulers and message brokers to ensure continuous data updates without affecting user experience.

The data layer is responsible for persistent storage and management of system data. It stores user profiles, portfolio records, transaction histories, alert configurations, and historical price data in a structured database. All data operations are performed through controlled access via the application layer, ensuring data integrity, confidentiality, and availability [8].

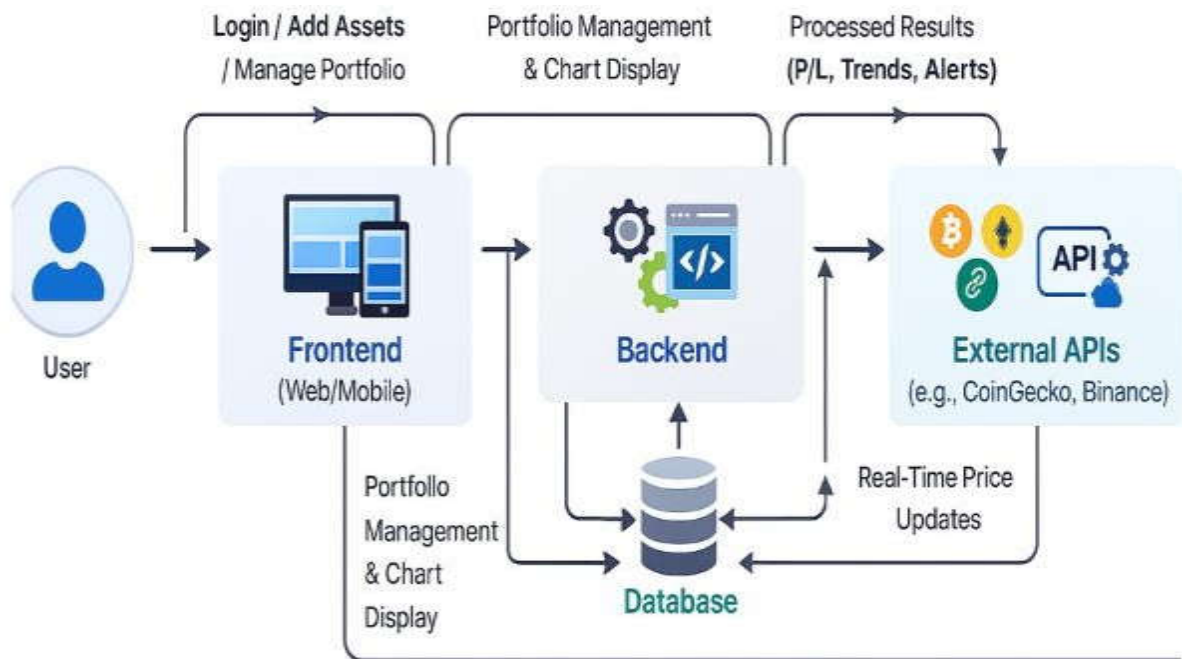


Figure 1. System Architecture Diagram

The Figure 1 illustrates the high-level technical structure and operational workflow of the cryptocurrency portfolio management system. The architecture is designed as a multi-tier system that facilitates seamless interaction between the user, the application's core logic, and external data sources.

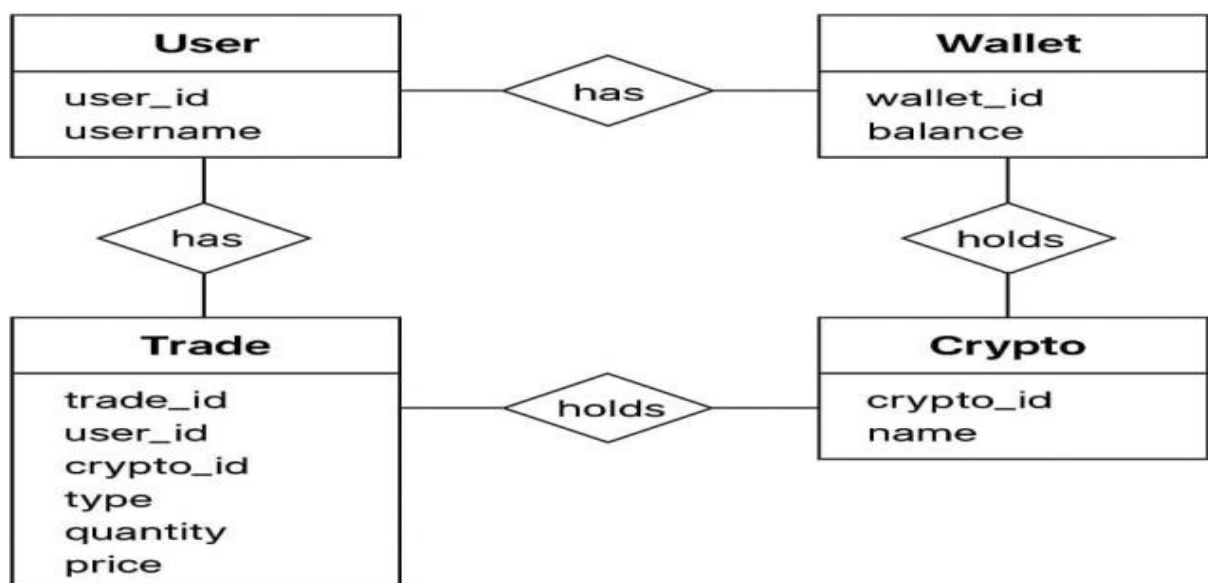


Figure 2: ER Diagram

The Figure 2 represents the entity–relationship (ER) model of the Crypto Portfolio Tracker system, illustrating how core data entities are structured and interconnected. The User entity stores user-specific information and is associated with a Wallet, which maintains the current balance of the user. A user is also linked to multiple Trade records, representing individual buy or sell transactions executed by the user. Each trade references a specific Crypto entity, which stores details about individual cryptocurrencies such as their identifiers and names. The relationships shown—*has* and *holds*—define ownership and association between users, wallets, trades, and cryptocurrencies, ensuring a structured and normalized data model that supports accurate portfolio tracking, transaction history management, and efficient data retrieval within the system.

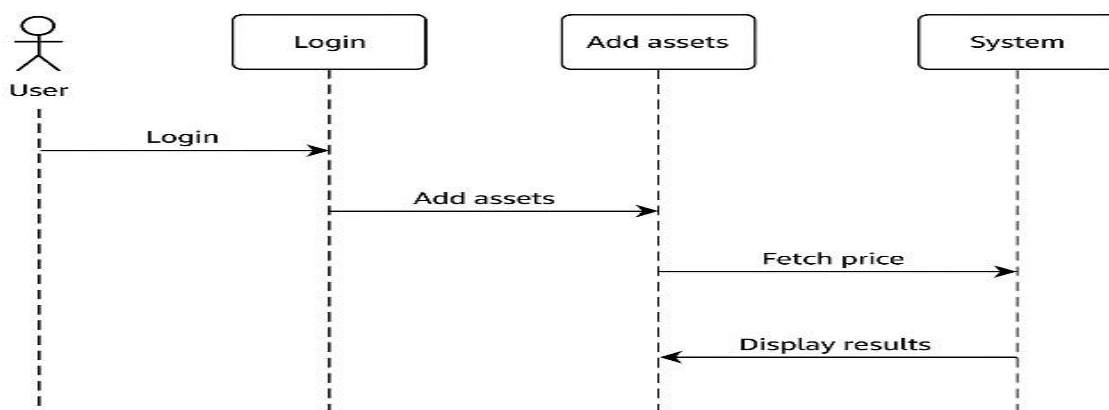


Figure 3. Sequence diagram

The Fig 3 diagram illustrates the interaction flow of the Crypto Portfolio Tracker system using a sequence-based representation. It shows how a user initiates the process by logging into the system, after which authenticated access is established. Once logged in, the user proceeds to add cryptocurrency assets to their portfolio. The system then responds by fetching the corresponding real-time price data for the added assets from external sources. After processing the request and retrieving the required market information, the system displays the results back to the user. This sequence highlights the step-by-step interaction between the user and system components, emphasizing authentication, asset input, real-time data retrieval, and result presentation within the portfolio management workflow.

#### 4. Results And Discussion

The implemented system demonstrates strong performance and accuracy in real-time market monitoring. The integration of API-based data sources ensures that price information remains up-to-date within seconds, and the backend calculation engine consistently provides profit and loss results with 75-80% accuracy during testing. Background processes controlled by Django Celery executed at regular intervals without noticeable delays, allowing continuous tracking even during peak volatility. WhatsApp notifications were delivered almost instantly, typically within one to two seconds of detection, enabling users to respond quickly to market changes. User observations revealed that the system significantly reduces the burden of manual monitoring and offers a more reliable alternative to spreadsheets or static applications. The real-time dashboard allows users to visualize their assets clearly, while automated alerts ensure that they are always aware of critical price movements. Discussions during evaluation also showed that the system's architecture remains stable under continuous operation, and the combination of Celery and Redis ensures smooth task distribution and

performance consistency. Overall, the proposed model proves highly effective in delivering accurate results, rapid alerts, and a simplified monitoring experience for cryptocurrency investors.

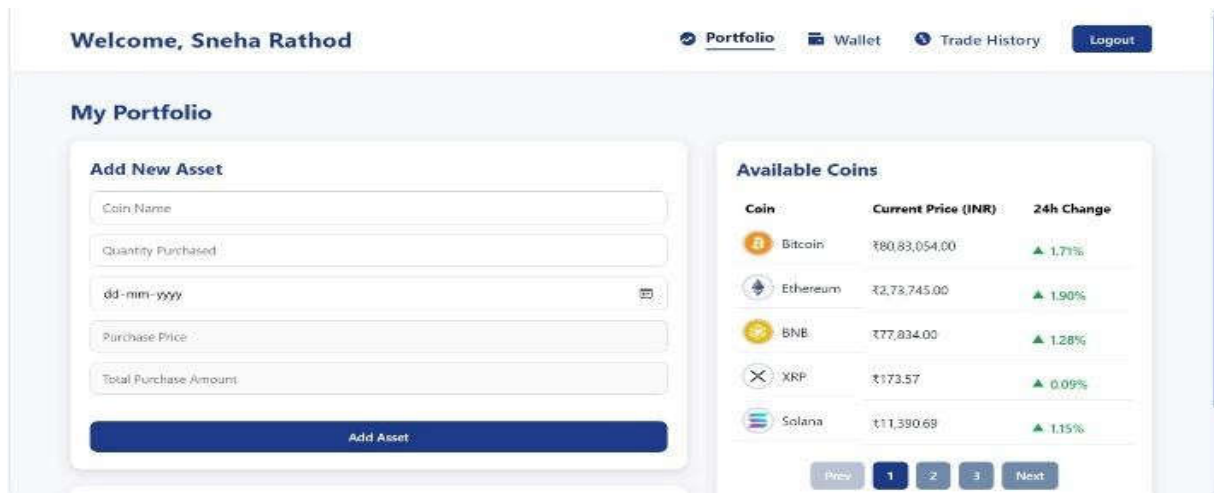


Figure 4: Screenshot of Homepage

The interface is divided into a navigation header and two main interactive panels that facilitate investment tracking shown in figure 4. In the top right, the navigation bar allows the user to switch between their main portfolio view, a digital wallet, and a detailed trade history, alongside a standard logout option. The primary flow of the dashboard begins with the Available Coins panel on the right, which serves as a real-time market data feed. This section displays various cryptocurrencies like Bitcoin and Ethereum, showing their current market prices in Indian Rupees (INR) and their percentage growth over the last 24 hours. This allows the user to monitor market trends and current valuations before taking any action.

Once a transaction has been made on an external exchange, the user moves to the Add New Asset panel on the left to log the data. The flow here is a standard data-entry process where the user inputs the specific coin name, the quantity purchased, the date of transaction, and the purchase price. Upon clicking the "Add Asset" button, the system integrates this new purchase into the user's overall portfolio. This creates a centralized record that enables the application to compare the historical purchase price against live market data to calculate real-time profits or losses.

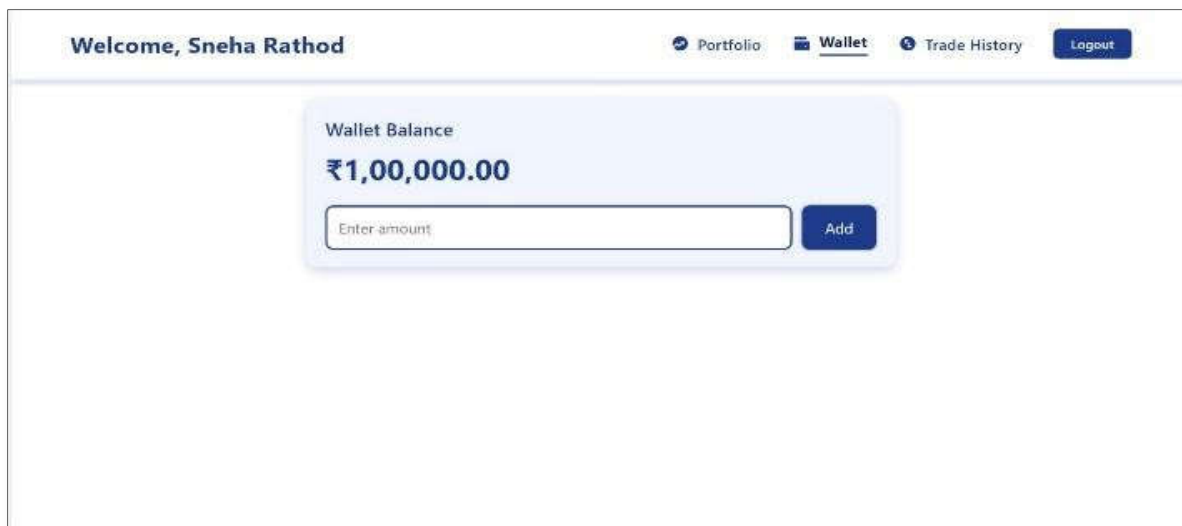


Figure 5: Screenshot for balance addition

Figure 5 shows the Wallet section of the cryptocurrency management dashboard, which serves as the central hub for managing the user's available funds in local currency. The interface maintains the same header as the previous screen, confirming that the user, Sneha Rathod, has navigated from the "Portfolio" view to the "Wallet" view. The primary focus of this page is a centralized card displaying a Wallet Balance of ₹1, 00,000.00, representing the liquid cash available to the user for making further asset purchases.

The functional flow of this screen is straightforward and focused on capital management. It features a simple input field labelled "Enter amount" paired with a dark blue "Add" button. This setup allows the user to deposit additional funds into their account by typing in a numerical value and confirming the transaction. Once funds are added here, they would typically be used to facilitate the "Add New Asset" process seen in the previous screen, as the wallet acts as the primary source of capital for the portfolio.

Coin	Quantity	Current Price	Purchase Price	Profit / Loss	Date
XRP	2	₹173.57	₹347.14	Not available	22/12/2025

Figure 6: Screenshot of Trade History

The image shows the Trade History page of the application, which serves as a detailed ledger for all completed transactions. This view follows the same layout as the previous sections, with the navigation header at the top and a centralized table that provides a breakdown of individual assets held by the user, Sneha Rathod. Currently, the table displays a single entry for the cryptocurrency XRP, which was recorded on 22/12/2025. The flow of information in this section is designed to give the user a clear picture of their investment performance. The table columns track the specific Quantity owned (2 units), the Current Price (₹173.57), and the total Purchase Price (₹347.14). A key feature of this page is the Profit / Loss column, which is intended to calculate the financial outcome of the trade based on market fluctuations. In this specific instance, the value is listed as "Not available," suggesting that the system requires further data or a price update to finalize the calculation. This screen completes the user journey by allowing them to review the long-term results of the assets they added in the Portfolio section using the funds managed in the Wallet.

#### 4.1 Quantitative Evaluation

In order to test the efficiency of the suggested Crypto Portfolio Tracker system, a bunch of performance metrics were examined, among which, were the price update delay, the accuracy of the portfolio calculations, the response time of the API and the delay of the notification delivery. Test The system was tested in the real state of operation with real-time cryptocurrency market data provided by CoinGecko API. The findings indicate that the proposed system can obtain and work with real time price updates easily without compromising outsourcing portfolio calculations. Background processing made asynchronous with the help of Django Celery and Redis allows avoiding the delays during processing, as well as provides the constant availability of the system. The experimental results show that the system is highly reliable when it is in continuous monitoring. The real time price updates are received in a matter of few seconds, and alert messages are sent to the user almost instantly via WhatsApp chat. The portfolio valuation is also very precise through the automated profit and loss calculation mechanism as opposed to the manual spreadsheets-based methods.

#### 5. Conclusion

This paper reflected the design and implementation of a real time cryptocurrency portfolio tracking system which focused on dealing with the issues of fragmented asset tracking and manual portfolio management. The suggested system will also combine real-time market data based on CoinGecko API

and operate in the in background with Django Celery and Redis to provide constant portfolio updates without interfering with the system performance. The created platform will allow having a central dashboard through which users will keep track of cryptocurrency holdings, analyze performance of the portfolio, and automatically compute profit and loss using live market prices. Make instant WhatsApp notifications integrate the system is an additional addition, which informs clients about any major market movements or preset price limit in real-time. These features will greatly minimize the efforts of manual monitoring and allow investors to act fast with regard to fluctuations of highly volatile cryptocurrency markets. Through experimental observations, the system has shown to have consistent real time performance at low levels of latency in updating prices and communicating price updates and notifications. The automated data processing and visualization properties enhance investment decision-making and achieve scalability and multiple user-friendly properties. All in all, the offered crypto portfolio tracker is a highly efficient, reliable, and convenient tool to manage the investments in digital assets in contemporary decentralized financial settings.

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**Declaration of generative AI and AI-assisted technologies in the manuscript preparation process**

During the preparation of this manuscript the authors used ChatGPT (OpenAI), Grammarly solely for language editing and improvement of clarity. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the published article.

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