

# Software Requirements Specification for Capstone 4ZP6A

StockSavvy: A User-Friendly Stock Market Solution

Team No. 4

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October 20, 2023

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## 1. Version History

Date	Version	Contributors	Notes
06-10-23	0	Jaskaran Singh Hosty Khurana Shubham Ahuja	Initial Software Requirement Specification Document created. Worked on Title and version
06-10-23	1	Shubham Ahuja Hosty Khurana	Personnel of the Project and their roles added. Naming Conventions and Terminology added.
07-10-23	2	Jaskaran Singh	The Purpose of the Project added
09-10-23	3	Jaskaran Singh Shubham Ahuja	Stakeholders added. Mandated Constraints added.
12-10-23	4	Jaskaran Singh Hosty Khurana Shubham Ahuja	Functional Requirement added. Data and Metrics added.
16-10-23	5	Shubham Ahuja	Non-Functional Requirements added.
18-10-23	6	Hosty Khurana	Risk and Issues Predicted added.
20-10-23	7	Jaskaran Singh Hosty Khurana Shubham Ahuja	Final Review Complete.
29-03-24	8	Jaskaran Singh Hosty Khurana Shubham Ahuja	Final SRS Document

## 2. Personnel of the project and their roles

### 2.1 Jaskaran Singh

- **Role:** Project Manager and Security Specialist
- **Responsibilities:** Jaskaran Singh takes on the role of project manager, overseeing the entire StockSavvy project. He is responsible for project planning, resource allocation, and ensuring that the project progresses according to the plan. Additionally, he plays a vital role as a security specialist, implementing robust security measures, conducting security audits, and ensuring that user data remains safe and private.

### 2.2 Hosty Khurana

- **Role:** User Interface Lead
- **Responsibilities:** Hosty Khurana is responsible for the user interface (UI) design and development of StockSavvy using the Tkinter GUI toolkit. He will oversee the creation of a user-friendly and visually appealing interface that simplifies stock market analysis for users. His responsibilities include UI design, layout, and ensuring a seamless and intuitive user experience.

### 2.3 Shubham Ahuja

- **Role:** Lead Developer
- **Responsibilities:** Shubham Ahuja is responsible for the technical aspects of StockSavvy. He leads the software development, architecture, and implementation and coordinates the development team. Shubham is also in charge of data integration with Yahoo Finance and the implementation of machine learning models for predictive analysis.

## 3. Glossary

### 3.1 Abbreviations

- **GUI** – Graphical User Interface
- **API** – Application Programming Interface
- **ML** – Machine Learning
- **LSTM** – Long Short-Term Memory
- **RNN** – Recurrent Neural Network
- **UI** – User Interface
- **UX** – User Experience

### 3.2 Definitions

- **Machine Learning (ML):** A subset of artificial intelligence that focuses on the development of algorithms and models that enable computers to learn and make predictions or decisions without explicit programming.
- **Long Short-Term Memory (LSTM):** A type of recurrent neural network (RNN) architecture used in deep learning for processing sequences of data, especially for tasks like time series analysis and natural language processing.
- **Recurrent Neural Network (RNN):** Is a type of Neural Network where the output from the previous step is fed as input to the current step.
- **User Interface (UI):** The point of interaction between a user and a computer program or system, including elements such as screens, buttons, and menus.
- **User Experience (UX):** Encompasses all aspects of a user's interaction with a product or system, focusing on how users perceive and interact with it.
- **Closing Price:** The closing price is the last price at which a security is traded during the regular trading day. A security's closing price is the standard benchmark used by investors to track its performance over time.
- **Trading Volume:** Volume of trade is the total quantity of shares or contracts traded for a specified security.
- **Volatility:** Volatility is a statistical measure of the dispersion of data around its mean over a certain period.
- **Tkinter:** Tkinter is a Python library for creating graphical user interfaces (GUIs) for desktop applications.

## **4. The Purpose of The Project**

### **4.1 The Current Situation**

Stock market investing can be complex and daunting for many individuals, particularly those without extensive financial expertise. Analyzing stocks, making informed decisions, and managing investments efficiently is a significant challenge. Existing solutions often cater to experienced investors or require substantial manual effort, leaving novice investors at a disadvantage.

### **4.2 The context of the work**

StockSavvy emerges in the context of increasing interest in stock market investment and a growing need for accessible, user-friendly tools. The platform is developed to empower investors with simplified stock market analysis, data-driven insights, and educational resources. It aims to address the challenges of stock market investing and make it accessible to a broader range of investors, regardless of their level of experience or financial resources.

### **4.3 Work Partitioning**

The project has been divided on priority basis from P0 to P3 having a set priority from High to Low respectively.

## **5. Stakeholders**

### **5.1 Client**

N/A

### **5.2 Customer**

The "Customer" represents the end-users or beneficiaries of the project's output. They are the ones who will use the product or service resulting from the project. All those interested in stock investing and have access to the following:

- Windows Users
- MacOS users
- Linux Users

### **5.3 Other Stakeholders**

All the stakeholders not directly involved as client or customer:

- Financial Institutions
- Educational Institutions
- Private Investors

### **5.4 Hands-On Users of the Project**

These are individuals or teams directly involved in using and operating the project or its outcomes. They may include administrators, operators, or those responsible for the day-to-day management of the project:

- Users
- Professor - Mehdi Moradi
- Shubham Ahuja
- Hosty Khurana
- Jaskaran Singh

### **5.5 Personas**

#### **5.5.1 Investor Irene**

Irene is a 34-year-old marketing manager with a keen interest in stock market investing. She has some experience with investing but finds the world of stocks and financial data overwhelming. She is looking for a user-friendly platform that simplifies market analysis and provides clear insights. Irene values data-driven recommendations and user-friendly interfaces that cater to her level of expertise. Her primary goal is to efficiently understand stock market trends and make informed investment choices without the need for extensive research.

#### **5.5.2 Financial Advisor Fred**

Fred is a 52-year-old financial advisor with over two decades of experience in the industry. He caters to a diverse clientele, from novice investors to high-net-worth individuals. Fred is looking for tools to assist his clients in making informed investment decisions. He needs a user-friendly platform like StockSavvy to streamline market analysis for his clients, providing actionable insights and trend analysis to enhance his advisory services. His primary goal is to help his clients achieve their investment objectives while minimizing complexity and optimizing investment choices based on data-driven insights.



## **6. Mandated Constraints**

### **6.1 Solution Constraints**

StockSavvy must be a desktop application developed using Tkinter for a Windows, macOS, or Linux environment. The user interface should be designed to be user-friendly and intuitive for investors of all levels within the desktop application. Strict data accuracy and reliability standards must be maintained for all financial data used within the application. StockSavvy must comply with all relevant financial regulations and data privacy laws, even within a desktop environment.

### **6.2 Implementation Environment of the Current System**

StockSavvy is a desktop application using the Tkinter GUI toolkit, designed for a specific desktop operating system (Windows, macOS, or Linux).

### **6.3 Partner or Collaborative Applications**

StockSavvy may have the capability to integrate with external data providers for sourcing market data within the desktop application.

### **6.4 Off-the-Shelf Software**

The project may utilize off-the-shelf software or libraries for specific functionalities where it is cost-effective and efficient within the desktop environment. example: yfinance for yahoo finance data, scikit-learn for ML model.

### **6.5 Anticipated Workplace Environment**

The project should be developed with a focus on a user's typical workplace environment, which, in this case, refers to a user's desktop or laptop computer.

## **7. Functional Requirements**

### **7.1 P0 - High Priority**

- **Stock Data Retrieval:** Retrieving Data from yahoo finance for selected timeframe and form a dataset for selected stocks.
- **Application Gui:** Make barebone structure of application to display predictions, analysis and retrieved data.

## 7.2 P1 - Medium Priority

- **Enhanced LSTM Model Development:** Construct and calibrate an LSTM machine learning model tailored for 4 stocks, selected based on volatility and volume, over a designated time window. Implemented model to get high and low-price prediction to give user a range of predicted price. Implement rigorous back testing protocols using historical data to simulate trading and validate model effectiveness, ensuring the model's reliability before deployment. Minimized mean square error for validation data to under 2.5.
- **User Interface with Enhanced Data Presentation:** Develop a user-friendly GUI in Tkinter that not only provides basic stock information, such as 52-week high, yield, and industry classification but also visualizes predictive trends and historical performance for user interpretation.

## 7.3 P2 - Moderate Priority

- **Comprehensive Statistical Predictions:** Deploy statistical models, including ARIMA/SARIMA, for nuanced predictions of stock performance indicators such as the 50-day moving average and volatility indices. Employ rigorous statistical methodologies and backtesting to ascertain the predictive power and potential limitations of the models.
- **Scaled-Up ML Model Refinement:** Expand the LSTM model to accommodate and predict an increased scope of 6 stocks, leveraging a larger dataset to refine the model's predictive accuracy, aiming for a mean square error on validation data of less than 2.0. Detail steps for iterative model improvement, including parameter tuning, feature selection, and cross-validation against different market conditions.

## 7.4 P3 - Low Priority

- **Advanced Analytics:** Add additional features that help user make informed decision.
- **User Login/ Profile:** Provide User with option to make profile and save their analysis.

# 8. Data and Metrics

## 8.1 Data for each Feature

### 8.1.1 Stock Price Prediction

- **Data:** Closing Price, Stock name, symbol, and trading volume
- **Source:** Yahoo Finance
- **Use:** Data will be used for ML and stats analysis

### 8.1.2 User Profile

- **Data:** Name, password, previous analysis
- **Source:** User
- **Use:** Make it easier for user to store their previous analysis

## 8.2 Data Source

- **Yahoo Finance Data:** Data will be derived from <https://finance.yahoo.com/> (Yahoo Finance site) using there python library yfinance 0.2.31 (<https://pypi.org/project/yfinance/>)
- **User Data:** Data that user will provide when they make profile and use the application.

## 8.3 Performance Metrics and Goals

### 8.3.1 Training-Validation data Split

- **Metric:** Splitting data into training and validation data
- **Goal:** To check for overfitting/underfitting and model accuracy

### 8.3.2 Cross Check Statistical and ML predictions

- **Metric:** Compare ML prediction with moving day averages, 52-week high/low, etc.
- **Goal:** Plot predictions with stats metrics to check for outlier and accuracy

## 9. Non-Functional Requirements

### 9.1 Look and Feel Requirements

- **User-Friendly Interface:** The platform must have an intuitive and visually appealing user interface to make it easy for investors of all levels to navigate.
- **Consistency:** Maintain a consistent design and layout across all pages and features for a cohesive user experience.
- **Responsive Design:** Ensure the platform is responsive and adapts to different screen sizes and devices.

## 9.2 Usability and Humanity Requirements

- **Language Support:** The platform should support multiple languages to cater to a diverse user base.
- **User Support:** Provide user support features, such as chat or email support, to assist users with their questions or issues.

## 9.3 Performance and Speed Requirements

- **Low Latency:** Ensure minimal data retrieval and processing delays for real-time stock data and analytics.
- **Scalability:** The platform should be able to scale and handle an increasing number of users and data without significant performance degradation.
- **Response Time:** Maintain fast response times for user interactions, such as loading portfolios and displaying stock prices.

## 9.4 Security and Privacy Requirements

- **Data Privacy:** Comply with data privacy regulations and obtain user consent for data usage, with clear privacy policies.
- **Regular Auditing:** Conduct regular security audits and penetration testing to identify and address vulnerabilities.

## 9.5 Legal Requirements

- **Regulatory Compliance:** Ensure compliance with financial regulations and data privacy laws in all regions where the platform is accessible.
- **Terms and Conditions:** Display clear terms and conditions for platform usage, including disclaimers and user responsibilities.
- **Copyright and Licensing:** Respect intellectual property rights and licensing agreements for any third-party content used within the platform.

# 10. Risk and Issues Predicted

## 10.1 Data Reliability and Quality

- **Risk:** Inaccurate or unreliable data from external sources can impact the quality of stock analysis and predictions.
- **Mitigation:** Implement data quality checks and consider data redundancy from multiple sources.

## 10.2 Regulatory and Compliance Risks

- **Risk:** Changing financial regulations and privacy laws can introduce compliance challenges and legal risks.
- **Mitigation:** Regularly monitor and adapt to regulatory changes and maintain clear privacy policies.

## 10.3 Security Breaches

- **Risk:** Data breaches or cyberattacks can compromise user data and the platform's reputation.
- **Mitigation:** Implement robust security measures, regular audits, and user education on best practices.

## 10.4 User Adoption and Retention

- **Risk:** Attracting and retaining users can be challenging, especially if the platform fails to meet their expectations.
- **Mitigation:** Continuously gather user feedback and adapt the platform based on user needs and preferences.

## 10.5 Data Integration Challenges

- **Risk:** Integrating with external data providers can pose technical challenges and data inconsistencies.
- **Mitigation:** Carefully plan data integration and maintain strong partnerships with reliable data providers.

## 10.6 Scalability Issues

- **Risk:** The platform may face performance issues and downtime as the user base and data volume grow.
- **Mitigation:** Design the platform to be scalable and conduct stress testing to identify and address scalability bottlenecks.

## 10.7 Technical Complexity

- **Risk:** Complex machine learning models and algorithms may lead to development delays and performance issues.
- **Mitigation:** Keep the technical architecture modular and well-documented to address complexity.

## 10.8 Competitive Landscape

- **Risk:** Competing platforms may offer similar or superior services, affecting user acquisition and retention.
- **Mitigation:** Continuously monitor the competitive landscape and differentiate the platform based on unique features and user experience.

### **10.9 Economic and Market Volatility**

- **Risk:** Sudden market fluctuations and economic events can challenge the accuracy of stock predictions.
- **Mitigation:** Ensure models are adaptable and can factor in volatile market conditions.

### **10.10 Maintenance and Support Challenges**

- **Risk:** Providing ongoing maintenance and user support may strain resources.
- **Mitigation:** Establish robust support procedures and consider automating routine tasks.

### **10.11 User Data Privacy Concerns**

- **Risk:** User concerns over data privacy and security can lead to reduced user trust.
- **Mitigation:** Clearly communicate data privacy practices and obtain user consent for data usage.

### **10.12 Change in User Behavior**

- **Risk:** User preferences and behaviors may change over time, affecting the platform's relevance.
- **Mitigation:** Continuously gather user feedback and adapt the platform to meet evolving user needs.