Software Requirements Specification

PORTFOLIO MANAGEMENT SYSTEM

Prepared By :

(Group No. 37)

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1. Introduction

In a world of fluctuating interest rates, changing gold prices & volatile financial markets, the aim of this project is to build an optimum portfolio for the users according to their risk appetite. The system's scope includes analysing client's preferable risk exposure, expected yearly returns and using this data to build a basket of securities and a variety of trading strategies based on technical analysis & machine learning techniques. Algorithmic Trading is used to automate trading strategies based on study of past historical data, technical indicators, machine learning algorithms & macroeconomic trends. This automation will help to eliminate human emotions from the investment process which will help in proper position sizing & risk management with strict stop losses and targets. The project aims to use Modern Portfolio Theory to maximize the alpha while reducing the risk.

1.1 Problem Statement

Design and create a portfolio management system which aims to :

- Maximize the alpha (returns) and minimize the risk.
- Implement various trading & investing strategies using technical & fundamental analysis.
- Optimize strategies using machine learning algorithms.
- Use Algorithmic Trading to remove the psychological & emotional bias faced during the investment process

1.2 Document Conventions

- Heading :
    - Font Size : 18pt
    - Font Style : Bold
    - Font : Arial
- Subheading :
    - Font : Arial
    - Font Size : 16pt
    - Font Style : Bold
- Sub-Subheading :
    - Font : Arial
    - Font Size : 14pt
    - Font Style : Bold

1.3 Intended Audience and Reading Suggestions

This document is intended for any individual user, tester, project supervisor that needs to understand the basic system architecture and its specification. Here are the potential users for each one of the reader types:

- **Developer:** The developer who wants to read, change, modify or add new requirements into the existing program, must firstly consult this document and update the requirements with appropriate manner so as to not destroy the actual meaning of them and pass the information correctly to the next phases of the development process.
- **User:** The user of this program reviews the diagrams and specifications presented in this document and determines if the software has all the suitable requirements and if the software developer has implemented all of them.
- **Tester:** The tester needs this document to validate that the initial requirements of this program actually corresponds to the executable program correctly.

1.4 Product Scope

There are three basic users as

A. Director(admin)
B. Clients i.e short-term,mid-term and long term investors
C. Computer professionals

- All users have their own profiles in the Portfolio-management system.
- Clients can create new account, log-in to their existing accounts which will give them the authority to use the services provided by the system.
- If a client wishes to create a new account then a questionnaire needs to be answered which will help the system understand the risk appetite of the customer.
- A new client might upload his/her existing portfolio for simple portfolio analysis like expected returns and red flags.
- Depending on the risk appetite, the system will create a list of stocks which are to be traded for a particular day/month/year.
- These strategies used are back-tested thoroughly and only then are they allowed to predict a list of stocks which will give positive returns.
- The long term investor gets stocks which are only based on fundamental analysis.
- The mid term and short term investors get stocks which are predicted using technical analysis and minimum fundamental checks.
- LSTM, GRU, Random Forest algorithms are used to predict the future trend of the market.

1.5 References

- Zerodha Varsity
- Moneycontrol, yahoo finance and other financial news sources
- Investopedia

1.6 Product Perspective

Portfolio Management System makes the use of various machine learning algorithms and portfolio analytics to give the user a unique combination of predictions, recommendations and risk to reward ratio for the current portfolio, if any.

Portfolio Management System will overcome the following drawbacks of the existing system:

- Separate platforms for recommendations and portfolio analysis.
- Need for analysts.
- Need for middlemen or brokers.

1.7 Product Functions

This web application will allow the user to do various things such as:

- Users can define his/her requirements for building the portfolio.
- Users can also see the historical trades done by the portfolio manager and see the back-tested reports.
- This web application will ease the process of building,analyzing and maintaining the portfolio efficiently which will guarantee good investment returns to the users.

1.8 User Classes and Characteristics

1.8.1 User

The user of the system can be anyone. He can use the system for building and analyzing his/her portfolio and defining the requirements.

1.8.2 Client / Investor

This user is the one who registers as a client in the application. He can post his requirement for which he wants to build the portfolio. He may define his risk appetite and other

requirements like maximum drawdown and expected returns.Also have a look at the average returns he/she has got over the past few years.

1.8.3 Admin

Admin is a user which will have specific controls to the application which will allow them to control certain modules in the application. The admin can change the forum settings to make the users happy. Admin will administer the overall control of the website and can override any setting, constraints in any module as he/she wants and help the clients to maintain their portfolio efficiently and guarantee them good returns.

1.9 Operating Environment

- This web application can be deployed on Linux or Window machine with Apache Server and MySQL server
- Minimum RAM 2 GB
- 320 GB Storage Space
- Intel i3 Processor
- Internet Connectivity with Ports configured
- This application can be accessed by a user through a machine having any web browser with bootstrap. Angular support and flash to get video content. The client devices must preferably have browsers like IE9 or above, Mozilla Firefox (version 60.02 quantum) or Opera 54.0 or chrome (version 68.0.3) or safari installed in their OS and must have enabled flash content to get video output. Specified versions are preferred to get Bootstrap 3.0 output.

1.10 Design and Implementation Constraints

The main design components of the system are as follows:

1. **Client/investor module** : This module is the centralized module which will be used by the user to register to the application.. This module will basically set up a user profile and accept all the necessary details to set up the portfolio.Here the user needs to give certain details about him/her such as username, password, email, contact, address, gender. The user shall choose if he is a long-term/short-term trader and other aspects like risk appetite.
2. **Admin/Portfolio manager module** : This module will be used for user who has registered as an owner. First the user will need to provide his username and password for security needs. Once he has successfully logged in as an owner he/she can handle the client requirements and provide them with different services. According to the client

requirements, the manager will analyze his/her portfolio using different strategies and implement the same on the live market. Also he/she will manage the funds according to the lock-in period.

3. **Computer professional** : This module will help the user how to use the website on the basis of their requirement who has registered as a buyer or seller or a farmer .how to login, signup and more other relevant information regarding product and website how it is beneficial to the user how he take a advantages of that site when some natural disasters happen like parched .he will claim to government for giving them a fund to run their family and free them not to pay the loans which they take from bank.

1.11 User Documentation

User documentation components such as user manuals, on-line help, and tutorials will be delivered along with the software. Manual can be downloaded along the CMS package. Other tutorials and support form will be made available in case to report any bug or other support related issues. A simple how it works page will be included in the package in html static page format.

1.12 Assumptions and Dependencies

Assumption is that the user should have some basic knowledge of computers. We are assuming that the user should have some basic knowledge of using internet and online payment.

2. External Interface Requirements

2.1 User Interfaces

2.1.1 Admin Interface

- In this interface admin will have full control over this web application. Various fields available on this screen will be:
    - Username
    - Password
- Once admin logs in, it will redirect admin to admin-dashboard.
- Admin Dashboard will allow admin to manage user activities and manage overall functionality of the website.

2.1.2 User Registration Interface

- This interface will allow users to register for the first time to the portfolio management platform. Interface will include following fields,
    - Username
    - Email
    - Password
    - Confirm Password
    - Contact
- Once a user is successfully registered to the platform, he/she will be automatically redirected to the Login Interface and will be asked to fill answers to Risk Appetite Questionnaire.

2.1.3 User Login Interface

- This interface will allow already registered users to login to his/her financial dashboard. This interface will include following field,
    - Username
    - Password
- Once a user is successfully logged into the platform, he/she will be automatically redirected to the personal portfolio dashboard.

2.1.4 User Dashboard Interface

- In this interface users can manage their own portfolio and get insights based on their current portfolio. This interface will have 3 major tabs,
    - User Portfolio
    - User Portfolio Insights

    - Profile
    - Recommendations
- **User Portfolio** : This interface will allow the user to see their personal stock-holdings, current returns over the invested amount. Each stock-holding will include the name of the stock (symbol), invested amount, stock-units.
- **User Portfolio Insights** : This interface will allow the user to see few financial parameters to validate the portfolio. This includes beta value, PE Ratio, price forecast, red flags, suggestions for portfolio updates.
- **Profile** : This interface will allow the user to see the details of Profile and update any details like name, password, contact,etc.
- **Recommendations** : This interface will display the recommended stocks and the amount of time that they should be held onto for.

2.2 Hardware Interfaces

Users can use any screen size above 300px width, i.e. the web interface will be responsive based on user screen sizes. Apart from this, users will need any interactive device like a mouse, touch pen for clicking on the options and keyboard (either physical or virtual) to enter the details for login/register.

2.3 Software Interfaces

- Client : Web Browser, Javascript-Enabled
- Web Server : Django Inbuilt Server
- Database Server : SQLite3 -> MySQL if needed for deployment
- Backend Development : Python3, Django (Framework), Tensorflow/Keras/Pytorch - ML
- Frontend Development : HTML, CSS, JS, Django-templates

2.4 Communication Interfaces

- Clients will interact with the platform using HTTP/HTTPS protocol.
- TCP/IP Network stack will be used for communication.

3. System Features

Provides a user-friendly website for managing their own portfolio in the most simplistic and transparent way. One touch access to accurate market information. Reduces the chances of misinterpretation, inconvenience and uneasiness in operating the product. Easy and hassle free access to the dashboard, portfolio, recommendations and other main functionalities. Clients can check their current portfolio, returns and our recommendations based on ML algorithms with backtest reports. Admin can use the user touch-points to analyze the website functionality.

- **Usability** : The interface should use terms and concepts, which are drawn from the experience of the people who will make the most of the system.
- **Efficiency** : The system must provide easy and fast access without consuming more cost.
- **Reliability** : Users should never be surprised by the behavior of the system. It should be easy to see all different options which are being offered in as few clicks as possible.
- **Transparency** : Recommendations made should be as transparent as possible. It will be handled by providing the backtest reports of different strategies and ML algorithms based on which recommendations are made.
- **Security** : System provides authentication mechanism without which no user can get into the system. Sharing of credentials will not be considered in the security aspect of the product.
- **Maintainability** : Software will be very well documented for easy maintenance of the system.

3.1 Feature List

- **User Registration :** The system should allow new users to register online.
- **User Login :** System should allow the user to log into the system and should be able to view personal dashboard.
- **Accepting User Registration :** Whenever a new user registers and logs in for the first time, then the system should ask for the user information and questionnaire. The answers to those questions will be saved in the database and user risk appetite will be calculated. This feature will be considered while recommending any stocks.
- **Recommendation :** User current portfolio will be evaluated based on rate of return and risk parameters. It will be then mapped with the risk appetite of the user. If the current portfolio is giving good returns as expected by the user then the system should recommend no change in portfolio. Otherwise the system should use Machine Learning to predict the future values, apply different trading strategies, prepare backtest reports

and recommend the stocks which are closer to the user expectation and satisfy user risk appetite limits.

- **Finding Portfolio Insights :** System should show the portfolio insights by using common financial parameters like Beta value, PE Ratio, Price Forecast, Red Flags, etc.
- **User Profile Update :** System should allow the users to update the information as well the existing portfolio.

4. Other Non-functional Requirements

4.1 Performance Requirements

The system should have a high performance rate when executing user’s input and should be able to provide feedback or response within a short time span usually 50 seconds for highly complicated tasks and 20 to 25 seconds for less complicated tasks.

4.2 Safety Requirements

Error should be considerably minimized and an appropriate error message that guides the user to recover from an error should be provided. Validation of user’s input is highly essential. Also the standard time taken to recover from an error should be 15 to 20 seconds.

4.3 Security Requirements

The subsystem should provide a high level of security and integrity of the data held by the system, only authorized personnel of the company can gain access to the company’s secured page on the system and only users with valid password and username can login to view the user's page.

4.4 Software Quality Attributes

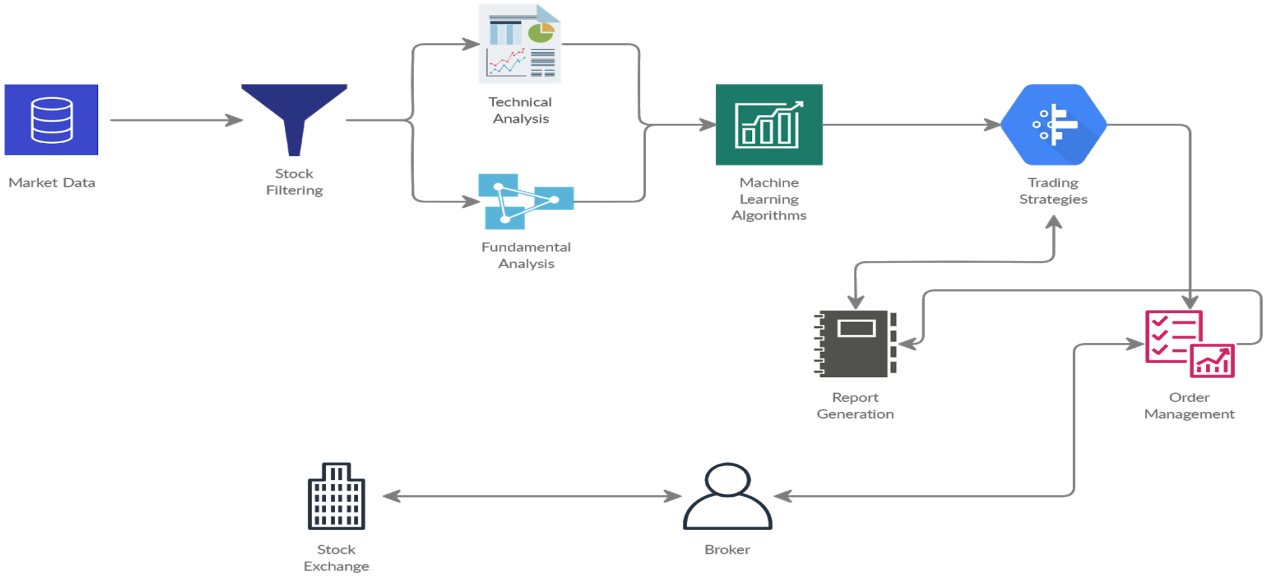
This system should always be available for access at 24 hours, 7 days a week. Also in the occurrence of any major system malfunctioning, the system should be available in 1 to 2 working days, so that the business process is not severely affected

4.5 Business Rules

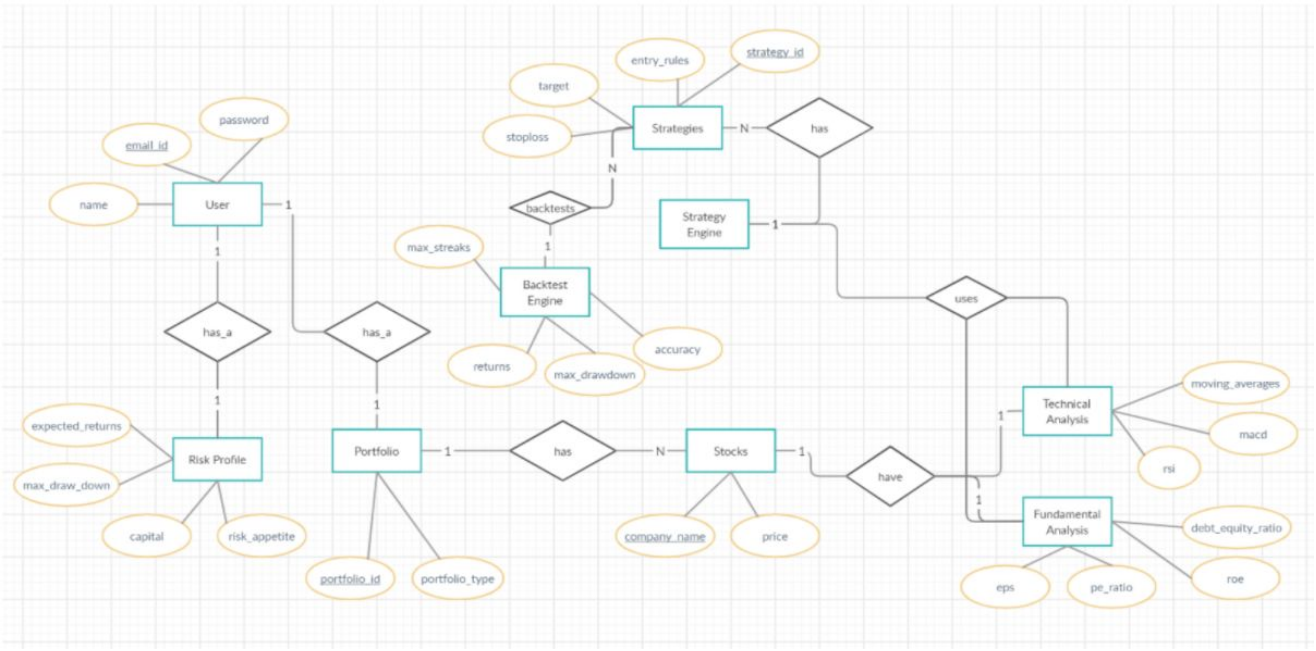
A business rule is anything that captures and implements business policies and practices. A rule can enforce business policy, make a decision, or infer new data from existing data. This includes the rules and regulations that the System users should abide by. This includes the cost of the project and the discount offers provided. The users should avoid illegal rules and protocols. Neither admin nor member should cross the rules and regulations.

5. Diagrams

5.1 Architecture Diagram



5.2 ER Diagram



5.3 Use Case Diagram