

# Design Document for Capstone 4ZP6A

## **StockSavvy: A User-Friendly Stock Market Solution**

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## 1. Version History

Date	Version	Contributors	Notes
26-01-24	0	Jaskaran Singh Hosty Khurana Shubham Ahuja	Initial Design Document Created.
29-03-24	1	Jaskaran Singh Hosty Khurana Shubham Ahuja	Final Design Document.

## 2. The Purpose of The Project

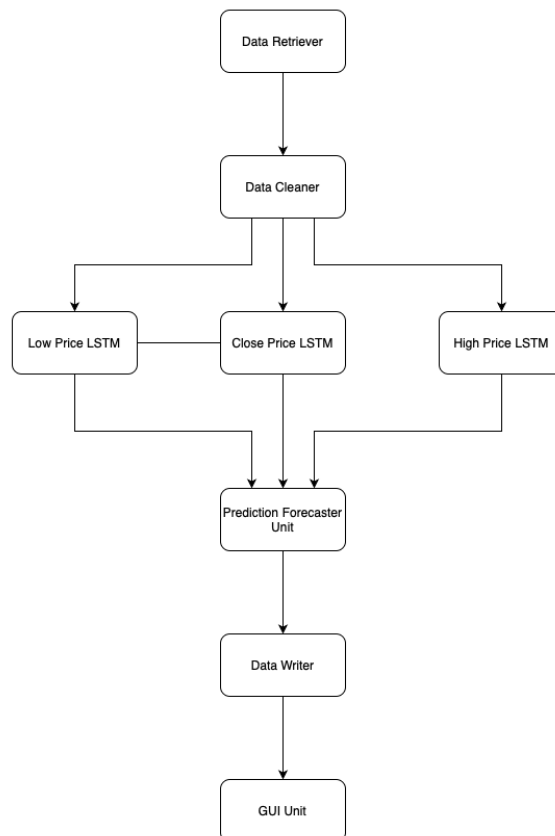
### 2.1 The Current Situation

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.

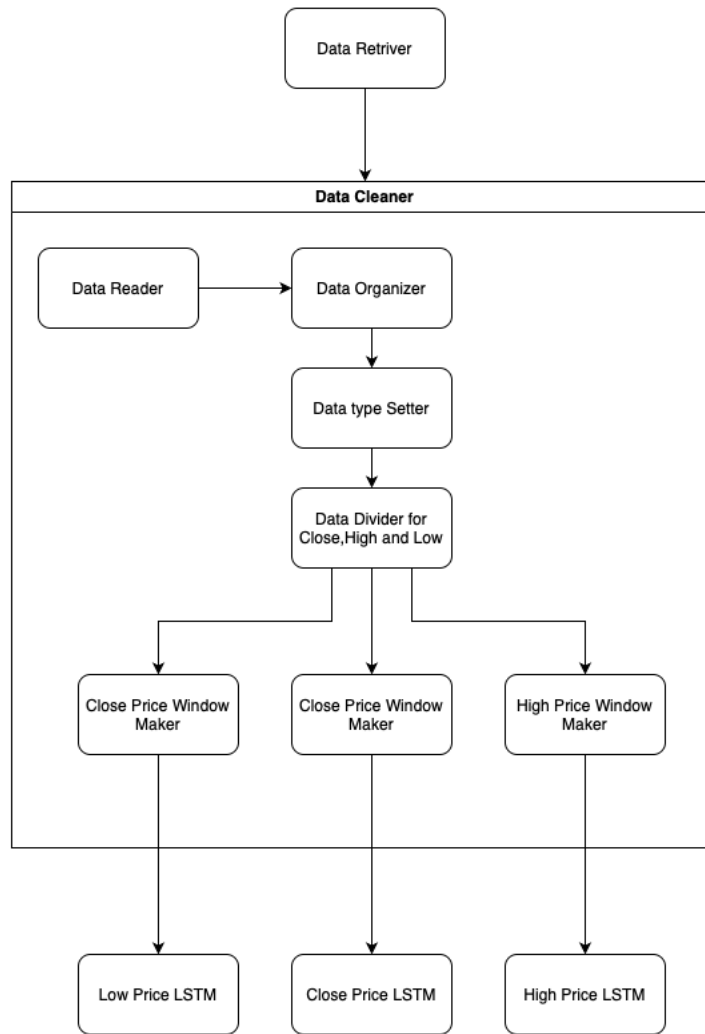
### 2.2 The context of the work

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.

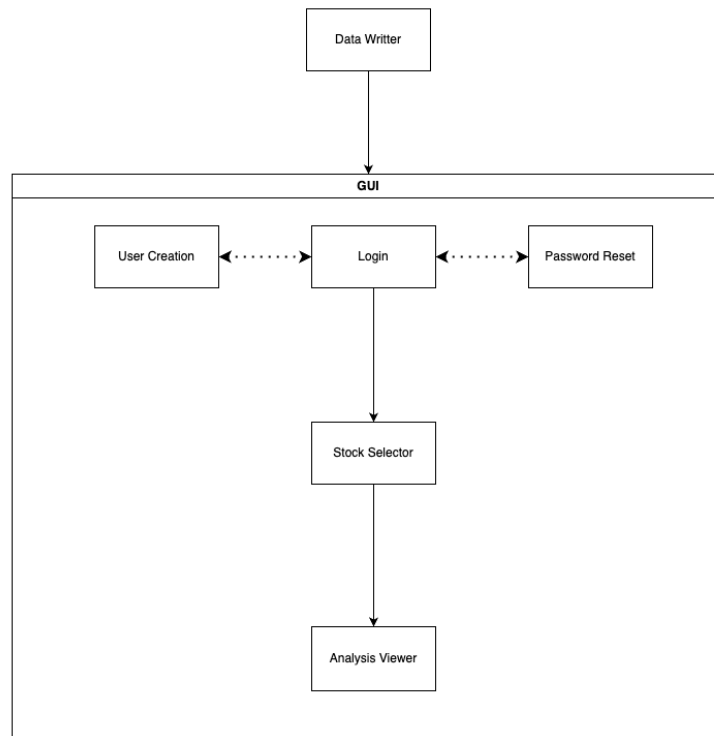
## 3. Component Diagram



Main Component Diagram



Data Cleaner Component Diagram



GUI Component Diagram

## 4. Component Overview

### 4.1 Data Retriever

- *Requirement:* Obtain raw data from external sources.

### 4.2 Data Cleaner

- *Requirement:* Process raw data, handle missing values, and ensure data integrity.
- *Sub-Components:*
  - **Data Reader**
    - *Requirement:* Extract data from CSV files and format it for further processing.
  - **Data Organizer**
    - *Requirement:* Organize the extracted data for efficient processing.
  - **Data Type Setter**
    - *Requirement:* Ensure consistent data types for accurate analysis.
  - **Data Divider**
    - *Requirement:* Segment data into relevant categories for specialized processing.
  - **Window Maker**
    - *Requirement:* Create windows or segments for time-series analysis.

### 4.3 LSTM

- *Requirement:* Train and deploy a Long Short-Term Memory (LSTM) model for predictive analytics.

### 4.4 Prediction Forecaster

- *Requirement:* Utilize the LSTM model to generate accurate forecasts based on historical data.

### 4.5 Data Writer

- *Requirement:* Provide a user-friendly interface for users to interact with the system and visualize predictions.

### 4.6 GUI Unit

- **Login**
  - *Requirement:* Provide a secure mechanism for users to log in to their accounts.
- **User Creation**
  - *Requirement:* Enable users to create an account and provide necessary information.
- **Password Reset**
  - *Requirement:* Allow users to initiate the password reset process securely.
- **Stock Selector**
  - *Requirement:* Enable users to select stocks for analysis and prediction.
- **Analysis Viewer**
  - *Requirement:* Display detailed analysis and predictions for selected stocks.

## 5. Behaviour Overview

### 5.1 Data Retriever

- **Normal Behavior**
  - Fetches raw data from external sources.
- **API (Input/Outputs)**
  - *Inputs:* None
  - *Outputs:* CSV file with stock data with columns -Date, Open, High, Low ,Close, Adj Close, Volume
- **Potential Undesired Behaviors**
  - Connectivity issues preventing data retrieval.

### 5.2 Data Cleaner

- **Normal Behavior**
  - Processes data, handles missing values, and ensures data integrity.
- **API (Input/Outputs)**
  - *Inputs:* CSV file with stock data from the data retriever.
  - *Outputs:* Cleaned data frame windowed by 50 days.
- **Implementation**
  - *Sub-Components:*
    - DataReader, DataOrganizer, DataTypeSetter, DataDivider, WindowMaker
  - *Relationships:*
    - DataReader → DataOrganizer → DataTypeSetter → DataDivider → WindowMaker
- **Potential Undesired Behaviors**
  - Mishandling of missing values leading to inaccurate data processing.

### 5.3 LSTM

- **Normal Behavior**
  - Trains on historical data, generates predictions, and passes them to the Prediction Forecaster.
- **API (Input/Outputs)**
  - *Inputs:* Windowed DataFrame.
  - *Outputs:* Trained model.
- **Potential Undesired Behaviors**
  - Poor performance if the training data is insufficient or of low quality.

### 5.4 Prediction Forecaster

- a. **Normal Behavior**
  - Receives predictions from the LSTM and provides them to the Data Writer for display.
- b. **API (Input/Outputs)**
  - *Inputs:* Trained model for close, high, and low price.
  - *Outputs:* List with predictions for the next 50 days using trained models.
- c. **Potential Undesired Behaviors**

- Incorrect processing of predictions leading to inaccurate forecasts.

## 5.5 Data Writer

### a. Normal Behavior

- Receives predictions from the Prediction Forecaster and displays them to the user.

### b. API (Input/Outputs)

- *Inputs:* DataFrame from Data Divider and predictions from the Prediction Forecaster.
- *Outputs:* CSV files with detailed information on stock predictions.

### c. Potential Undesired Behaviors

- Unable to write to file due to unexpected errors like space issue.

Name	Name of stock	String
Date	Date for which the price is written	Datetime
Expected	Expected closing price	Float
Actual	Actual closing price	Float
isFuture	Is it predicted value for future or before	Boolean

## 5.6 GUI Unit

### • Login:

#### • Normal Behavior:

- User can login using their credentials.

#### • API (Input/Outputs):

- **Inputs:** User-provided login credentials.
- **Outputs:** Successful login confirmation or error message.

#### • Potential Undesired Behaviors:

- Incorrect credentials leading to failed login attempts.

### • User Creation:

#### • Normal Behavior:

- Creates a new user account.

#### • API (Input/Outputs):

- **Inputs:** User-provided information (username, password, and re-enter password).
- **Outputs:** Account creation confirmation message or error message.

#### • Potential Undesired Behaviors:

- Input validation failure leading to inaccurate account creation.

### • Password Reset:

#### • Normal Behavior:

- User can change/reset the password.

#### • API (Input/Outputs):

- **Inputs:** User-provided username for password reset.
- **Outputs:** Password reset confirmation message or error message.

#### • Potential Undesired Behaviors:



- Incorrect or non-existent username input leading to failed password reset attempts.
- **Stock Selector:**
  - **Normal Behavior:**
    - Allows user to select stock from a list of stocks.
  - **API (Input/Outputs):**
    - **Inputs:** List of available stocks from the database.
    - **Outputs:** Selected stock for analysis and prediction.
  - **Potential Undesired Behaviors:**
    - None in this context
- **Analysis Viewer:**
  - **Normal Behavior:**
    - Displays a graph showing stock prices for the current week, past month, and past 6 months.
    - Shows additional information such as 52-week high, 52-week low, and 100/200/50-day averages.
    - Presents the predicted closing price for the week's end.
  - **API (Input/Outputs):**
    - **Inputs:** Selected stocks from the Stock Selector, historical stock data.
    - **Outputs:** Visual representation of stock analysis with predictions.
  - **Potential Undesired Behaviors:**
    - Inaccuracies in displayed data due to data retrieval errors.
    - Graph rendering errors affecting the visual representation.

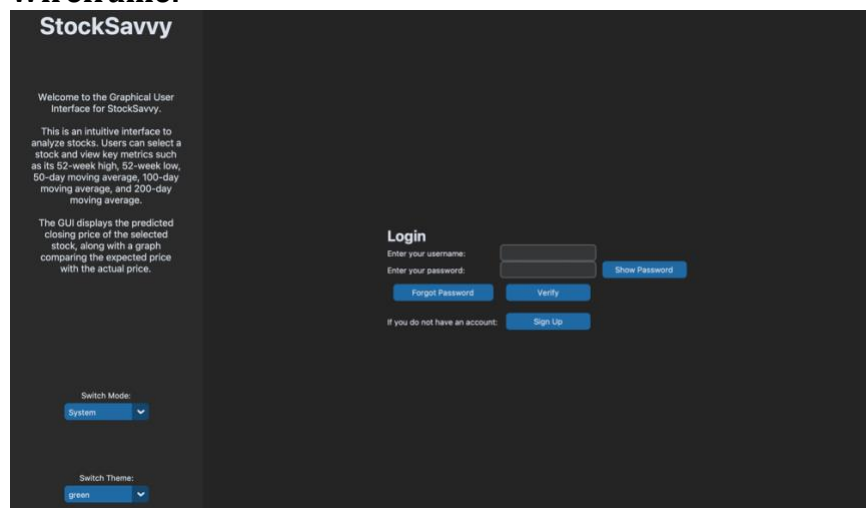
## 6. UI Design

### 6.1 SideBar

#### Layout:

- Provide a brief overview of what StockSavvy is about.
- Includes a dropdown menu to change the system appearance.

#### Wireframe:

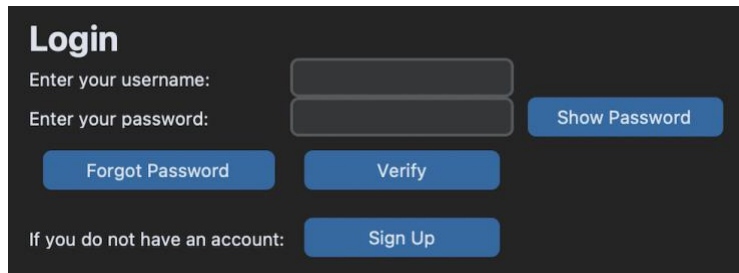


## 6.2 Login Page

### Layout:

- Provide input fields for username and password.
- Includes a "Verify" button for user authentication.
- Includes a "Sign Up" button for user registration.
- Includes a "Forgot Password" button to reset user's password.

### Wireframe:



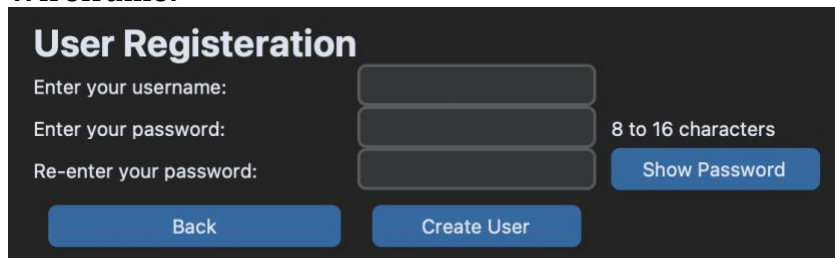
The wireframe for the Login Page is a dark-themed interface. At the top left, the title "Login" is displayed in white. Below it, there are two input fields: "Enter your username:" and "Enter your password:". To the right of the password field is a blue button labeled "Show Password". Below the input fields are two blue buttons: "Forgot Password" and "Verify". At the bottom, there is a link "If you do not have an account:" followed by a blue button labeled "Sign Up".

## 6.3 User Creation Page

### Layout:

- Provide input fields for username, password, and re-enter password.
- Includes a "Create User" button for user creation.
- Includes a "Show Password" button to view password.

### Wireframe:



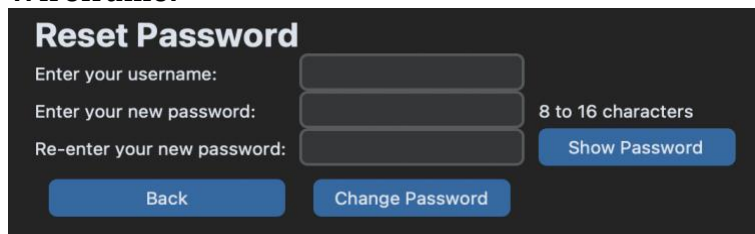
The wireframe for the User Registration Page is a dark-themed interface. At the top left, the title "User Registration" is displayed in white. Below it, there are three input fields: "Enter your username:", "Enter your password:", and "Re-enter your password:". To the right of the password field is a text label "8 to 16 characters" and a blue button labeled "Show Password". Below the input fields are two blue buttons: "Back" and "Create User".

## 6.4 Password Reset Page

### Layout:

- Provide input fields for username, password, and re-enter password.
- Includes a "Change Password" button to trigger the reset.
- Includes a "Show Password" button to view password.
- Includes a "Back" button to navigate back to Login Page.

### Wireframe:



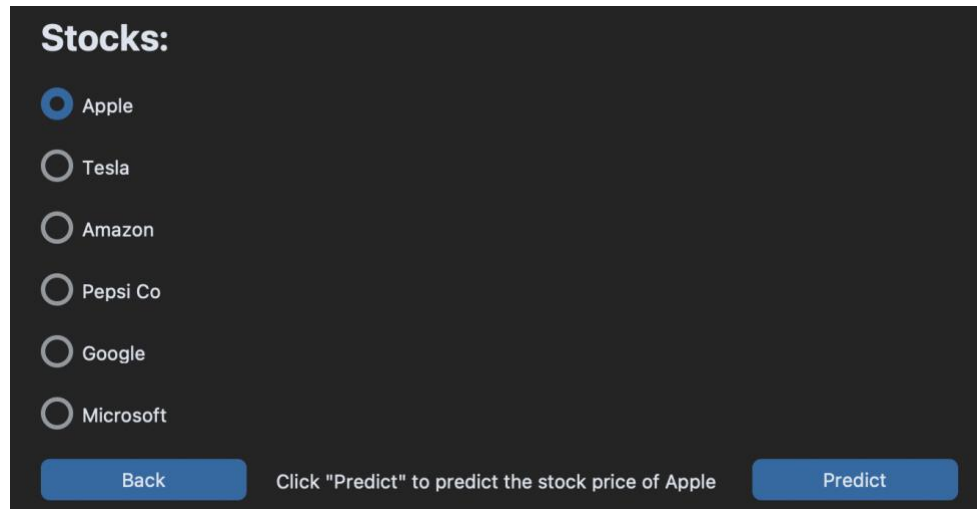
The wireframe for the Password Reset Page is a dark-themed interface. At the top left, the title "Reset Password" is displayed in white. Below it, there are three input fields: "Enter your username:", "Enter your new password:", and "Re-enter your new password:". To the right of the password field is a text label "8 to 16 characters" and a blue button labeled "Show Password". Below the input fields are two blue buttons: "Back" and "Change Password".

## 6.5 Stock Selector Page

### Layout:

- Displays a list of available stocks from your database.
- Implement radio buttons for users to select specific stocks.
- Includes a "Predict" button to initiate stock prediction based on user selection.

### Wireframe:



The wireframe shows a dark-themed interface titled "Stocks:". Below the title is a vertical list of six radio buttons, each followed by a stock name: Apple (selected), Tesla, Amazon, Pepsi Co, Google, and Microsoft. At the bottom of the interface, there are three elements: a "Back" button on the left, a text label "Click 'Predict' to predict the stock price of Apple" in the center, and a "Predict" button on the right.

## 6.5 Analysis Viewer Page

### Layout:

- A dual-axis graph displays expected versus actual stock prices over selectable time frames.
- Current stock data is presented, including 52-week high, 52-week low, and moving averages for 200, 100, and 50 days.
- The most recent closing price, updated daily, is prominently displayed for user reference.
- Users can toggle between Low, High, and Close options to display the corresponding predicted prices on the graph.
- A "Last Updated" timestamp at the top of the page ensures users are aware of the data's recency.
- Navigation buttons "Back" and "Logout" provide clear pathways for user action.

Wireframe:

Apple

Last Updated: March 16 2024

Please choose from the following options:

☐ Low

52 Week High:

198.11

☐ High

52 Week Low:

125.02

☐ Close

200 Days Avg:

184.25

100 Days Avg:

183.83

50 Days Avg:

192.01

Monday's Closing Price:

170.06

Back

Logout

Apple

Last Updated: March 16 2024

☒ Low

☐ High

☐ Close

Expected Price vs Actual Price

200

190

180

170

160

150

140

130

Expected

Actual

Price (\$)

2022-03

2022-06

2022-09

2022-12

2023-03

2023-06

2023-09

2023-12

2024-03

Date (Quarterly)

52 Week High:

198.11

52 Week Low:

125.02

200 Days Avg:

184.25

100 Days Avg:

183.83

50 Days Avg:

192.01

Monday's Closing Price:

170.06

Back

Logout