UFCFXK-30-3: Digital Systems Project

Sentiment Analysis and the Stock Market

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Abstract:

The New York Stock Exchange, with a market capitalization of $26 trillion (as of 2021), is the world's largest and most trusted stock exchange. Stock market analysis is utilised by many people to make educated selections. Sentiment analysis is an area of analysis that has grown in popularity over the years, and many utilise it as a resource to help make decisions related to the stock market. On select stocks, data from social media and news sites will be used to compare various sentiment models. The sentiment gathered by these models will be used to predict stock prices, and will be evaluated using historical data.

Objectives

The key objectives of this project are:

- Take user comments from social media, and news articles from financial websites to analyse the sentiment of stocks on the New York Stock Exchange
- Use previous stock data to check for any correlation between the sentiment gathered and stock price
- Compare different sentiment analysis models using a data set from previous years
- Create a visualisation of the sentiment gathered that can be viewed online

Research:

Key Research Questions

- What languages, frameworks and libraries are available to use for my project?
- What APIs will I use to grab data for various aspects of my project?
- What sentiment analysis models can I use, can I improve their capabilities?
- What features can I include on my webpage that will benefit the users?

Sentiment Analysis is defined as the task of identifying author views on certain items (Feldman, 2013).

In a study, individual tweets were processed using sentiment analysis to evaluate their polarity – positive or negative. A trained classifier was used to provide probability values to these tweets. Two prediction models were constructed based on these values. The findings revealed that tweets were predictive of future Stock Exchange closing Index values (Caliñgo. Sison & Tangulig, 2016).

Key requirements:

The requirements below are the most important that allow for full functionality of the system

Functional Requirements

User Interface Requirements

- The system must have a web user interface (M)
- The UI requires a method to type and search the system (M)
- The UI requires a method to present data in visual form (M)
- The UI requires a method to present data in textual form (M)

Priority is measured using MoSCoW principles.

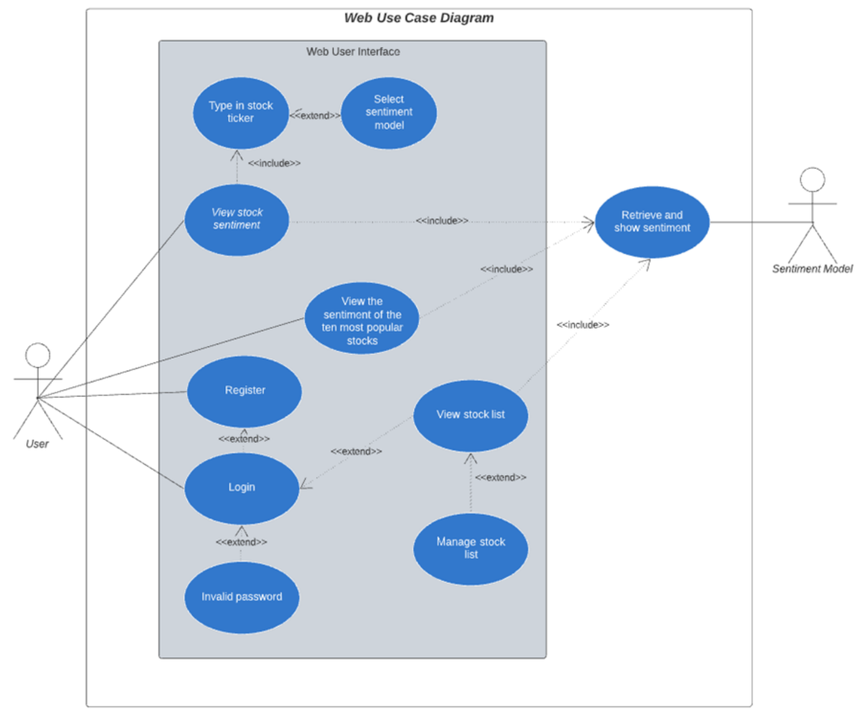
Non-functional Requirements

- Performance - The system should load pages, input data and output data at a reasonable speed.
- Usability - The system should be user friendly and accommodate to impaired users where possible.
- Scalability - The system should be able to handle a moderate amount of users, working in the same efficient manner.

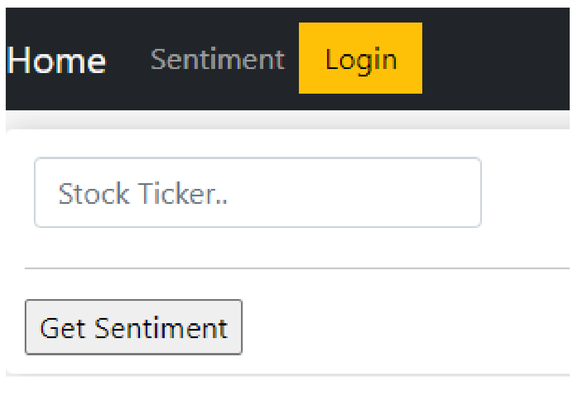
Non-functional requirements classified in the manner above

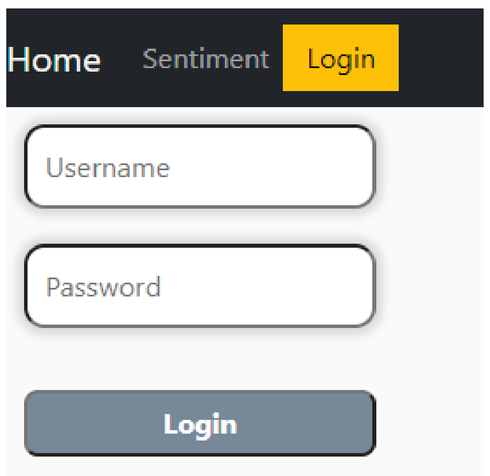
Design, Implementation & Testing

Web Use Case Diagram



User Interface (Work in progress)





Testing

Acceptance tests will prove that project has been implemented correctly. Therefore each requirement will be tested by at least one acceptance test. An example is given below:

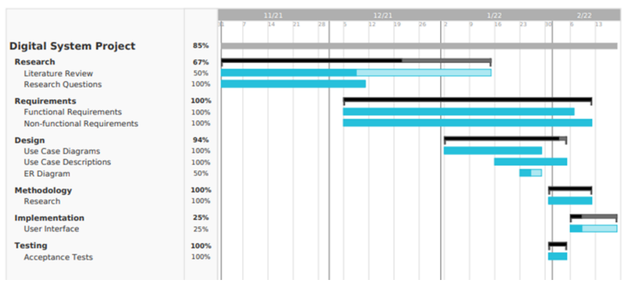
The system must correctly display an error message if a invalid stock ticker is submitted.

- Action -User types in invalid stock ticker
- Expected outcome - System returns an error message: 'stock ticker not found'

Methodology:

Agile Methodology

- Flexible approach
- Iterative and incremental, allowing for regular testing and enhancement of the project's functionality
- Appropriate for a project of this size; adjustments can be made with less consequence



Gantt chart

The project will be divided into small sprints, this splits up tasks into smaller, more manageable chunks. This is appropriate for a project of this size since adjustments can be made with less consequence.

References:

Feldman, R. (2013). Techniques and applications for sentiment analysis. *Communications of the ACM*, 56(4), pp.82-89. [Accessed 11th December 2021]

Caliñgo, A. R., Sison, A. M., & Tanguilig III, B. T. (2016). Prediction Model of the Stock Market Index Using Twitter Sentiment Analysis. *International Journal of Information Technology and Computer Science (IJITCS)*, 8(10), pp.11-21. [Accessed 11th December 2021]