



Cairo University



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# Stock prediction using Machine Learning

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# ABSTRACT

Stock price prediction is an important issue in the financial world. It is the act of trying to determine the future value of a company, stock or other financial instrument traded on a financial exchange. The successful prediction of a stock's future price will maximize investor's gains and could yield a significant profit to investors and the country. This paper proposes a machine learning model to predict stock market prices. The Predicting process is a challenging problem in itself because of the number of variables that are involved. There are so many factors involved in the prediction – physical factors, rational and irrational behavior, etc. All these aspects combine to make share prices volatile and very difficult to predict with a high degree of accuracy.

In this article, We will work with historical data about the stock prices of publicly listed companies. We will (implement) several machine learning algorithms to predict the future stock price of this company, starting with simple algorithms like “Linear Regression”& Support Vector Machine “SVM”, and then move on to advanced techniques like “XGBoost” which stands for Extreme Gradient Boosting which is an approach where new models are trained to predict the errors of prior models.

We prefer in our model long term data over short term as dealing with short term data is chaotic and sensitive, so it will be less efficient because of the unexpected change in the stock value will decrease the accuracy of the prediction as the model won't be fast enough to adapt to these changes in the data, also having access to live data is not applicable and is not easy to get.

# INTRODUCTION

## MOTIVATION

Stock Market prediction and analysis is the act of trying to determine the future value of a company stock or other financial instrument traded on an exchange. Stock market is an important part of the economy of the country and plays a vital role in the growth of the industry and commerce of the country that eventually affects the economy of the country. Both investors and industry are involved in the stock market and want to know whether some stock will rise or fall over a certain period of time. The stock market is the primary source for any company to raise funds for business expansions. It is based on the concept of demand and supply. If the demand for a company's stock is higher, then the company share price increases and if the demand for company's stock is low then the company share price decreases.

## PROBLEM DEFINITION

Investors investing in stock market usually are not aware of the stock market behavior they are facing the problem of trading as they do not properly understand which stock to buy or which stock to sell in order to get more profits and in this case the percentage between success and fail is 50% to 50% the input to our system will be an eight years historical data from yahoo finance Appropriate data would be applied to find the stock price trends. Hence the prediction model will notify the up or down of the

stock price movement for the next trending year and the percentage of success will increase to more than 90% so investors can act upon it so as to maximize their chance of gaining a profit and reduce the risk. the entire system would be implemented in python. Hence it will effectively be a zero-cost system

## PROBLEM OBJECTIVE

In the past decades, there is an increasing interest in predicting markets among economists, policymakers, academics and market makers.

The objective of the proposed work is to study and improve the supervised learning algorithms to predict the stock price.

- Technical Objective :

The technical objectives will be implemented in R.

The system must be able to access a list of historical prices. It must calculate the estimated price of stock based on the historical data. It must also provide an instantaneous visualization of the market index.

- Experimental Objective:

Two versions of the prediction system will be implemented; one using XGB and other using LSTM . The experimental objective will be to compare the forecasting ability of XGB with LSTM . We will test and evaluate both the systems with the same test data to find their prediction accuracy.

## 1.4 GANTT CHART

## 1.5 PROJECT DEVELOPMENT METHODOLOGY

### 1.5.1 HOW TO COLLECT INPUT DATA ?

For our project there are 4 types of required data :

For our project there are 4 types of required data :

1. **Stock Data** : All stock data and prices , We obtain this data by sending a request to Alpha Vantage API. And it has 6 columns
  - a. Open : The first price of a stock traded at the beginning of a specified trading day.
  - b. Close : The last price of a stock in the last transaction on a specified trading day
  - c. Adjust close :The close price adjusted based on the reflection of dividends and splits.
  - d. High : The highest price when a stock traded on a specified trading day.
  - c. Low : The lowest price when a stock traded on a specified trading day.
  - f. Volume : Total amount of shares of a stock traded on a trading day.

2. **User Data** : User enters his data and It is stored in System`s DB.

3. **Companies Data** : Static data about companies stored in System`s DB.

4. **News** : Daily News and updates related about stocks for the companies in our DB , It is restored from GoogleNews API.

### 1.5.2 HOW TO SOLVE THE PROBLEM ?

We will solve the problem using below supervised learning techniques to build our model

- LSTM with Technical Indicators.
- XGBoost Vector Machine with Technical Indicators.

To Solve the problem , We will follow the below steps :-

1. Fetch the data of a stock from Yahoo finance of the last 8 years.
2. Calculate the values of technical indicators.
3. Train the model using these indicators and training data.
4. Test the model using testing data.
5. Evaluate our system using various evaluation techniques.

### 1.5.3 ALGORITHM DESIGN

Why did we choose XGBoost specifically?

Prediction of the stock market has attracted attention from industry to academia. Various machine learning algorithms such as neural networks, genetic algorithms, support vector machines, and others are used to predict stock price.

However, accuracy is unsatisfied, because of the reasons:

1. Data Noise: There are lots of unprocessed factors. It causes some problems like data redundancy, data noise, and overfitting.
2. Market Emotion: The stock market is a stochastic field. Various aspects influence investors' emotions. Market emotion strongly affects the stock market trend. And investors' emotions are usually affected by financial news.
3. Time series Information: Traditional methods can handle time-series data, but with limited performance. And some methods like ARIMA have poor effect on big data

#### 1.5.4 LANGUAGES USED

##### Python

Python is a programming language and software environment preferred for machine learning models and statistical computing and graphics. We used python in our project in the machine learning model.

##### HTML

HyperText Modeling Language Used to create the content and design basis for the project.

##### JS , CSS , JQuery

Used for customizing the front-end of the website and the content and tables .

##### Packages Used :

- Npm
- Axios
- Body-parser
- Cookie-parser
- Dotenv
- Ejs
- Express



## USED TOOLS:

- MongoDB
- Mongoose
- React
- NodeJs
- Colab Spider
- Visual Studio
- Windows
- Linux

## 1.7 REPORT ORGANIZATION

## RELATED WORKS

From previous researches and literature ; We have found that there are different algorithms used to predict stock market values and the results will be shown below :

- **Support Vector Machine “SVM”**: with dataset from apple stock achieves accuracy 77.6%.
- **Artificial Neural Network “ANN”**: with dataset from google stock achieves accuracy 72%.
- **Logistic Regression “LR”**: with dataset from individual stock achieves 75.1%.

From websites; We have found different websites used predict stock market :

- **First-Daily Market Forecast :**

**I Know First**  
DAILY MARKET FORECAST

Stock Forecast Based On a Predictive Algorithm. Contact Us: [contact@iknowfirst.com](mailto:contact@iknowfirst.com)  
Monday, August 10th, 2020

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**PACKAGE NAME: AGGRESSIVE STOCKS**

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Small Cap Stocks To Buy Based on AI: Returns up to 39.46% in 7 Days

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**State of the Art Algorithmic Forecasts**  
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does not provide personal investment or financial advice to individuals, or act as personal financial, legal, or institutional investment advisors, or individually advocate the purchase or sale of any security or investment or the use of any particular financial strategy. All investing, stock forecasts and investment strategies include the risk of loss for some or even all of your capital, The algorithm is based on artificial intelligence, machine learning and incorporates elements of artificial neural networks as well as genetic algorithms to model and predict the flow of money between markets for more than 10,000 assets for 6 time horizons spanning from 3-days to a year:

Stocks, ETF's(exchange-traded fund) , world indices, gold , currencies, interest rates, and commodities.

# Stock Market Outlook Based on Machine Learning: Returns up to 138.6% in 1 Month

© August 9, 2020

Package Name: Fundamental - High Price-to-Sales ratio Stocks  
Recommended Positions: Long  
Forecast Length: 1 Month (7/9/2020 - 8/9/2020)  
I Know First Average: 55.59%



[Read The Full Forecast](#)

## Algorithmic Stock Forecast

1 Month Updated on 09_Jul_2020				
VSLR	OSTK	NVAX	SQ	TUP
43.17	20.51	15.96	10.75	9.58
0.21	0.36	0.33	0.41	0.33
GNMK	OPK	CLNE	SRNE	PLUG
8.88	7.87	6.55	5.70	5.50
0.29	0.23	0.14	0.18	0.19
4.88	4.78	4.72	4.34	4.19
0.32	0.25	0.31	0.23	0.27
4.12	4.06	3.92	3.84	3.74
0.26	0.21	0.27	0.15	0.43
-1.52	-1.52	-1.61	-1.70	-1.83
0.33	0.38	0.43	0.33	0.26
-1.88	-1.95	-2.01	-2.14	-2.16
0.32	0.40	0.35	0.38	0.41
-2.20	-2.21	-2.55	-2.71	-2.87
0.18	0.44	0.40	0.16	0.35

## Forecast Performance (long)

Symbol	Forecast July 9th	% Change August 9th	Accuracy
VSLR	↑	63.57%	✓
OSTK	↑	138.60%	✓
NVAX	↑	73.23%	✓
SQ	↑	10.40%	✓
TUP	↑	126.28%	✓
GNMK	↑	-14.21%	✗
OPK	↑	37.99%	✓
CLNE	↑	3.50%	✓
SRNE	↑	97.80%	✓
PLUG	↑	18.74%	✓
I Know First Average		55.59%	
S&P 500		5.72%	



Ticker	Signal	Recommended Long Position: ↑
Predictability		Recommended Short Position: ↓

\*I Know First Average denotes the non-weighted average return of the listed symbols

## Package Performance (Long)



<https://iknowfirst.com/>

- **Trading Economics** : provides its users with accurate information for 196 countries including historical data and forecasts for more than 20 million economic indicators, exchange rates, stock market indexes, government bond yields and commodity prices. Their data is based on official sources, not third party data providers, and their facts are regularly checked for inconsistencies. TradingEconomics.com has received more than 646 million page views from more than 200 countries.


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### Week Ahead

The coming week will see second-quarter GDP data for the UK, Russia, Malaysia, Hong Kong, Taiwan and Singapore, alongside industrial production for the US, China, Eurozone, UK and India and retail sales for the US and China. The labor market reports from the UK and Australia will also be in the spotlight, as well as inflation numbers for the US, China and India. Central banks in Mexico and New Zealand will be deciding on monetary policy.



#### China Inflation Rate Rises to 3-Month High

China's annual inflation rate rose to 2.7 percent in July 2020 from 2.5 percent in the prior month and above market expectations of 2.6 percent. This was the highest inflation rate since April. 16 min ago

#### ASX Opens in the Green

The ASX 200 recouped some of its recent losses on Monday, as investors bet on a swift economic recovery from coronavirus-driven lockdown, shrugging off a rising tide of 2 hours ago

#### Wall Street Set for Weak Start

US stocks were set to open lower on Monday after Democrats and the White House were unable to reach an agreement on a coronavirus stimulus relief bill last week. 2 hours ago

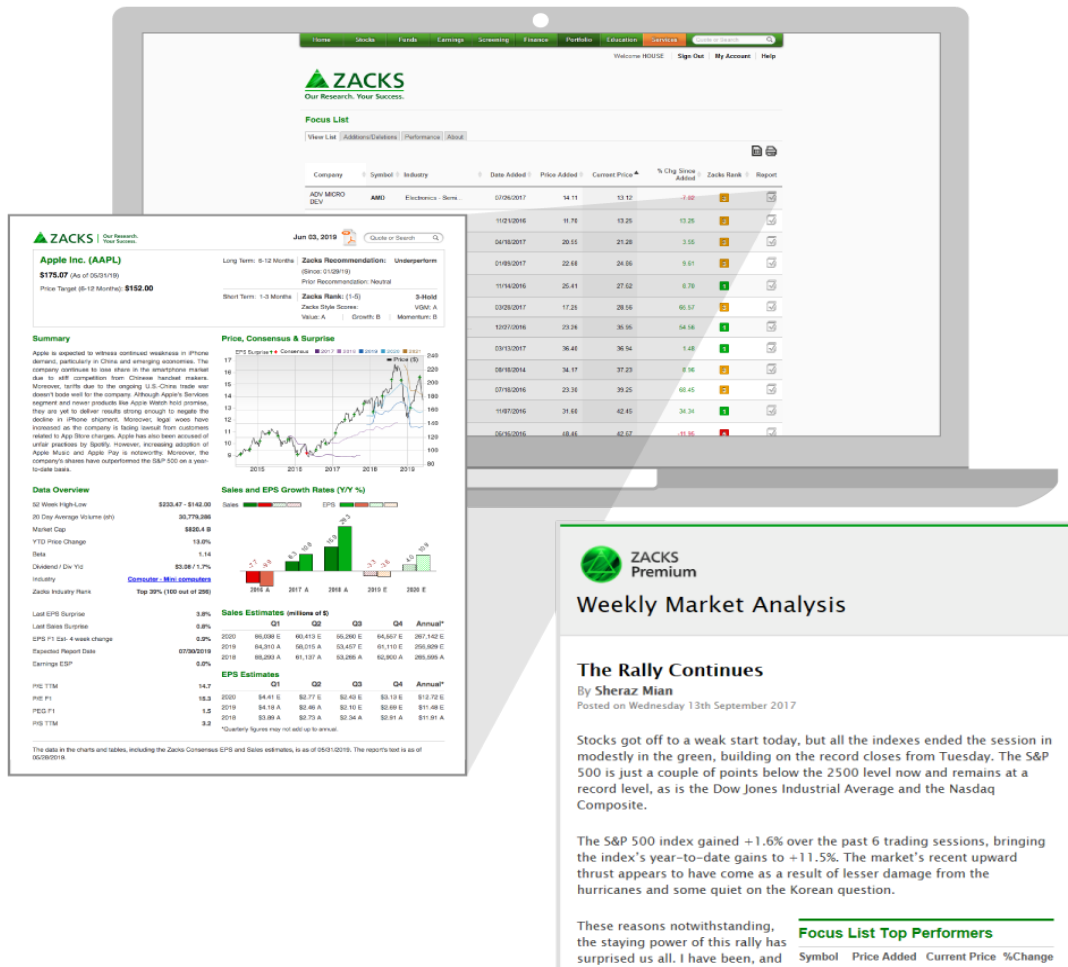
Forex	Indexes	Shares	Commodity	Bond
	Actual	Chg	%Chg	
Dow Jones	27431	▼ 2	-0.01 %	🟡
S&P 500	3355	▲ 4	0.11 %	🟡
NASDAQ 100	11106	▼ 32	-0.29 %	🟡
NIKKEI 225	22,309	▼ 110	-0.49 %	🟢
FTSE 100	6,032	▲ 5	0.09 %	🔴
DAX	12,675	▲ 83	0.66 %	🔴
CAC 40	4,890	▲ 4	0.09 %	🔴
FTSE MIB	19,516	▲ 41	0.21 %	🔴
IBEX 35	6,940	▼ 11	-0.16 %	🔴
ASX 200	6067	▲ 62	1.03 %	🟢
SHANGHAI	3362	▲ 8	0.25 %	🟢
SENSEX	38,041	▲ 15	0.04 %	🔴
MOEX	2,972	▼ 16	-0.54 %	🔴
TSX	16,544	▼ 35	-0.21 %	🔴

[More](#)

<https://tradingeconomics.com/>

- **Zacks Investment Research**: is an independent market research outfit known for detailed, engagingly written stock and fund picks that often go against the grain of conventional wisdom  
Few events move a stock more than an earnings surprise. You can use the Zacks Earnings Expected Surprise Prediction (ESP) Filter to search for stocks to buy beforehand that have the highest probability of positively surprising for profitable earnings season trading. You can also use it to find those stocks to sell before they report that are likely

to negatively surprise, or profit by going short before an earnings miss. It's based on the Zacks Earnings ESP metric that has proven to predict earnings with 70% accuracy over a 10-year study using a one-week holding period.

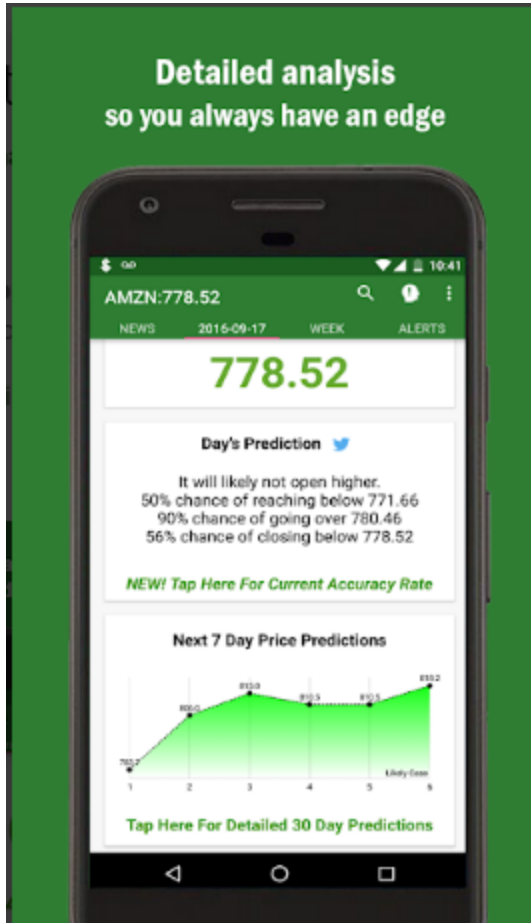


<https://www.zacks.com/>

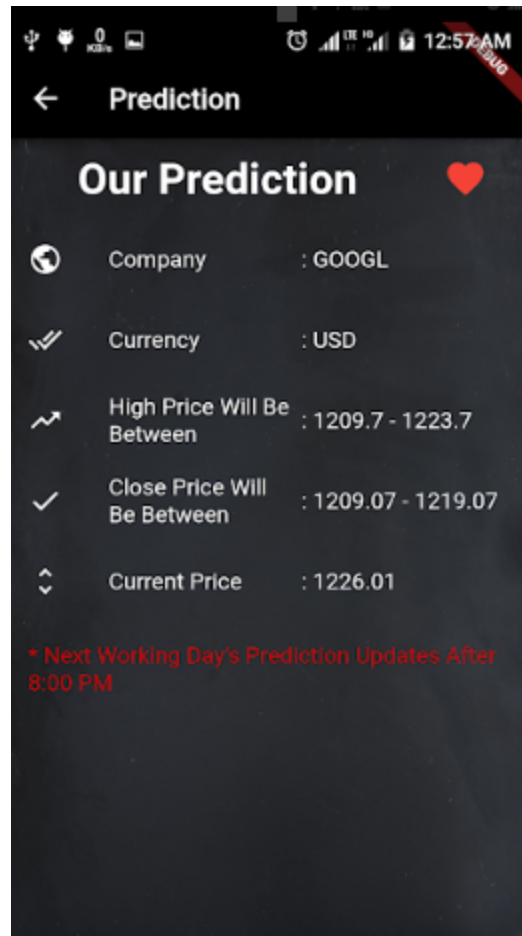
From Mobile Application; We have found different applications used predict stock market :

- **Market Sensei** : gives a stock's most likely low,high,opening & closing prices - daily. So you are comfortable in making your investment and trading decisions. Sensei also improves your intuition with the most fun stock training game. You can also explore the

activity of interesting stocks in a more fun way. View stock predictions for each of the next 7 trading days.



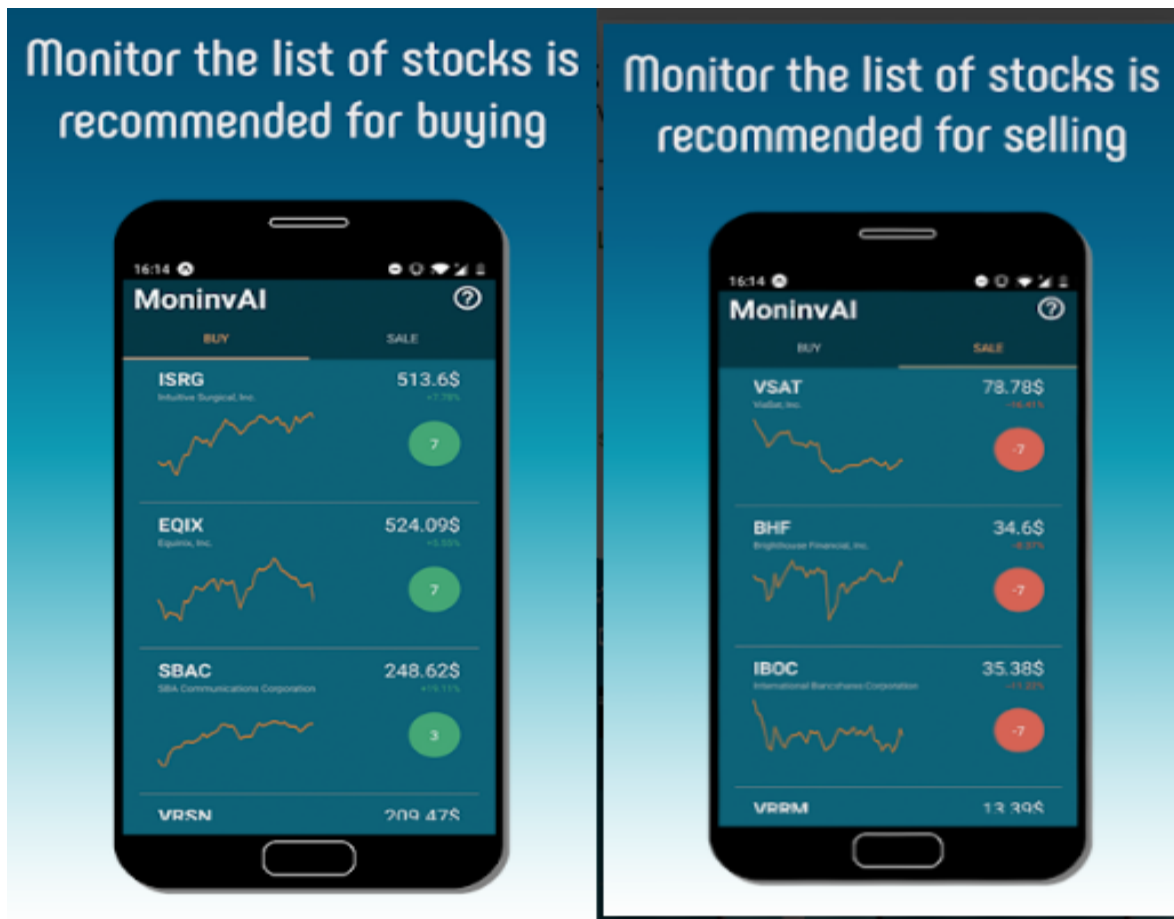
- **Stock Market Predictor:** the act of trying to determine the future price of a company stock. The successful prediction of a stock's future price could yield significant profit. It basically works with the past values of the company and gives the approximate range of the stock price.



- **MonInvAI: Stock Screener & Price Predictions:** screens stock market and predicts future price changes of company's stocks for best investments & trading opportunities using artificial intelligence (AI). Using advanced technologies we are trying to predict the future price change of company's stocks. The successful prediction of a stock's future price allows you to keep your portfolio profitable and up-to-date with the market. It basically scans the data of the company and gives the approximate probability for increasing or decreasing the



stock price.



- **stock-cast-stock-forecasts**: created StockCast to level the playing field with Wall Street and give you access to the same tools they have in an easy to use way, All of our models are based on proprietary statistical models that we have developed to forecast stocks. This is a light version of our more advanced app Clairvoyant - Stock Market & Forex Forecasting.



# Chapter 3: System Analysis

## 3.1 Project specification

### 3.1.1 Functional requirements

Function	Description
Sign-up	<p>Every user should sign up on the website to authenticate his identity so he should enter his:-</p> <ul style="list-style-type: none"><li>• Username</li><li>• First Name</li><li>• Last Name</li><li>• Password (min. 8 char)</li><li>• Resident Country</li></ul> <p>All this data will be entered only for the first time then we create cookie to the user</p>
Sign-in	<p>After making sign-up, he/she able to sign in the website using only:-</p> <ul style="list-style-type: none"><li>• Username</li><li>• Password</li></ul> <p>After signing we create cookie for the user</p>
Logout	<p>Users have the ability to logout and delete their cookies.</p>
Home	<p>The website home page will contain content about our services and what features we will make in the future.</p>
Trend	<p>Every week we update the trending page that consists of the company name and how much gain or lose it earned by calculating the pulse in this week.</p>

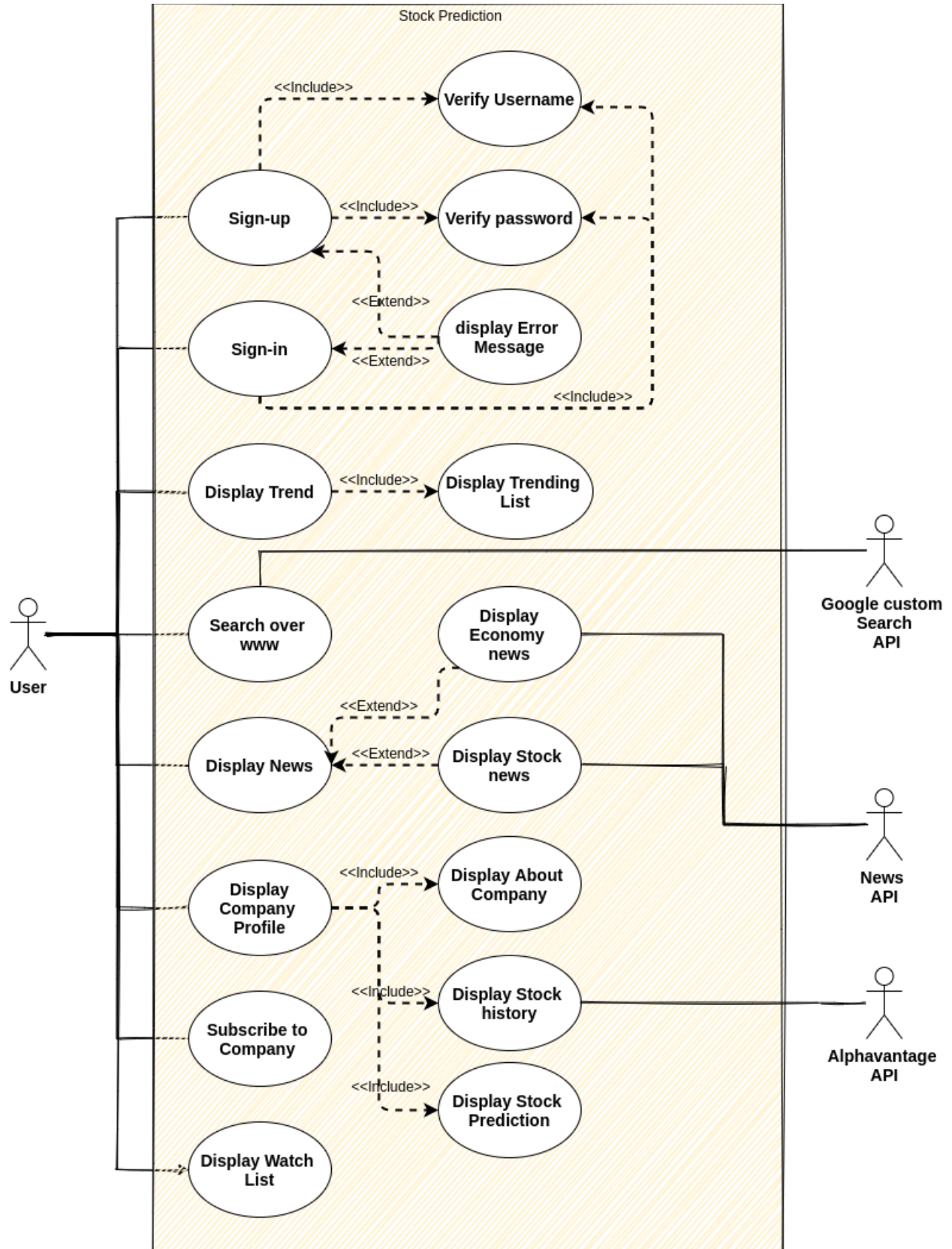
News	For every user, there is a customized news page based on his geographical location which displays the stock relevant news to this location.
Search	Search feature add to enable users to search on anything they want over the web, the searching results will be relevant to the query Note: search will be done using google custom search over yahoo.finance and msn money
Company profile	Every company in our system will have a profile which will contain: <ul style="list-style-type: none"> <li>• About <ul style="list-style-type: none"> <li>○ Industry</li> <li>○ Headquarters</li> <li>○ Current CEO</li> </ul> </li> <li>• History stock data (chart)</li> <li>• Prediction stock data (chart)</li> </ul>
Subscribe	Every user can subscribe to any company he/she is interested in, then by subscribing to this company will have an entity in the watch list.
Watch-list	Every user can subscribe to any company he/she wants to watch his stock index.

### 3.1.2 Non-Functional requirements

Requirement	Description
Performance	defines how fast a software system or its particular piece

	responds to certain users actions under certain workloads.
Scalability	assesses the highest workloads under which the system will still meet the performance requirements.
Portability	defines how a system or its element can be launched in one environment or another.
Security	all data inside the system or its part will be protected against malware attacks or unauthorized access.
Reliability	This quality attribute specifies how likely the system or its element would run without failure for a given period of time under predefined conditions.
Maintainability	defines the time required for a solution or its component to be fixed, changed to increase performance or other qualities, or adapted to a changing environment.
Availability	describes how likely the system is accessible for a user at a given point in time.

## 3.2 Use Case Diagram



Use Case ID	
Use Case Name	
Actor	
Abstract	
Pre-condition	
Post-condition	
Flow of events	
Exceptions	

Use Case ID	1
Use Case Name	Sign-up
Actor	User
Abstract	User will be authenticated by the system.
Pre-condition	User enter registration data: 1. Username (unique) 2. First name 3. Last name 4. Password 5. Choose resident country

Post-condition	<ol style="list-style-type: none"> <li>1. System validate user inputs.</li> <li>2. System will save the user in the database.</li> </ol>
Flow of events	<ol style="list-style-type: none"> <li>1. User request sign-up page.</li> <li>2. User fill registration form.</li> <li>3. System will save users in the database.</li> </ol>
Exceptions	<ol style="list-style-type: none"> <li>1. Existing user with the same username.</li> <li>2. Password less than 8 chars.</li> </ol>

Use Case ID	2
Use Case Name	Sign-in
Actor	User
Abstract	Users are able to enter the system without sign-up again.
Pre-condition	<ol style="list-style-type: none"> <li>1. User must sign-up first (Use Case 1).</li> <li>2. User fill sign-in form: <ol style="list-style-type: none"> <li>a. Username</li> <li>b. Password</li> </ol> </li> </ol>
Post-condition	<ol style="list-style-type: none"> <li>1. System validate user inputs.</li> <li>2. Users will be able to use system features.</li> </ol>
Flow of events	<ol style="list-style-type: none"> <li>1. User navigated to the sign-in page.</li> </ol>

	2. User fill sign-in form.
Exceptions	1. Username did not match any existing username. 2. Password did not match username.

Use Case ID	3
Use Case Name	Display Trend
Actor	User
Abstract	User will be able to view trending page.
Pre-condition	User request trending page.
Post-condition	1. System will compute trending results. 2. System will display results.
Flow of events	1. User request trending page.

Use Case ID	4
Use Case Name	Search over world wide web (www)
Actor	User
Abstract	User will be able to search for any query he/she wants.
Pre-condition	1. User enters searching query.
Post-condition	1. System will process the query. 2. System will make an api (google custom



	search) request.
Flow of events	<ol style="list-style-type: none"> <li>1. User enters query.</li> <li>2. System process query.</li> <li>3. System display query results.</li> </ol>
Exceptions	No searching results found

Use Case ID	5
Use Case Name	Display news
Actor	User
Abstract	User will be able to view news page.
Pre-condition	<ol style="list-style-type: none"> <li>1. User must be signed into the system (Use Case 1 &amp; 2).</li> </ol>
Post-condition	<ol style="list-style-type: none"> <li>1. System will take user resident country.</li> <li>2. System will make an api request (to news api)</li> <li>3. System will display relevant results.</li> </ol>
Flow of events	<ol style="list-style-type: none"> <li>1. User sign into the system.</li> <li>2. User navigate/request to news page</li> </ol>
Exceptions	No news found

Use Case ID	6
Use Case Name	Display company profile

Actor	User
Abstract	User will be able to view company profile.
Pre-condition	1. User must be signed first (Use Case 1 & 2).
Post-condition	1. System will process user request. 2. System will navigate user into the profile.
Flow of events	1. User request a specific company profile. 2. System retrieve profile data. 3. User view company profile.
Exceptions	Company not existed

Use Case ID	7
Use Case Name	Display stock prediction
Actor	User
Abstract	User will be able to display a stock prediction to a specific company.
Pre-condition	1. User must be signed first (Use Case 1 & 2).
Post-condition	1. System will process user request. 2. System will navigate user into the prediction section.
Flow of events	1. User request a specific company prediction. 2. System computer prediction (run Machine learning model). 3. User view prediction results.
Exceptions	Prediction model not existed.

Use Case ID	8
Use Case Name	Subscribe to company
Actor	User
Abstract	User will be able to subscribe to any company he/she wants.
Pre-condition	1. User must be signed first (Use Case 1 & 2).
Post-condition	1. System will mark this company as a subscribed company for this user in the database.
Flow of events	<ol style="list-style-type: none"> <li>1. User request a specific company.</li> <li>2. User subscribe to this company.</li> <li>3. System will mark this company as subscribed for this user.</li> </ol>

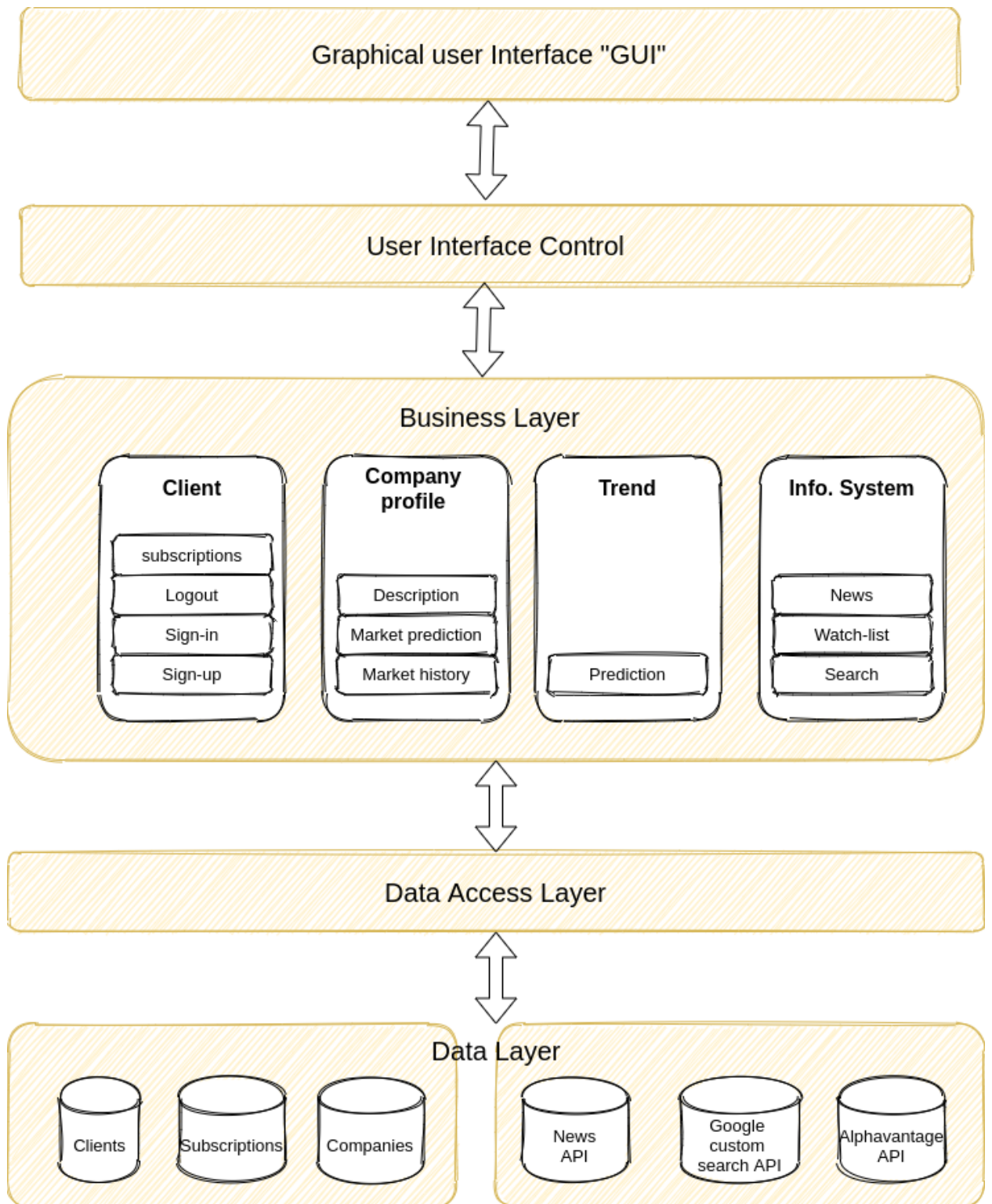
Use Case ID	9
Use Case Name	Display watch-list
Actor	User
Abstract	User will be able to display companies he/she subscribed for.
Pre-condition	<ol style="list-style-type: none"> <li>1. User must be signed first (Use Case 1 &amp; 2).</li> <li>2. User subscribe to a specific company (Use Case 8).</li> </ol>
Post-condition	1. System will retrieve a subscribed list for the

	user.
Flow of events	<ol style="list-style-type: none"> <li>1. User subscribe for a specific company (Use Case 8).</li> <li>2. User navigate/request watch-list page</li> <li>3. System will display watch-list.</li> </ol>
Exceptions	No subscribed companies found.

### 3.3 SYSTEM TEST CASES

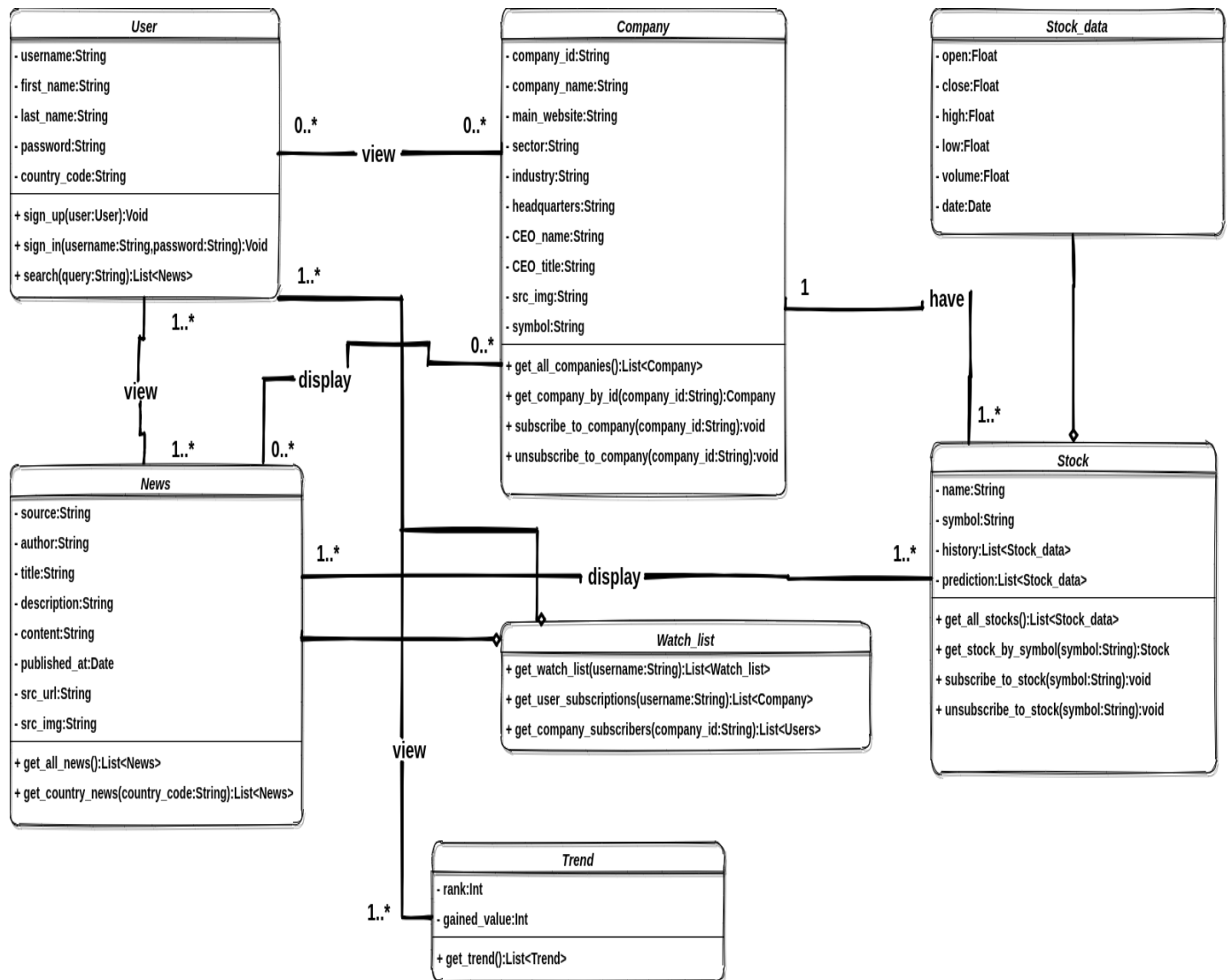
## Chapter 4: System Design

- System component diagram



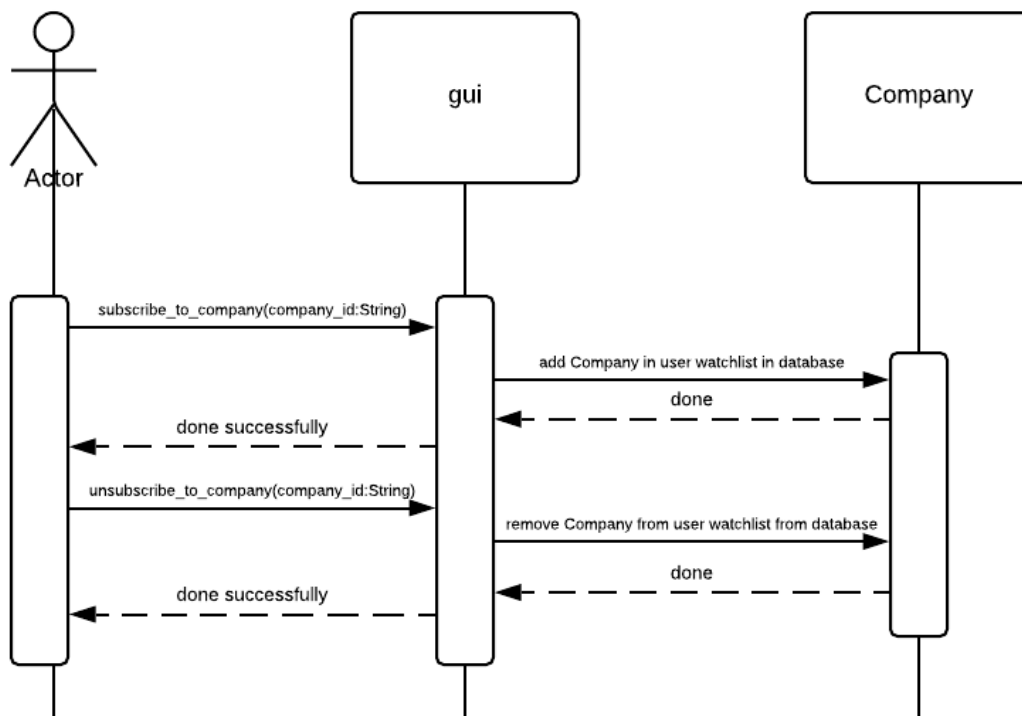
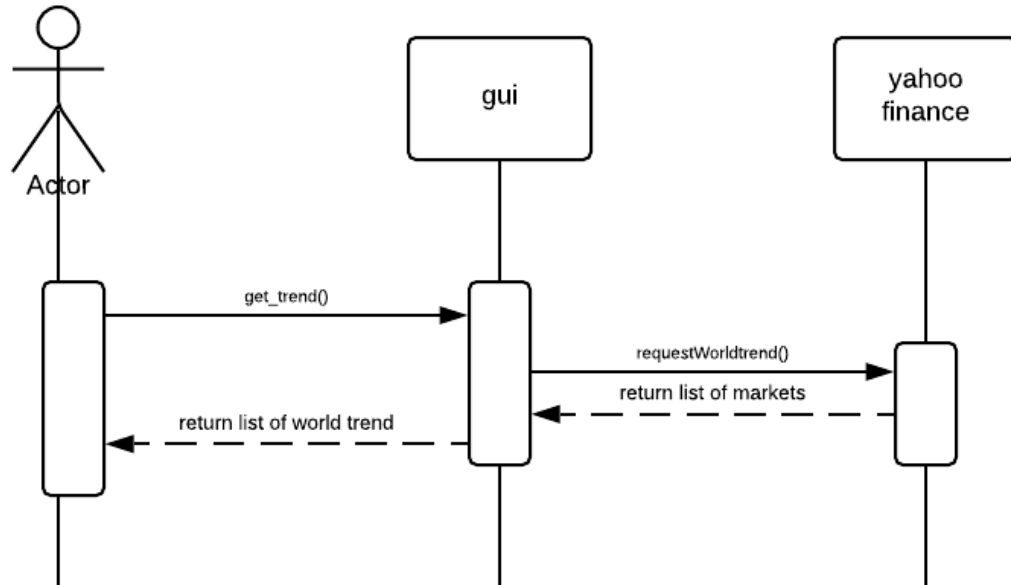
Layer	Description
Presentation	This layer contains the graphical user interface “GUI” and all the user interface “UI” components that will interact with the user
Presentation logic layer	This will connect every UI component in the system with his peer that performs the logical part of it.
Business	In this layer, all business logic and his rule will be embedded here.
Data access	This is an intermediate layer that controls the exchange of data between business logic/rules and actual data that will be retrieved either from database or application programming interfaces “APIs”
Data	Data layer will contain the actual stored data in databases and also that will be retrieved from APIs

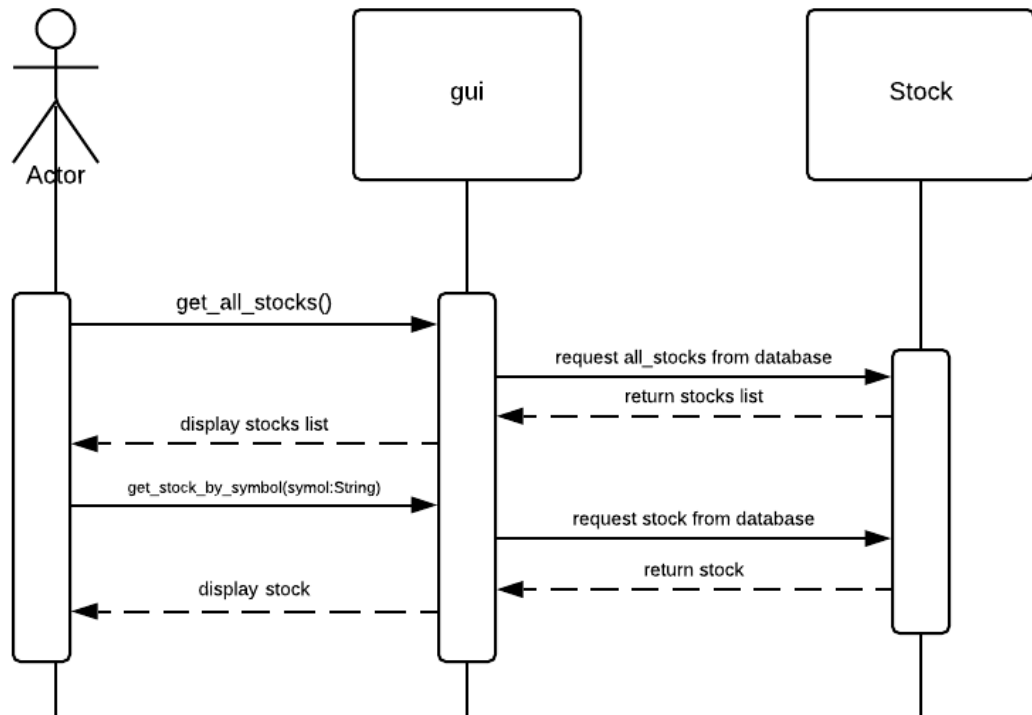
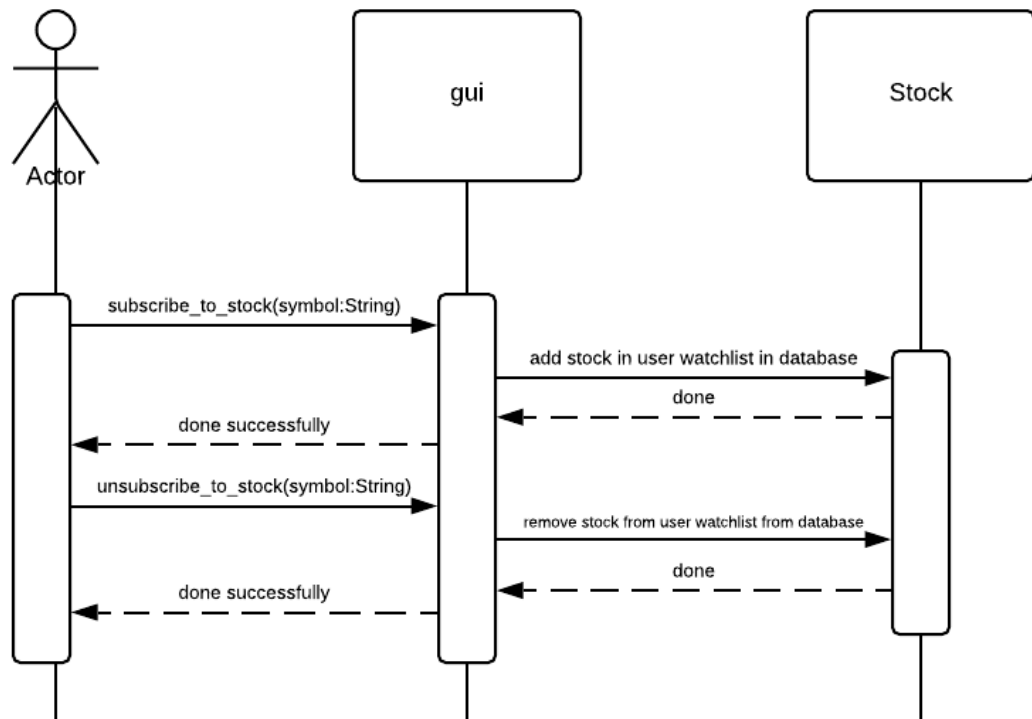
- System Class Diagrams

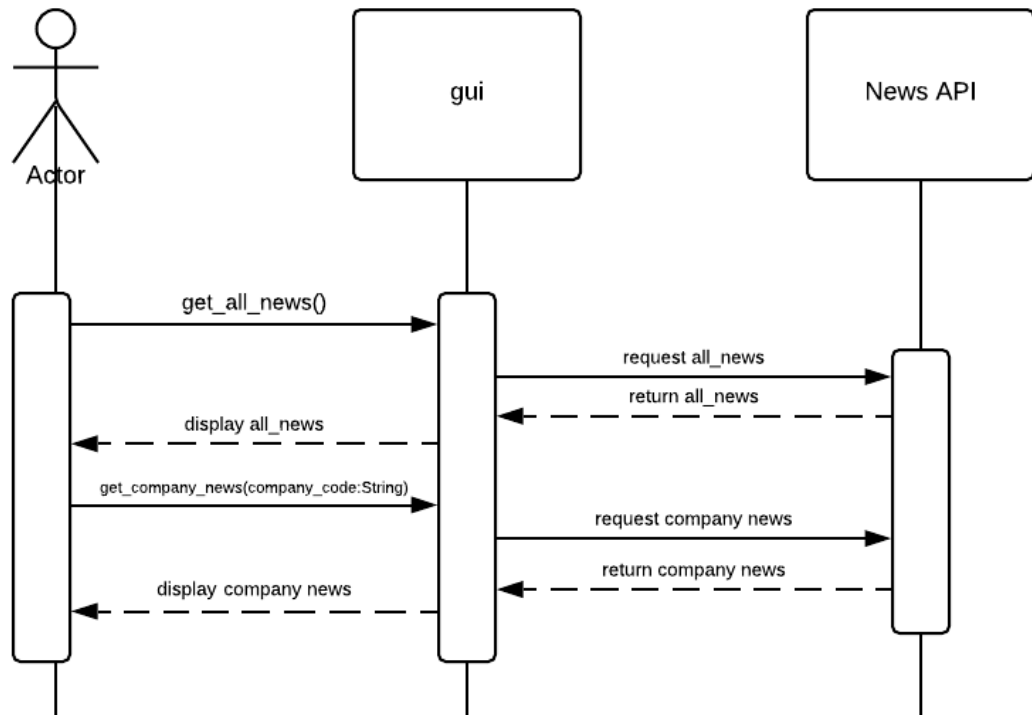
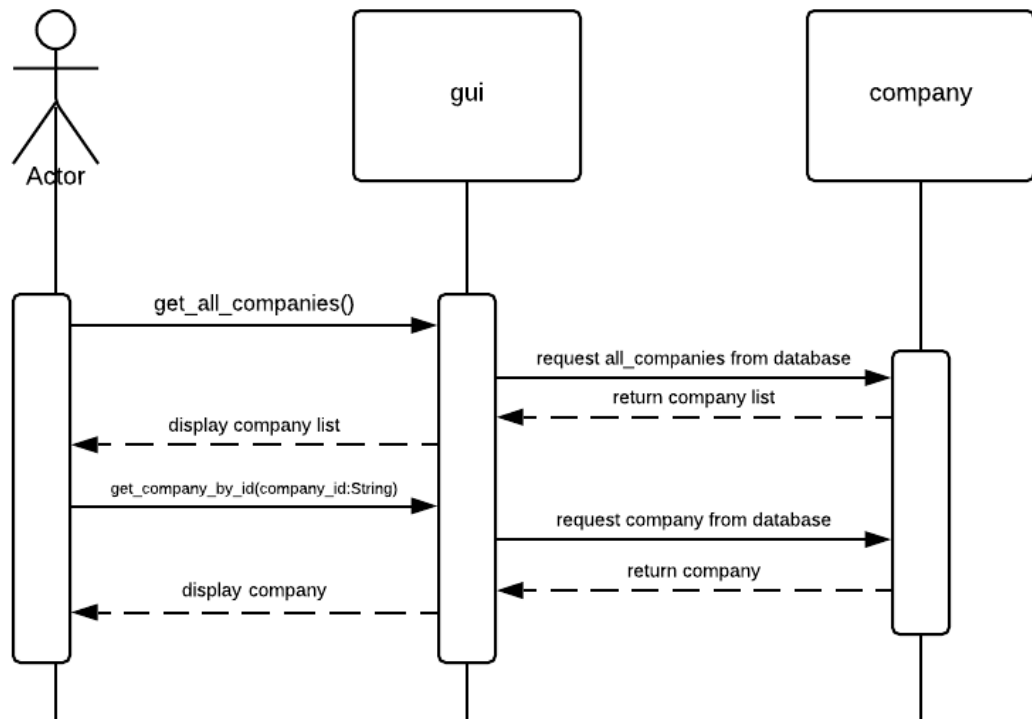


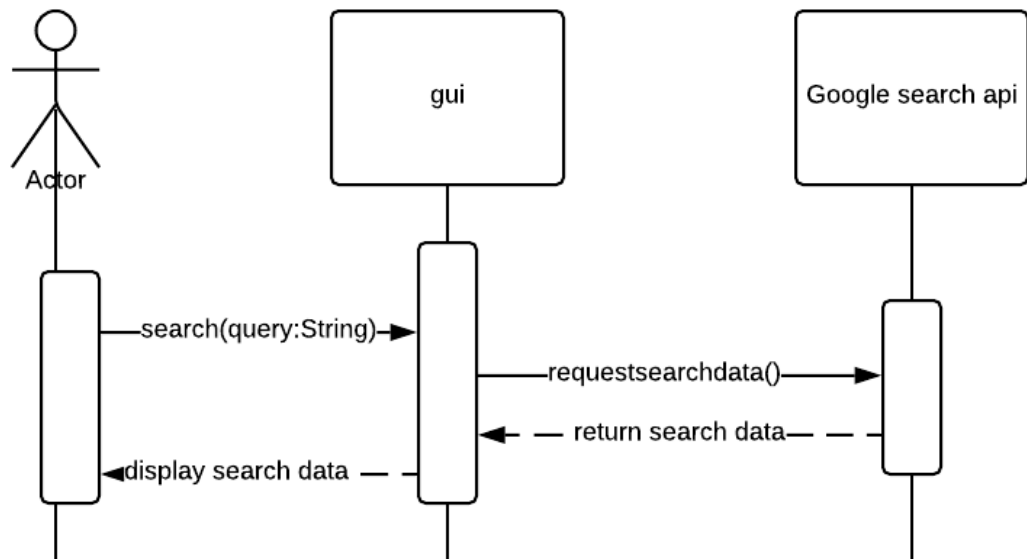
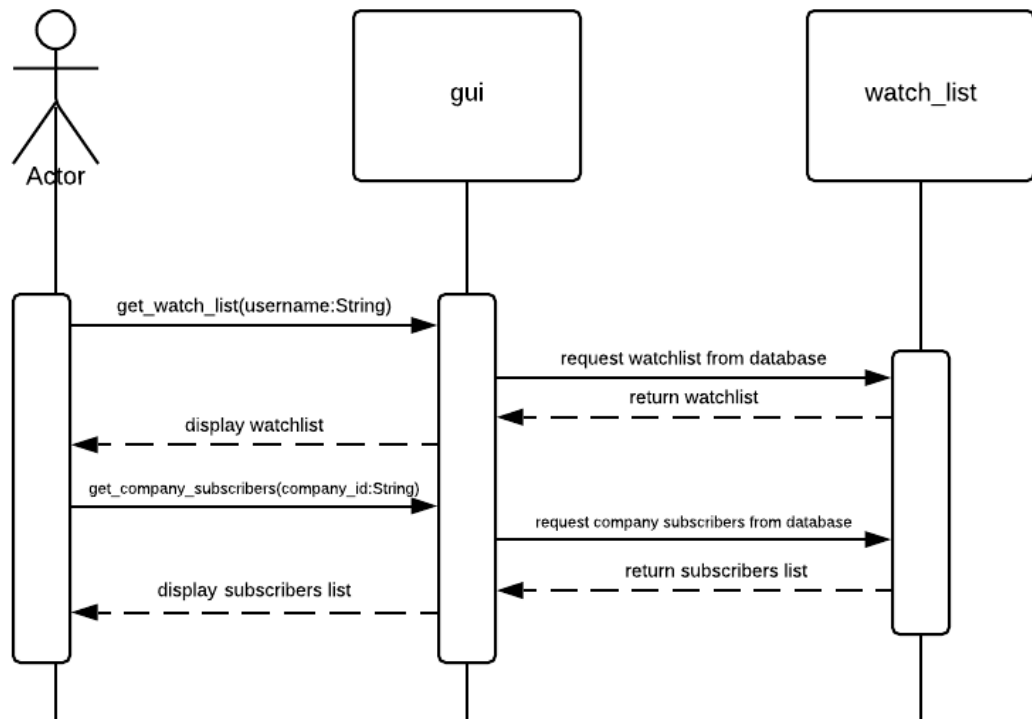


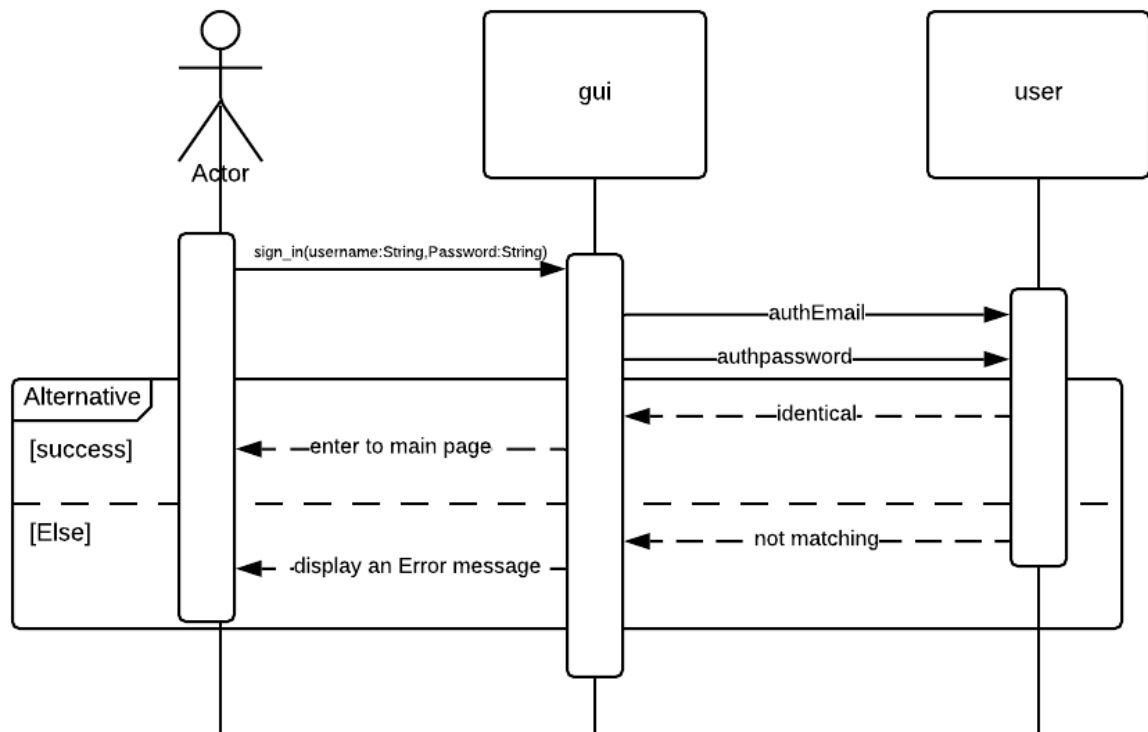
- Sequence Diagrams

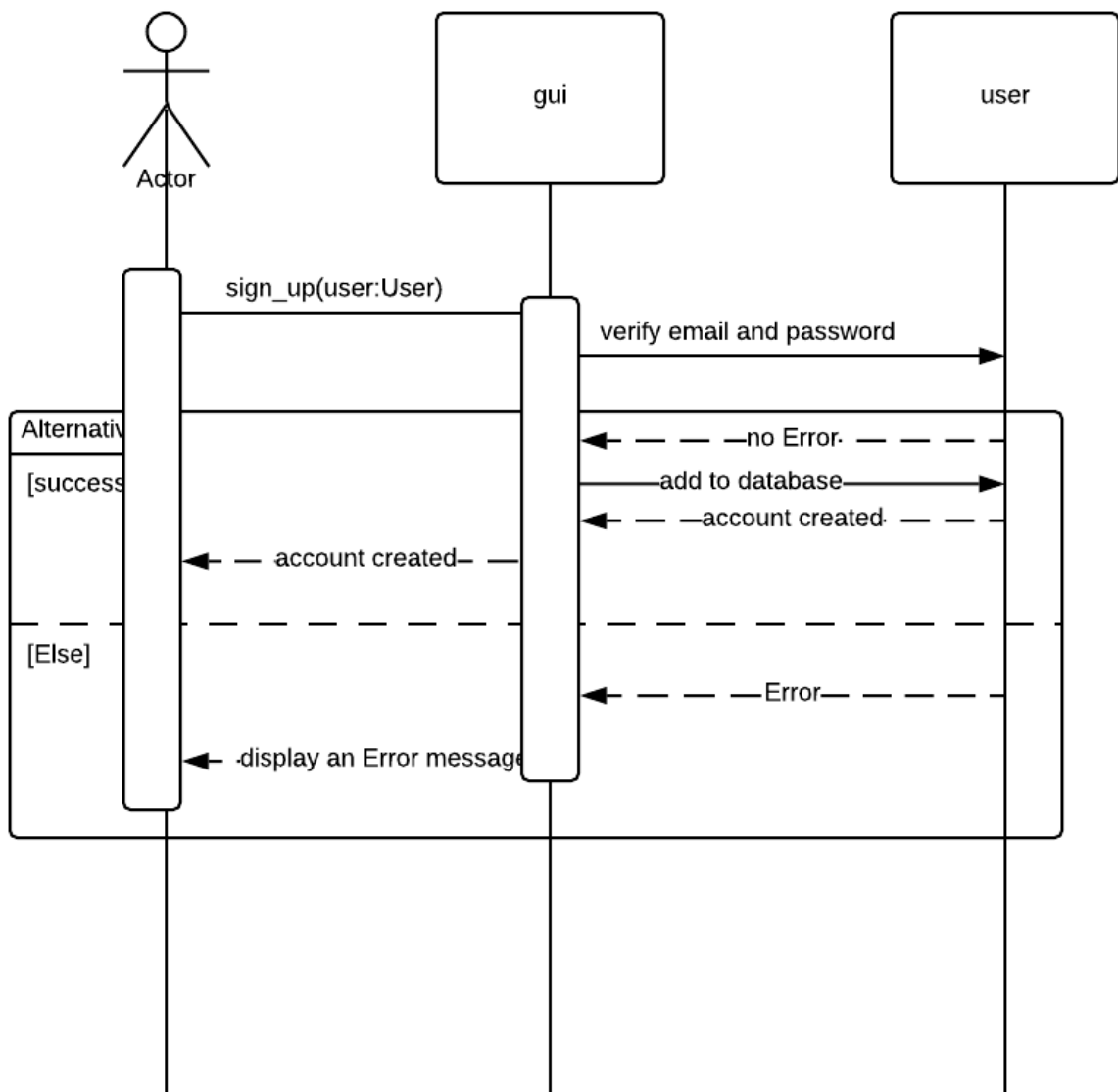












- Project ERD
- System GUI Design

## 5- IMPLEMENTATION AND TESTING

### Implementation:

- As we started implementing we know what to do but not how to do it exactly, luckily for us most of the technologies we used had a good learning curve and the ideas we were pursuing had a lot of papers to help us get there, in this part we will talk about the components and parts that make this project tick.

### Machine learning models (algorithms) :

**Xgb:** XGBoost is a gradient boosting library with focus on tree model, which means inside XGBoost, there are 2 distinct parts:

1. The model consisting of trees and
2. Hyperparameters and configurations used for building the model.

**Lstm:** Long Short-Term Memory (LSTM) networks are a type of recurrent neural network capable of learning order dependence in sequence prediction problems.

### Datasets:

Daily apple dataset from

## Daily WMT dataset

### Packages and libraries :

#### Npm:

is a package manager for the JavaScript programming language. It is the default package manager for the JavaScript runtime environment Node.js. It consists of a command line client, also called npm, and an online database of public and paid-for private packages, called the npm registry

#### keras API:

Keras is the high-level API of TensorFlow : an approachable , highly-productive interface for solving machine learning problems, with a focus on modern deep learning. It provides essential abstractions and building blocks for developing and shipping machine learning solutions with high iteration velocity.

#### Jason:

Java Script Object Notation is an open standard file format, and data interchange format, that uses human-readable text to store and transmit



data objects consisting of attribute–value pairs  
and array data types

Pandas:

In computer programming, pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series.

Numpy:

a great fundamental package for scientific computing with Python. It

contains among other things:

- a powerful N-dimensional array object
- sophisticated (broadcasting) functions
- tools for integrating C/C++ and Fortran code
- useful linear algebra, Fourier transform, and random number

Axios:

Body parser

## Cookie parser

### Testing :

#### 1. Unit test

Unit testing is carried out for testing modules constructed from the system design

Each part is compiled using inputs for specific modules. Every modules are

assembled into a larger unit during the unit testing process.

Testing has been performed on each phase of project design and coding. The testing

of module interface is carried out to ensure the proper flow of information into and

out of the program unit while testing. The temporarily generated output data is

ensured that maintains its integrity throughout the algorithm's execution by examining

the local data structure. Finally. all error-handling paths are also tested.

## 2. Integration test

We usually perform system testing to find errors resulting from unanticipated

interaction between the subsystem and system components. Software must be tested

to detect and rectify all possible errors once the source code is generated before

delivering it to the customers. For finding errors, series of test cases must be

developed which ultimately uncover all the possibly existing errors. Different

software techniques can be used for this process. These techniques provide systematic

guidance for designing test that exercise the internal logic of the software components

and exercise the input and output domains of a program to uncover errors in program

function, behavior and performance.

### 3. Verification and validation

The testing process is a part of broader subject referring to verification and validation.

We have to acknowledge the system specifications and try to meet the customer's

Requirements and for this sole purpose. we have to verify and validate the product to

make sure everything is in place. Verification and validation are two different things.

One is performed to ensure that the software correctly implements a specific

functionality and other is done to ensure if the customer requirements are properly

met or not by the end product.

Verification of the project was carried out to ensure that the project met all the

requirement and specification of our project. We made sure that our project is up to

the standard as we planned at the beginning of our project development.

## Test case 1:

localhost:8080/news

Apps Y4T2 - Google Drive (95) 7- weil oder de... PPT - The FIVE DYS... (98) The 5 Dysfuncti... (98) good teamwor... عناصر بناء الثقة بين أ... GitHub - petranb2/...

Stock Home Services News Search Username: karam

استقرار سعر الذهب اليوم بالسوق المحلي و عيار 21 عند 910 جنيهه - محتوى بلس  
Muhtwaplus.com | 2020-08-09 20:05:58  
الموافق 9 أغسطس 2020 استقر سعر الذهب في السوق المحلي وذلك بعد الانخفاض الذي حدث أمس السبت بشكل مفاجئ حيث تحدث نادي  
[More](#)

ارتفاع جماعي لمؤشرات البورصة المصرية للجلسة الرابعة على التوالي - اليوم السابع  
Yuum7.com | 2020-08-09 12:40:00  
مصرية، تعاملات جلسة اليوم الأحد، بداية جلسات الأسبوع، بارتفاع جماعي لكافة المؤشرات، للجلسة الرابعة على التوالي، كما ارتفع رأس المال الس  
[More](#)

ArabFive - توشيبا بتودع سوق اللاب توب بعد 35 سنة  
Arabfive.com | 2020-08-09 12:32:14  
See More مما يعني أنها Sharp أكدت توشيبا هذا الأسبوع أنها باعت الحصة المتيقفة في أعمال الكمبيوتر المحمول الخاصة بها إلى

## Test case 2:

localhost:8080/companies

Apps Y4T2 - Google Drive (95) 7- weil oder de... PPT - The FIVE DYS... (98) The 5 Dysfuncti... (98) good teamwor... عناصر بناء الثقة بين أ... GitHub - petranb2/...

Stock Home Services News Search Username: karam

Companies List  
Watch List  
Trend

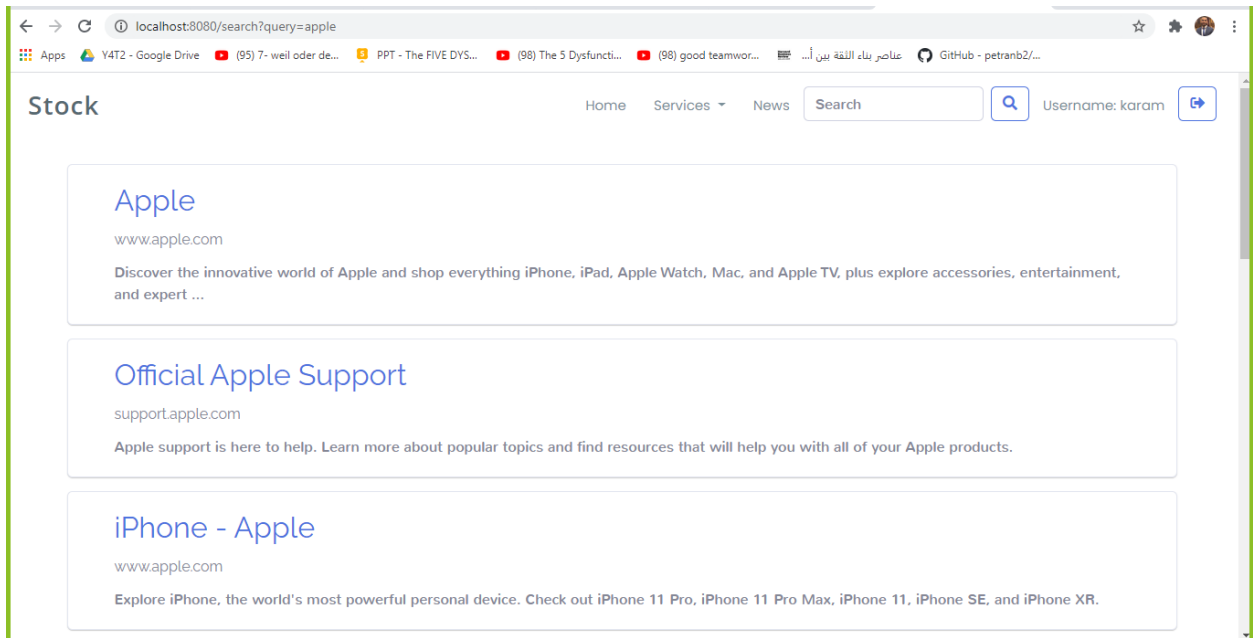
Walmart  
Retailing • General Merchandisers  
Website: walmart.com

Berkshire Hathaway  
Financials • Insurance: Property and Casualty (Stock)  
Website: berkshirehathaway.com

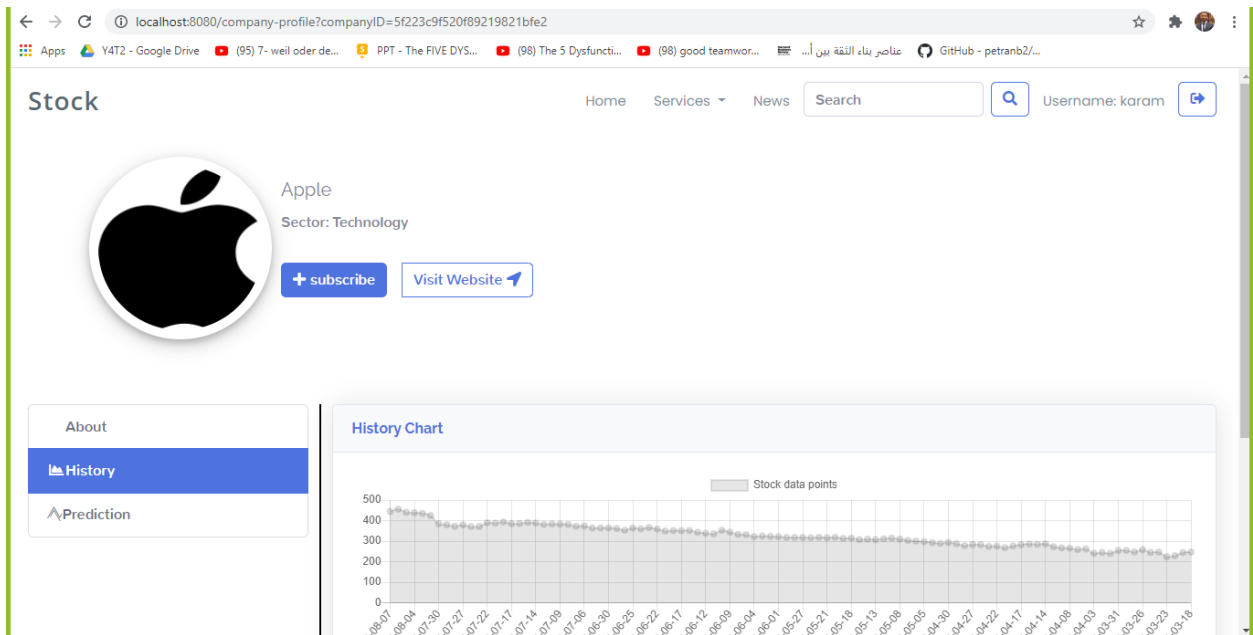
Apple  
Technology • Computers, Office Equipment  
Website: apple.com

Exxon Mobil

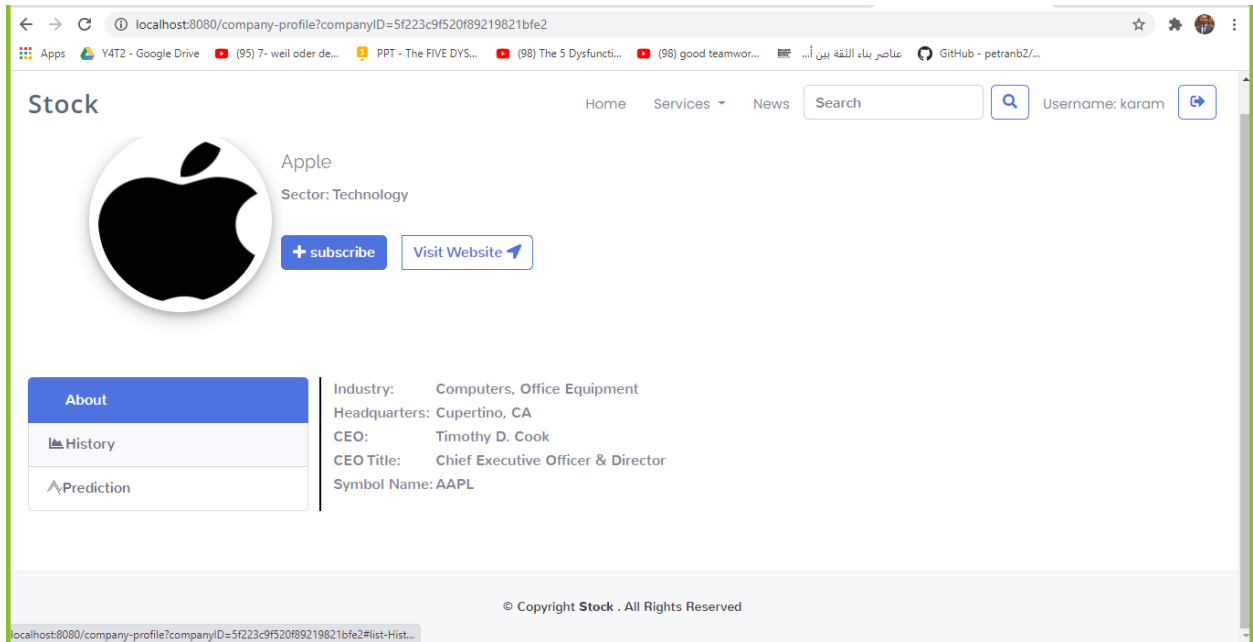
## Test case 3:



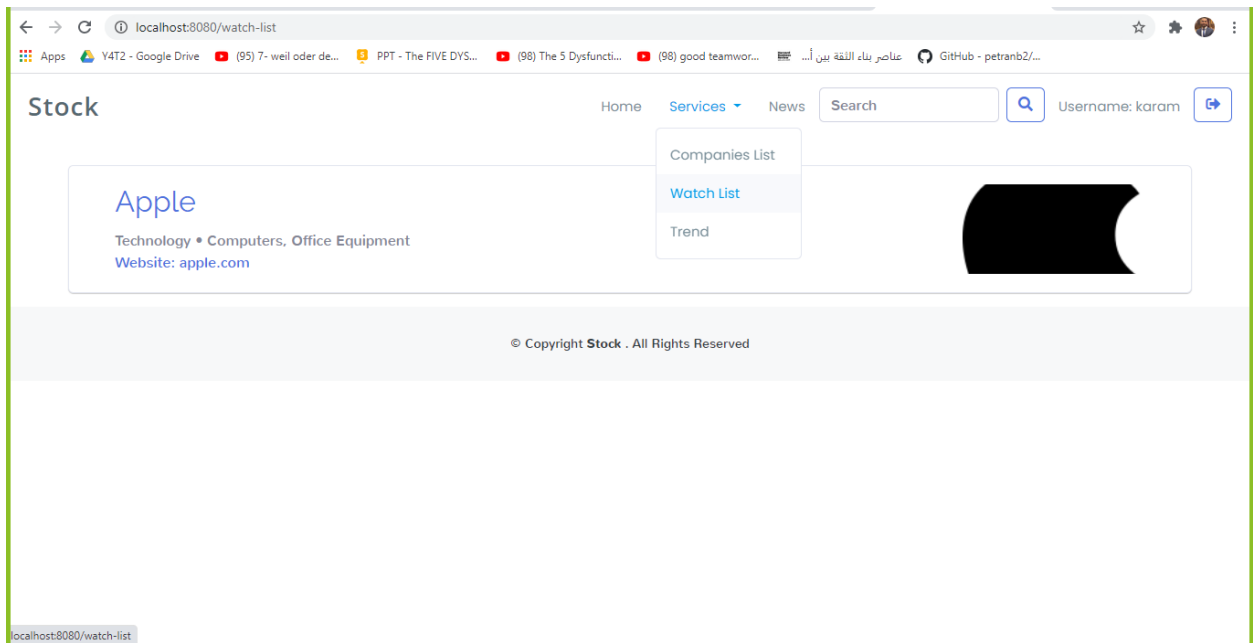
## Test case 4:



## Test case 5:



## Test case 6:



## Test case 7:

## Apple

Technology • Computers, Office Equipment  
Website: [apple.com](https://apple.com)

↑ 39.788

## Berkshire Hathaway

Financials • Insurance: Property and Casualty (Stock)  
Website: [berkshirehathaway.com](https://berkshirehathaway.com)

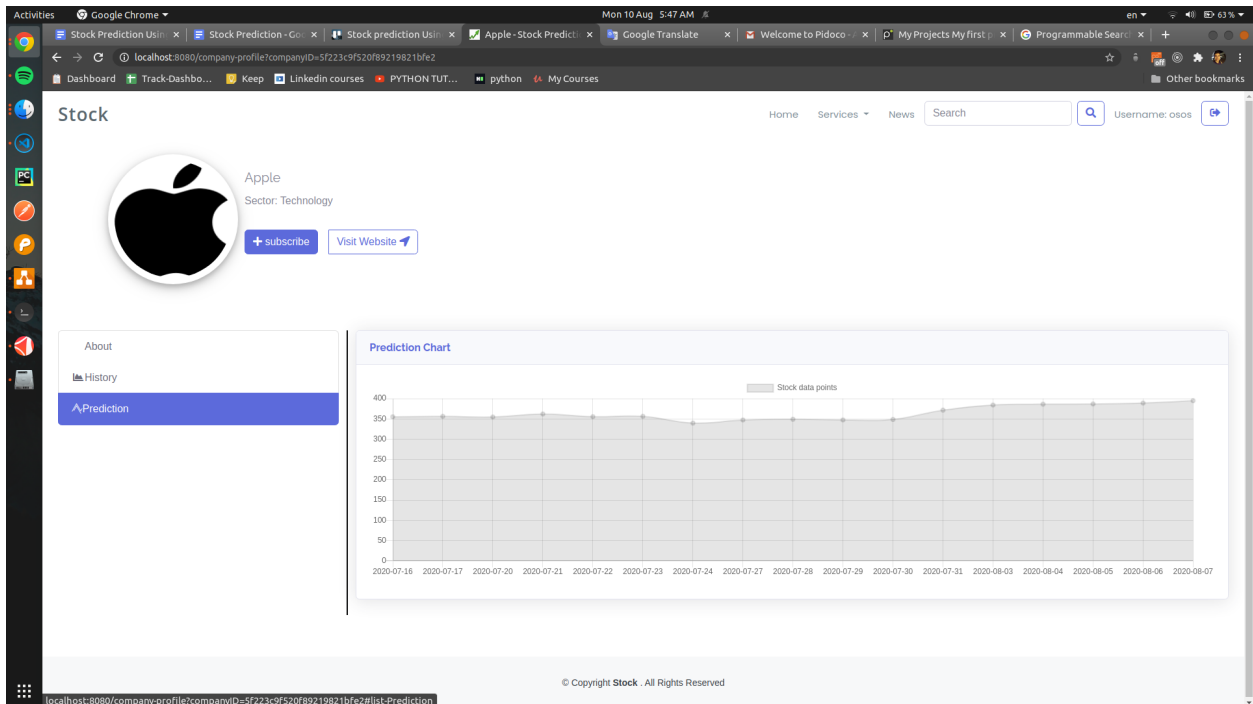
↑ 0.441

## Walmart

Retailing • General Merchandisers  
Website: [walmart.com](https://walmart.com)

↓ 1.304

## Test case 8:





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- Stock Market Analysis: A Review and Taxonomy of Prediction Techniques:  
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