Department of Computer Science North Carolina A&T State University

Architecture Design Specification

COMP 496: Senior Design II

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Finance Goons

Invest the Best

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Revision History

Revision	Date	Author(s)	Description
1.0	03/12/2020	KDS	document creation
1.1	03/17/2020	KS,KDS,MC,JA	initial release

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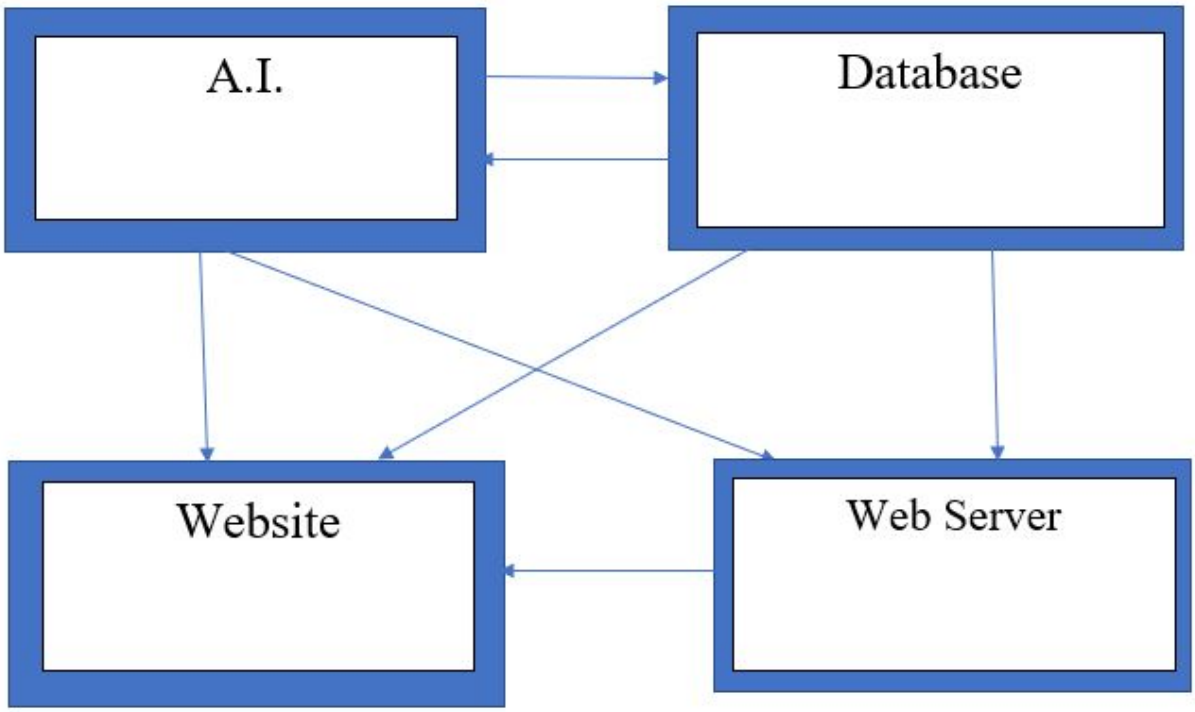
1 Introduction

This section provides an overview of our product and how the architectural design plays into the design of our product, Invest the Best. Invest the Best is a website that we are creating to allow people to view the stock market prices of different companies in the market and be able to show the predictions of how the market will change in the next day. The purpose of our product is to allow investors to be able to buy stocks and decide on which stocks that they want to buy. We want to create a service that can separate companies by the industry that they work in. The service that we are providing will be displayed as a web page to the customer as they navigate throughout the website.

The service that we are building consists of four major components that go into the formation of our product. Those components consist of the website, the AI, the web server, and the database. The website is the interface on which all of the data that will be displayed for our product, the website will also contain a login feature that will allow users to enter their personal information and gain access to the website. The AI that we are planning to integrate into the website will utilize the data from the database to predict how the stock prices will change based on the trends throughout the day. The web server will be used to connect the website on the server that is being provided. The database will be used to provide the AI and the website with the information that they need such as company stock to be able to find the prediction of the stock market price and even user information that will be used for the login system.

2 System Overview



2.1 Website

The website layer is the layer that will display the information that is provided by the other layers of our system. The website will include features such as the login system and the display that will show all of the data provided by the web server and database. The website will make use of the Google API to create the login system for the website and the database for the user information so users can log into the system.

2.2 Database

The purpose of the data is to store the information that will be used by the website. The data stored will consist of the user data, prediction values, and the stock data. The user data will be used to store the names of the users and other data to keep track of the preferences of certain users. The database will also store the prediction value that the AI will use the data later to make the best prediction for the

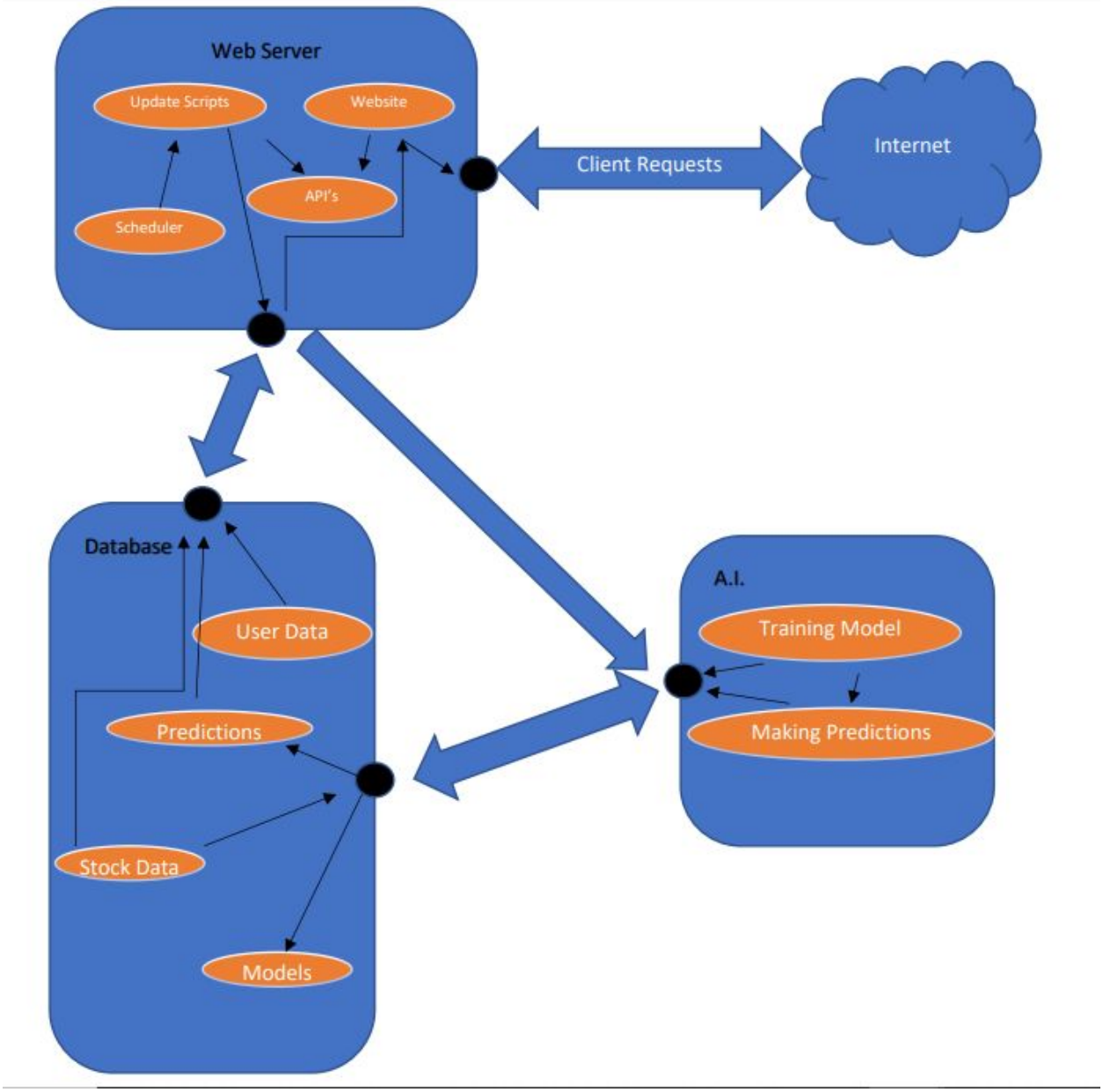
2.3 A.I.

The purpose of the machine learning algorithm is to find the best prediction for the rise and fall of the stock market for each company. There will be a training model in place for the A.I so that it can get the proper training to be able to find the most accurate prediction for stock market changes. We will be using tensorflow or keras to train the AI with the data of the companies provided by the database.

2.4 Web server

The web server will be used to track the page requests being made to the website and update for the data in the database. The web server will be able to actively update the model of the graph that is displayed and update the predictions of what the AI algorithm will be making so that it can find the best possible rise and fall of the prices each day. The server will also use API from Tiingo and Google. The Tiingo API will be used to get the stock market information to be implemented into the system and the Google API will be used to create the login feature for our website.The scheduler will update the data of the stock after the business day has ended.

3 Subsystem Definition & Data Flow



4 Website

The purpose of the website is to display the data to the user. There are three pages in total. A homepage for learning what this website is about. A industry page for seeing how an industry's stocks as a whole are moving. Finally a company page to see the predictions for that company.

4.1 Home Page

This page is here to display information about the website. The home page will display information about the group that made the website.

4.1.1 Assumptions

This page should allow a user to select an industry from the list available from the database. This page should also incorporate the Google login API to allow people to login using their gmail account

4.1.2 Responsibilities

This page needs to describe the website, allow people to login using their google account, and allow someone to choose an industry, preference, or search a company.

4.1.3 Interfaces

This subsystem should be used to lead a user from one section of the website to the next.

ID	Description	Input	Output
#1	Search	Name of a company	The company page
#2	Preference	One of the person's saved preferences	The company page or industry page
#3	DropBox	One of the listed industries	The industry page
#4	Home button	None	Returns to the home page
#5	Login button	Google account information	Signed into google

4.2 Industry Page

This page should display the trends in the selected industry as well as see if the prediction of whether this industry's stock prices will increase or decrease as a whole. It should also allow a person to choose a company that belongs to the selected industry.

4.2.1 Assumptions

This page should allow a user to select a company from the list available from the database in the currently selected industry. This page should receive information from the database to show the user how the company is doing in the stock market. This page should also incorporate the Google login API to allow people to login using their gmail account.

4.2.2 Responsibilities

This page needs to show the trends happening in the industry.

4.2.3 Interfaces

This subsystem should be used to lead a user from one section of the website to the next.

ID	Description	Input	Output
#1	Search	Name of a company	The company page
#2	Preference	One of the person's saved preferences	The company page or industry page
#3	DropBox	One of the listed companies	The company page
#4	Home button	None	Returns to the home page
#5	Login button	Google account information	Signed into google

4.3 Company Page

This page should display the trends in the selected company as well as see if the prediction of whether its stock prices will increase or decrease.

4.3.1 Assumptions

This page should receive information from the database to show the user how the company is doing in the stock market. This page should also incorporate the Google login API to allow people to login using their gmail account.

4.3.2 Responsibilities

This page needs to show the trends happening in the company.

4.3.3 Interfaces

This subsystem should be used to lead a user from one section of the website to the next.

ID	Description	Input	Output
#1	Search	Name of a company	The company page
#2	Preference	One of the person’s saved preferences	The company page or industry page
#3	Home button	None	Returns to the home page
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5 Database

The purpose of the data is to store the information that will be used by the website. The data stored will consist of the user data, models, prediction values, and the stock data. The user data will be used to store the names of the users and other data to keep track of the preferences of certain users. The database will also store the prediction value that the AI will use the data later to make the best prediction for the

5.1 User Data

This subsystem is used to store each users information to use for user accounts

5.1.1 Assumptions

It will be assumed that the system is able to input to the database

5.1.2 Responsibilities

This subsystem's responsibility is to store the users data

5.1.3 Interfaces

This subsystem can be check if the person logging in is who they are and other information

ID	Description	Input	Output
#1	User Data	Query (sql)	The action will be carried out based on the input query

5.2 Stock Data

This subsystem is used to store stock history

5.2.1 Assumptions

It will be assumed that the system is able to input to the database

5.2.2 Responsibilities

This subsystem's responsibility to store stock history

5.2.3 Interfaces

This subsystem can insert new data, delete unneeded data, and reference data

ID	Description	Input	Output
#1	Stock Data	Query (sql)	The action will be carried out based on the input query

5.3 Prediction Data

This subsystem is used to store previous prediction data

5.3.1 Assumptions

It will be assumed that the system is able to input to the database

5.3.2 Responsibilities

This subsystem's responsibility the data of the best prediction of the day to use for making better predictions

5.3.3 Interfaces

This subsystem can store prediction data

ID	Description	Input	Output
#1	Prediction Data	Query (sql)	The action will be carried out based on the input query

6 A.I.

The Machine Learning Layer provides our system with the stock predictions. In order to provide the needed predictions, data is taken from the database about each company and a model is trained for each and every company. Python scripts have been created in order to train the models and try and download data for empty company databases that are in the queue. Once each model is done training, the model is then saved and used to make predictions while it is still in memory. Predictions are made by taking the last data entry and feeding that to the model, the result is saved to a 2D list and the result is fed back into the model. This process is looped through a set number of times in order to achieve a general curve of how the model expects the stock to do.

6.1 Model Training

This subsystem is used to train each model using its respective data from the database. Once training is complete, the model is saved and then used to make predictions.

6.1.1 Assumptions

It will be assumed that the underlying system will have the capability to run python and enough memory to train models.

6.1.2 Responsibilities

It is this subsystem's sole responsibility to train and save models.

6.1.3 Interfaces

This subsystem's input is a 2D list and the output is the model used to make predictions

ID	Description	Input	Output
#1	Model creation	[["Date", close, high, low, open], ["Date", close, high, low, open], …]	Model (.h5 file)

6.2 Making Predictions

This subsystem is used to predict future stock prices based on the last day of data in the database for a company. The initial data will be in the following format:
[["Date", close, high, low, open],]
Models are loaded after training and fed the initial data, it then uses the result as the input for a new prediction. The ordered collection of predictions is then saved to the database.

6.2.1 Assumptions

It will be assumed that the models have been created using the most recent data.

6.2.2 Responsibilities

It is this subsystems's sole responsibility to make predictions based on the last data entry for a company

6.2.3 Interfaces

This subsystems's initial input is a 1D list that is made into a 2D list in order to append the prediction values to it.

ID	Description	Input	Output
#1	Predictions	h5 format model, [["Date", close, high, low, open],]	2D list of predictions: [["Date", close, high, low, open],]

7 Web Server

The web server will be used to track the page requests being made to the website and update for the data in the database. The web server will be able to actively update the model of the graph that is displayed and update the predictions of what the AI algorithm will be making so that it can find the best possible rise and fall of the prices each day. The server will also use API from Tiingo and Google. The Tiingo API will be used to get the stock market information to be implemented into the system and the Google API will be used to create the login feature for our website.The scheduler will update the data of the stock after the business day has ended.

7.1 Server

This subsystem is used to communicate with the client and update when certain changes are made

7.1.1 Assumptions

It will be assumed that the system is able to use the database and the predictions

7.1.2 Responsibilities

This subsystem’s responsibility to communicate to the client

7.1.3 Interfaces

This subsystem can track the page requests being made to the website and update for the data in the database

ID	Description	Input	Output
#1	Receive from client	Nothing	Received information
#2	Update database	Query (sql)	The action will be carried out based on the input query

7.2 APIs

This subsystem is used to get the stock market information and to create the login feature

7.2.1 Assumptions

It will be assumed that the system is able to use the APIs

7.2.2 Responsibilities

This subsystem's responsibility is to use APIs the get specific takes done

7.2.3 Interfaces

This subsystem can get the stock market data and login to an account

ID	Description	Input	Output
#1	Stock Data	Company symbol	[["Date", close, high, low, open],]
#2	Login	Username and password	Gain access to account data

7.3 Scheduler

This subsystem is used to say when to update the stock data using the API and run the A.I. section

7.3.1 Assumptions

It will be assumed that the system is able run repeatedly over a set time interval

7.3.2 Responsibilities

This subsystem's responsibility to update the stock data using the API and get predictions

7.3.3 Interfaces

This subsystem can interface with other areas

ID	Description	Input	Output
#1	Update the stock data	Time	Run the API code
#2	Get predictions	Time	Run predictions

References