Department of Computer Science North Carolina A&T State University

Detailed Design Specifications

COMP 496: Senior Design II

Spring 2020

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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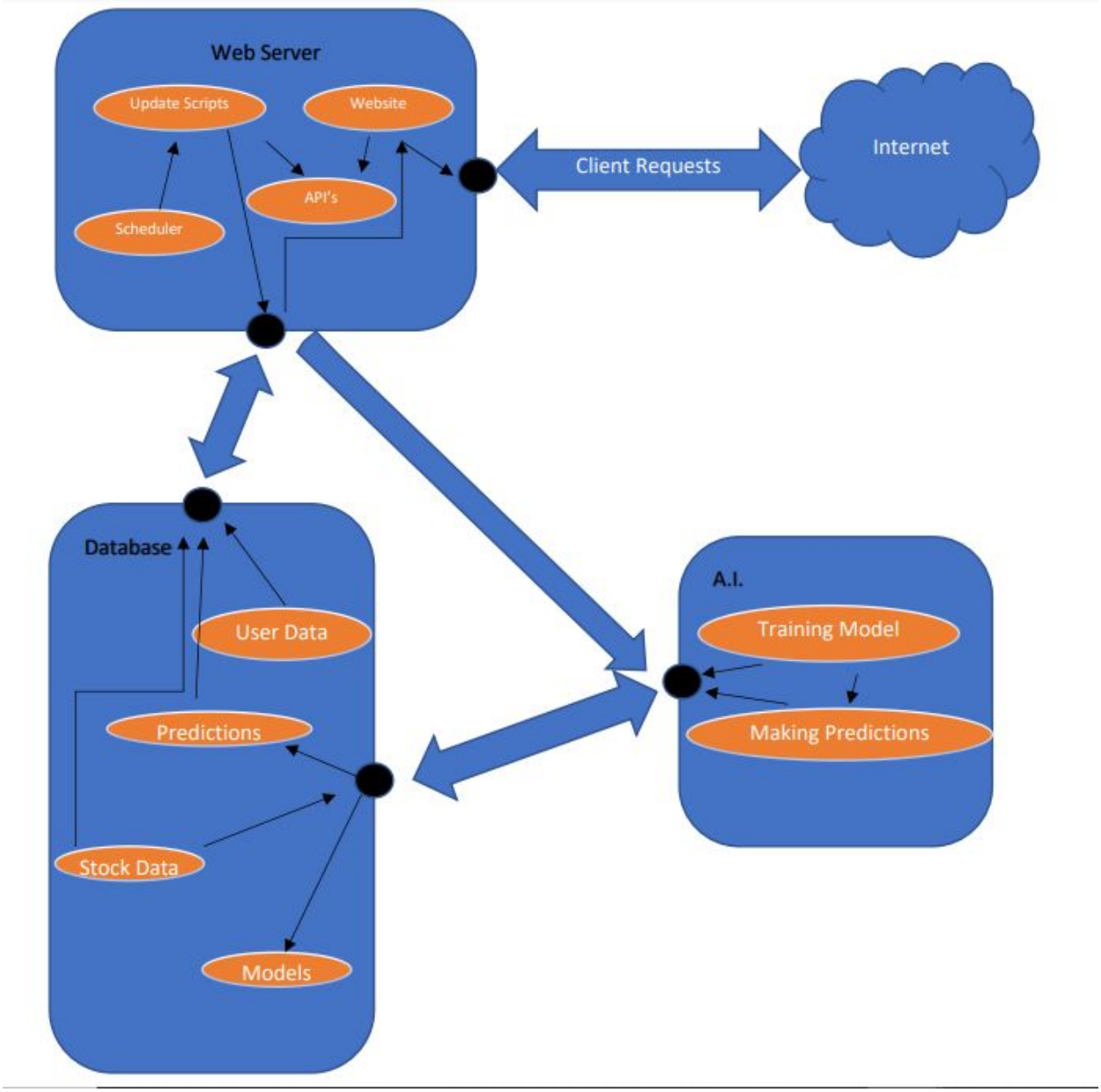
1 Introduction

Our project, Invest the Best, is a website that we are creating that will allow people to view the prices of the stock market, so that investors have the ability to decide which stocks they want to invest in, so they have the potential to earn more money by owning a portion of the company. The service that we are planning to create will be able to separate company stocks based on the industry that they are a part of. The service will be simple enough so that investors who are experienced in buying stocks and investors who are just starting to invest in different companies. The service will also include a login system that will allow users to log in to the website and has the ability to save their favorite companies that they like to invest in.

2 System Overview

Our project is divided into four main systems that will be used for the basis of our project design for the website. The four systems that are part of our design consist of the website, the webserver, the database, and the AI algorithm will be included into the system of the website. The web server will contain the server that the website is run on, an update script for, so the website is able to stay up to date with the stock market after the project is finished. The AI algorithm will contain an algorithm to calculate the predictions of how the stock prices will rise and fall throughout the day. The website is the physical service that will display the information given from the database and will feature a login system. The database will contain all the customer and industry information that will be displayed on the website and given to the web server. The database will also be used to store the users on the website and keep track of the data of the preferences certain users have, and store the predicted values created by the AI algorithm.


Web Server
Update Scripts
Website
API's
Scheduler
Client Requests
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User Data
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3 Website Layer Subsystems

3.1 Layer Hardware

This subsystem is a software process running on a web server.

3.2 Layer Operating System

This subsystem is a software process running on a web server. The web server is running on Python using flask

3.3 Layer Software Dependencies

Bootstrap is one of the dependencies. It allows for easier than normal html scripting.

3.4 Subsystem Home Page

The home page for the website.

3.4.1 Subsystem Hardware

This subsystem is a software process running on a web server.

3.4.2 Subsystem Operating System

This subsystem is a software process running on a web server. The web server is running on Python using flask.

3.4.3 Subsystem Software Dependencies

A software dependency that is required by the layer is Bootstrap

3.4.4 Subsystem Programming Languages

HTML, Javascript

3.4.5 Subsystem Data Structures

This system takes in queries in the search box and the dropdown box to decide on whether to move to the industry or company page and which version of them to go to.

3.4.6 Subsystem Data Processing

N/A

3.5 Subsystem Industry Page

The Industry page for the website.

3.5.1 Subsystem Hardware

This subsystem is a software process running on a web server.

3.5.2 Subsystem Operating System

This subsystem is a software process running on a web server. The web server is running on Python using flask.

3.5.3 Subsystem Software Dependencies

A software dependency that is required by the layer is Bootstrap

3.5.4 Subsystem Programming Languages

HTML, Javascript

3.5.5 Subsystem Data Structures

This system takes in queries in the search box and the dropdown box to decide on whether to move to the industry or company page and which version of them to go to.

3.5.6 Subsystem Data Processing

N/A

3.6 Subsystem Company Page

The Company page for the website.

3.6.1 Subsystem Hardware

This subsystem is a software process running on a web server.

3.6.2 Subsystem Operating System

This subsystem is a software process running on a web server. The web server is running on Python using flask.

3.6.3 Subsystem Software Dependencies

A software dependency that is required by the layer is Bootstrap

3.6.4 Subsystem Programming Languages

HTML, Javascript

3.6.5 Subsystem Data Structures

This system takes in queries in the search box to decide on whether to move to the industry or company page and which version of them to go to.

3.6.6 Subsystem Data Processing

N/A

4 Database Layer Subsystems

4.1 Layer Hardware

This subsystem is a software process running on an computer that will run the database and use sql

4.2 Layer Operating System

N/A

4.3 Layer Software Dependencies

A software dependency that is required by the layer are sqlite

4.4 Subsystem User Data

It is a database used to store the users data when sign in

4.4.1 Subsystem Hardware

This subsystem is a software process running on an computer that will run the database and use sql

4.4.2 Subsystem Operating System

N/A

4.4.3 Subsystem Software Dependencies

A software dependency that is required by the layer are sqlite

4.4.4 Subsystem Programming Languages

Python, SQL

4.4.5 Subsystem Data Structures

The data is queried into and out of the database when a user is signed in

4.4.6 Subsystem Data Processing

N/A

4.5 Subsystem Stock Data

It is a database used to store the stock data retrieved from the tiingo api

4.5.1 Subsystem Hardware

This subsystem is a software process running on an computer that will run the database and use sql

4.5.2 Subsystem Operating System

N/A

4.5.3 Subsystem Software Dependencies

A software dependency that is required by the layer are sqlite

4.5.4 Subsystem Programming Languages

Python, SQL

4.5.5 Subsystem Data Structures

The data is queried and then used by the server to be displayed on the website

4.5.6 Subsystem Data Processing

N/A

4.6 Subsystem Prediction Data

It is a database used to store the prediction data from the machine learning algorithm

4.6.1 Subsystem Hardware

This subsystem is a software process running on an computer that will run the database and use sql

4.6.2 Subsystem Operating System

N/A

4.6.3 Subsystem Software Dependencies

A software dependency that is required by the layer are sqlite

4.6.4 Subsystem Programming Languages

Python, SQL

4.6.5 Subsystem Data Structures

The data is queried and then used by the server to be displayed on the website

4.6.6 Subsystem Data Processing

N/A

5 A.I. Layer Subsystems

The A.I. 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.

5.1 Hardware

This layer is strictly script based and should work on any device running python.

5.2 Operating System

N/A

5.3 Software Dependencies

This layer is dependent on the use of Python and its libraries. Those libraries include: Tensorflow, Keras, Numpy, Pandas, and Matplotlib.

5.4 Model Training Subsystem

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. It is assumed that the underlying system will have the capability to run python and enough memory to train models. It is this subsystem's sole responsibility to train and save models. This subsystem's input is a 2D list and the output is the model used to make predictions.

5.4.1 Hardware

N/A

5.4.2 Operating System

N/A

5.4.3 Software Dependencies

This subsystem uses the Tensorflow, Keras, Numpy, Pandas libraries. Programming Languages.

5.4.4 Programming Languages

This subsystem was developed in Python.

5.4.5 Data Structures

This subsystem uses Dataframes and nparrays in the form of :
[[“Date”, close, high, low, open] , [“Date”, close, high, low, open] , …]

5.4.6 Data Processing

This subsystem takes CSV files and reads them into Dataframes. The index is then set to the “Date” field and sent to be processed for training. The data is normalized, converting it into a nparray. Just before training, the data is split into 4 parts (x, y, x_val, y_val). X and y contain approximately 80% of the data and are offset from each other by one data entry. X_val and y_val contain the remaining 20% and are also offset.
x = [0,1,2] y = [1,2,3]
x_val = [3,4,5] y_val = [4,5,6]

5.5 Predictions Subsystem

This subsystem is used to predict future stock prices based on the last day of data in the database for a company. 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.It is assumed that the models have been created using the most recent data. It is this subsystem’s sole responsibility to make predictions based on the last data entry for a company. This subsystem’s initial input is a 1D list that is made into a 2D list in order to append the prediction values to it.

5.5.1 Hardware

NA

5.5.2 Operating system

NA

5.5.3 Software Dependencies

This subsystem uses the Numpy, Pandas, and Matplotlib libraries.

5.5.4 Programming Languages

This subsystem was developed in Python

5.5.5 Data Structures

This subsystem uses Dataframes and nparrays in the form of:
[[“Date”, close, high, low, open] , [“Date”, close, high, low, open] , …]

5.5.6 Data Processing

This subsystem takes the last already processed data entry and creates a new nparray of compatible shape to be used for prediction. The prediction process is looped to simulate a prediction of a set number of days and takes the last entry of the nparray. After each prediction is made, the results are appended to the end of the nparray for the next round of prediction , typically creating an arching curve.

6 Web Server Layer Subsystems

6.1 Layer Hardware

This subsystem is a software process running on an computer that will run the server and allow clients to connect with it

6.2 Layer Operating System

The operating systems needed are terminal to run the server and a web browser for the client

6.3 Layer Software Dependencies

A software dependency that is required by the layer are python and the flask module

6.4 Subsystem Server

It is a server that allows the website to connect to it

6.4.1 Subsystem Hardware

The operating systems needed are terminal to run the server and a web browser for the client

6.4.2 Subsystem Operating System

The operating systems needed are terminal to run the server and a web browser for the client

6.4.3 Subsystem Software Dependencies

A software dependency that is required by the layer are python and the flask module

6.4.4 Subsystem Programming Languages

Python

6.4.5 Subsystem Data Structures

N/A

6.4.6 Subsystem Data Processing

N/A

6.5 Subsystem APIs

It is apis used by the program to get stock data from the tiingo api and other things

6.5.1 Subsystem Hardware

The operating systems needed are code to connect to the api

6.5.2 Subsystem Operating System

N/A

6.5.3 Subsystem Software Dependencies

A software dependency that is required by the layer are the tiing

6.5.4 Subsystem Programming Languages

Python

6.5.5 Subsystem Data Structures

The data is retrieved and then sent to the database

6.5.6 Subsystem Data Processing

N/A

6.6 Subsystem Scheduler

It is code that will run certain code at certain intervals

6.6.1 Subsystem Hardware

The operating systems needed are python code

6.6.2 Subsystem Operating System

N/A

6.6.3 Subsystem Software Dependencies

N/A

6.6.4 Subsystem Programming Languages

Python

6.6.5 Subsystem Data Structures

N/A

6.6.6 Subsystem Data Processing

N/A

References