Oregon State Investment Group Research and Portfolio Analysis Software

Milestone 2: Vision and Scope
Team CS46

Blake Cecil, Joseph Noonan, Ashyan Rahavi, Braeden Kuether

Contents

1 Background

The Oregon State Investment Group (OSIG) is a student run asset management team that currently manages around $3 million. However, unlike the investment firms of Wall Street they do not use sophisticated software in their daily operations. Currently OSIG members produce pitches and do much of their analysis by hand. This project aims to help OSIG reap the benefits of modern asset management tools, in particular, equity research and portfolio management software.

Portfolio management is a simple but crucial part of asset management. Given some assets OSIG is interested in, they must then determine the percentage of the portfolio each asset should take up. The goal is to construct a portfolio in such a way that returns are maximized for the amount of risk the group is willing to take on.

Currently, the project is starting out on a clean slate where it doesn't yet have any previous models that it is building off of. The portfolio analysis will be based on predicting a key feature of a portfolio, the Sharpe Ratio. The Sharpe Ratio is a formula used by investors to predict what the expected return of a certain portfolio adjusted to its risk. Using a neural network, we want to try to find the best possible combination of assets to build a portfolio which would maximize the Sharpe Ratio.

The other aspect of the project is the research suite. This will help the members of the club in researching assets to invest in, an essential part of the quarterly pitches members create. The research suite will help expedite the research process and provide a standardized method for collecting and presenting research.

2 Vision Statement

Portfolio management is a crucial step in asset management. Our portfolio analysis models will provide invaluable insight into how to allocate their assets. Managers will no longer need to use heuristics or crunch mounds of data to allocate assets appropriately.

Managers will spend less time on tedious management tasks, allowing them to spend more time on the big picture. Furthermore managers will be able to fine tune the models to their liking, giving them the confidence they need to act on the models recommendations.

2.1 Value Hypothesis

For most managers the task of portfolio management either requires a long and involved research process, or heuristics. Our analysis software offers a way to circumvent this issue and provides a fast and reliable allocation strategy.

2.2 Growth Hypothesis

The product is completely free to use, and is specifically designed for the target audience. We save managers time, and give them the confidence they desire when allocating assets for a portfolio, meaning there is little downside to using the software.

2.3 Functional Requirements

Must include an equity research platform that provides users with clean data, that includes the data from 10-k statements. Must be able to graph data selected by the user. The home page will have the OSIG schedule, last week's pitches & pitch results, and useful links. Application should draw from a database to import data. Users should be able to upload "mock" portfolios with the program returning machine learning insights on the portfolio.

2.4 Non-functional Requirements

Users should be able to perform the previously described functions via a website interface. The interface should be user-friendly and provide the user with all the needed information in a manner that is efficient and easy to digest. It should also provide more experienced users with complex tools that give the user more freedom (ex: terminal window).

3 Prioritized Project constraints

3.1 Time

Given that the project is being built from scratch it is imperative our time is budgeted both realistically and efficiently. We have a 9 month timeline to produce a working piece of software for OSIG. Our team members are all full time students, with some working part time as well. This means we will have to be judicious about the scope of what the project will provide to the end users. As such making sure that we are allocating time to the features that will actually provide the customer value is absolutely imperative to the project's success.

We expect to be able to dedicate 4-6 hours a week on the project, with potentially more time during winter and spring break. The biggest constraint on this time allowance will be our school and work obligations which may fluctuate throughout the year. We do not have a project partner currently. However, it is imperative to us that we produce a fully realized usable product by the end of the nine month window.

3.2 Resources

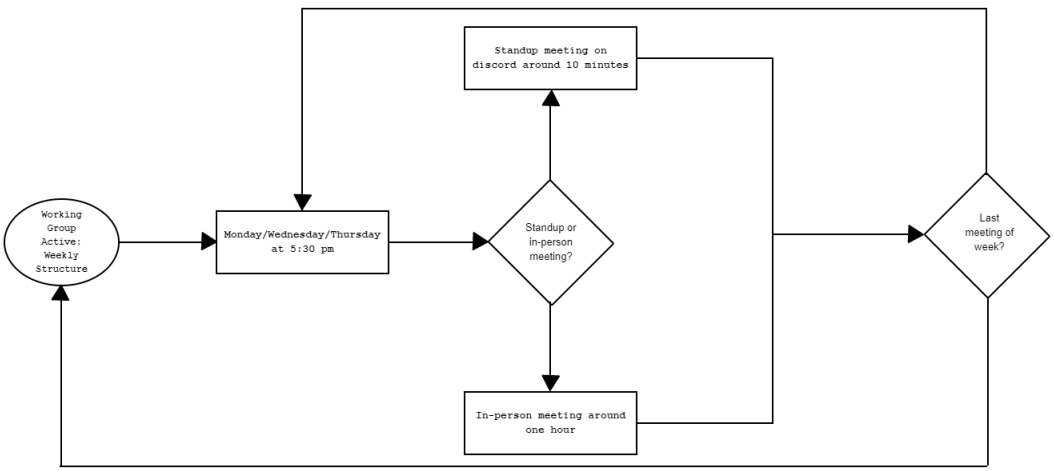
We will be quite limited in budget for this project but after initial review we believe this will not be an issue. The only cash expense we currently foresee incurring is paying a monthly subscription for a financial service that provides us with more/better stock data. We currently estimate this to be only $9 a month. This would provide us with more data to train the portfolio analysis model on, leading to an increase in results and therefore customer satisfaction. One resource we are in need of that we hope either project partner or school will be able to provide is someone willing to do technical consulting. Specifically, we desire someone with machine learning expertise that can help guide the creation of the portfolio management model. This will enable us to bring a higher quality product to market at an even shorter timeline.

3.3 Scope

We are building something from scratch, so our aim is to make sure we bring a tangible finished product to our customers. This means we are going to focus on a design and perfecting a few core features, rather than trying to build a comprehensive financial analysis tool. Due to our scope constraints we will not be designing multiple portfolio analysis tools, instead we will focus on having a single, well polished portfolio analysis tool.

For the front end we will be focusing on getting a server and domain to be able to host our website, preferably under OSU. We hope to have the domain name of osig.oregonstate.edu for our web application. This will also help with the longevity of the project and the maintenance of the servers since OSU will be handling keeping the servers software up to date. We will be able to deliver our fully functioning interface through our website. For the front-end we will focus on using the output from the ML models to create different portfolio outcomes and features to present to the users. We will be trying to have a web application that pulls financial data from an API and our database to display to users. We are aiming to have this web application be a sort of one stop shop for OSIG general information about the club and pitches. We are also aiming for this application to assist in portfolio decisions and stock research so that financial analysts can better understand their companies and look up key data on the companies all in one place. Another feature that is desirable is that users will be able to create mock portfolios and see their expected future performances based on the ML models created from our algorithms. We would like to have a portal where analysts can code in python to create models and visuals using data available on the website. This feature is of low priority since many of the club members are not familiar with coding and this feature may be neglected by the group's analysts.

4 Process Flows



5 User Stories

1. As an asset manager,
   I need to allocate resources for my portfolio,
   So that my portfolio is diversified and I see desirable returns.

2. As an asset manager,
   I need to be able to modify my portfolio analysis model,
   So me and my investors have confidence in it.

3. As a user,
   I need to be able to see the schedule on the home page,
   So that I have the necessary information available to me there

4. As a user,
   I need to be able to see the upcoming and past pitches on the home page,
   So that I have the necessary information available to me there

5. As a user,
   I need to be able to see last weeks voting results on the home page,
   So that I can see the past pitches results

6. As a user,
   I want to be able to see useful resources to me on the front page,
   So that I can easily have access to them

7. As a stock researcher,
   I need to have a stock research page for all related info for a stock,
   So that I can properly research a stock I am interested in

8. As a portfolio manager,
   I need to be have a separate page for my portfolio's information,
   So that I can see key statistics related to my portfolio

9. As a admin of the website,
   I need to be able to retrain the models for the portfolio through the website,
   So that the data used in diagrams are up-to-date and correct

10. As a user,
    I should be able to create mock portfolios on the website,
    So that I can make judgements about the future performances of the hypothetical portfolio.

11. As a user,
    I should be able to run ML models using a mock portfolio,
    So that I can see different stock metrics related to this mock portfolio

12. As a software developer,
    I should be able to train different ML models using a user's mock portfolio,
    So that the user is able to see the models output for those mock portfolios

6 Iteration Plan

6.1 Portfolio Analysis Model

This term we will focus on a blend of research and prototyping with the aim of being finished with research and ready to move into production by winter term. In order to achieve this we plan to produce a development paper outlining our methods for tackling this problem, as well as some concrete data and a proof of concept prototype. We will build a model based on the paper Deep Learning for Portfolio Optimization using python frameworks for the machine learning and collection of financial data. As we build the model we will be researching cutting edge machine learning architectures and methods that we can use to improve upon the model when we move to production.

6.2 Front-End Development

For the next quarter of work on this project, the goal of the front end side is to have an interface template working and live at all times. This will involve being able to get a domain under OSU and getting a Django server working with React and Bootstrap as the framework for the front end. We will be able to access this interface but it will not be expected to have any functional interaction with the ML side of things in terms of building models based on user input. It will also not be expected to be pulling financial data for all companies held in the different OSIG portfolios. One of the functionalities for the website will be to be able to make calls to a financial API for financial data pertaining to 10-K.