Oregon State Investment Group Research and Portfolio Analysis Software

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Executive Summary

Abstract

The Oregon State Investment Group (OSIG) is a student run, school funded asset management group. A crucial part of asset management is conducting in depth analysis of assets and structuring them into a portfolio. This project aims to modernize OSIG's analysis workflow by creating a centralized web platform for the groups past and present research, streamlining and automating the research process, and provide machine learning tools that help with portfolio management.

1   The Task at Hand

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.

We will also be creating a web application that helps the group members automate their common tasks, expedite research and create a centralized platform for the groups information.

2   Our Solution

Our solution to the portfolio allocation problem involves a mix of classical economic theory and modern deep learning methods. Based on our research we decided to construct an algorithm with attempts to generate a set of asset allocations that maximize the Sharpe Ratio of the portfolio. The Sharpe ratio measures the expected returns of the portfolio compared to investing in a risk free asset. This helps us not only take into account the portfolio's value, but its risk as well. Maximizing this metric is where deep learning comes in, in particular we use a LSTM model connected to a softmax layer which ensures we get asset allocations that sum to one. For more precise details please check our slide deck which covers the model in more detail.

For the web application we are using django for the backend and react for the front end. The stock research is facilitated by the IEX cloud API which allows group members to easily access a massive collection of assets and various financial information. We have also created simple scripts that allow the group members to automate collection of SEC information, and the creation of various excel templates that the group utilizes. Our machine learning model can also be accessed through the website and the groups portfolio managers can use it to analyze different portfolios and compute and visualize various portfolio statistics.

3   Future Work

The project has been a success and we believe there are certain areas that can be expanded upon. The portfolio analysis aspect has plenty of additions that could be made.

Empirical evidence has shown that transformer deep learning models outperform LSTM's on the same task. It would be worthwhile trying to design a transformer version of the model we currently have. Another avenue of attack would be implementing more classical methods for optimizing portfolio allocation. In particular the field of modern portfolio theory has techniques to do this. This would allow portfolio managers to get a "second opinion" and weigh the options of two different models.

There is also an essentially infinite well of work that could be done on expanding the kinds of analysis tools the group has at their disposal. Models could be made that attempt to predict price movements of particular assets, analyze sectors for potentially good stocks to add to a portfolio and a wealth of other options that would be incredibly valuable to the group as they currently use little to no sophisticated methods in their research process.

As for the website, styling work can always be done for the website to stay modern. The different elements of the website can be made modern by adding rounded edges and shadowing for the elements. Styling changes can be made to trim down the API response time. Graphing capabilities could also be added to the stock research page as well using the nivo react library.