

Simulating Stock Market Performance through E-CARGO

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Abstract- This project models the complex and confusing environment of stock trading, to simplify investing for the user. Given an initial investment amount and a desired risk factor, this system will optimally identify stocks that are the most profitable. This is done by considering many factors such as simple trading tools like standard deviation, expected returns, dividends, a measured *SEP weight* (Social-economic and political weight) and many more.

I. Problem statement/Objectives

Investing in the stock market is a complex task that often requires expertise, time, and the ability to interpret a wide range of financial and external factors. Most beginner investors lack the tools or understanding to make good choices that balance profit with risk. This project aims to reduce that complexity by developing a system that simplifies portfolio selection. By applying Group Role Assignment (GRA) in a productive way—treating stocks as agents and various financial characteristics as roles—this project will optimize stock choices based on user-defined inputs such as budget and risk tolerance. It will also integrate traditional financial indicators with external socio-economic and political metrics to make recommendations more holistic and adaptive to real-world events.

The main goals of this project are to simplify the investment process for users and maximize potential profits. By using Group Role Assignment to match stocks with financial roles based on user-defined budget and risk tolerance, the system will handle complex analysis behind the scenes—making investing easier, smarter, and more accessible for non-experts.

II. Methodology

This project is quite complex in both its concepts and implementation. Numerous hours of researching stocks, stock measurement tools, indications and more will be required to properly begin the project. Once the research is complete, the implementation will require many APIs to gather all the real-time data required. Yahoo Finance API is a free open-source Python library that can handle stock data. Many other APIs and libraries will be required to determine the SEP weight, as the news will need to be checked, as well as legislation and public opinion. Overall, the system will be an application that requires user input – amount of money and requested risk – before processing the data and returning the best stocks for the given constraints, using GRA. The stock indications will be treated as roles, and stocks as agents.

III. Libraries/APIs

- Yfinance, for stock data – <https://pypi.org/project/yfinance/>
- NewsAPI, for socio-political data – <https://newsapi.org/>
- PuLP, for GRA and GMRA algorithm - <https://coin-or.github.io/pulp/>
- NumPy, for computing – <https://numpy.org/>
- Pandas-ta, for data analysis - <https://pandas.pydata.org/>
- VADER Sentiment, for sentiment analysis – <https://pypi.org/project/vaderSentiment/>
- FRED API, for economic data – <https://fred.stlouisfed.org/docs/api/fred/>
- PyPortfolioOpt, for portfolio optimization - <https://pyportfolioopt.readthedocs.io/en/latest/>

IV. Expected Contributions

This project is expected to contribute a unique application of GRA to the field of financial technology, specifically in simplifying stock selection through GRA. It will provide a proof-of-concept system that can take user input and return optimized investment options that consider not just return and risk, but also broader influences like political shifts and public sentiment. Furthermore, the project will contribute a methodology for quantifying qualitative SEP factors and integrating them into algorithmic decision-making. Ultimately, this system can serve as a foundation for building more accessible and intelligent investment tools for non-experts.

V. Desired Timeline

The timeline can be approximated as follows:

Week 1-2	Research into stocks, stock indicators and social-economic factors, as well as how they affect one another.
Week 3-4	Research into the numerous APIs and proof-of-concept for modelling data.
Week 5-6	Prototyping with GRA, web-scraping APIs and stock data APIs.
Week 7-8	Prototyping with GRA, web-scraping APIs and stock data APIs. (2)
Week 9-10	Creating application frontend and backend
Week 11-12	Implementing the prototype into the application
Week 13-14	Debug, fix issues and improve design
Week 15-16	Debug, fix issues and improve design (2)

VI. Feasibility

This project would be quite difficult to complete within the time frame. This is simply due to the scale and ambition involved in the project. The amount of research, data and training required for this project is much larger than the rest. As it would be the first time working with most of these libraries or concepts, it would also be very difficult to implement. Lastly, the stock indications and their respective weights is very subjective and would be truly difficult to properly analyze. In my opinion, this is the hardest of the projects, but I am up for the challenge.

VII. Datasets Required

- Sentiment Analysis - <https://www.kaggle.com/datasets/jp797498e/twitter-entity-sentiment-analysis> or <https://www.kaggle.com/datasets/kazanova/sentiment140>
- Historic and Current Market Data -yfinance
- Stock indicators – pandas-ta
- Social indicators – NewsAPI (used with NLP)
- Economic indicators – fredapi (Federal Reserve Economic Data)

VIII. Similar\Related Research

There is some related search in this field. Most research lies in AI for stock market prediction using historic data. However, this lacks some considerations such as social-economic aspects,

technical analysis and sentiment analysis of the public. This results in baseless stock suggestions, as the AI systems act as a blackbox, leaving users wondering where the decision came from.

Example:

<https://sgino209.medium.com/deep-reinforcement-learning-for-automated-stock-trading-c661299ebe0f>

<https://builtin.com/artificial-intelligence/ai-trading-stock-market-tech>