Robo-Advisor Redux

A Diversification Portfolio Tool for Investors

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Executive Summary

Robo-advisor

With 4 levels of risk tolerance

ChatBot

AWS chatbot communicates to you

Machine Learning

Trained data from 2000-2014, tested 2014 to 2018, live is 2018 onward

React Dashboard

Dashboard displays the Chatbot and monitors performance, as well as the market as a whole

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Project Goals

Ease of use

Set and forget. The model will take care of the rest.

Transparency

See all trades on our easy to use dashboard.

Advanced Trading

Machine Learning allows for complex trading (buys and sells) on a very simple platform.

Available to All

Financial Advisors should not be taking your hard earned money.

Stock Tickers for the Sectors ETF

Gold

Nasdaq

S&P 500

Materials

Energy

Financials

Industrials

Technology

Consumer Staples

Real Estate

Utilities

Healthcare

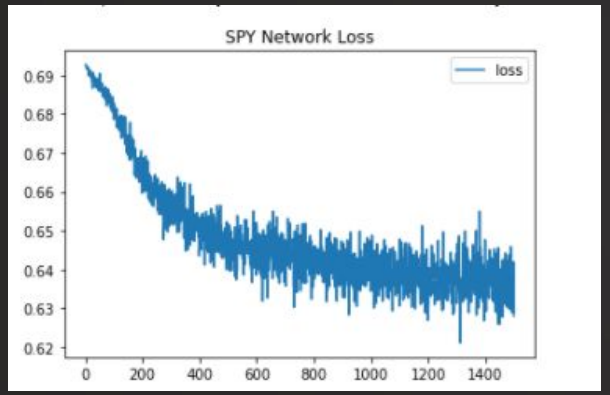
Consumer Discretionary

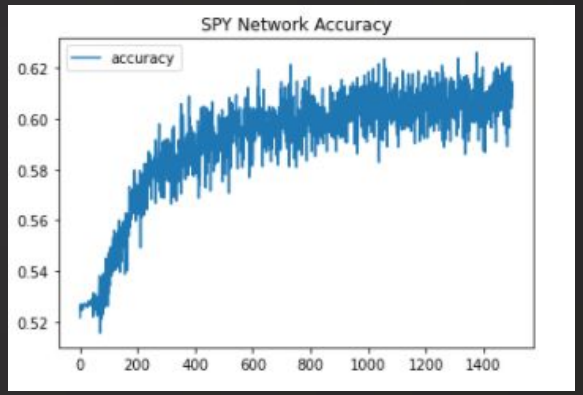
03

Project Analysis

Neural Network Training

- We began by generating 58 different possible technical indicators to use as variables (of those 58 we ended up using 37 of them in our final model)
- Then (after using StandardScaler) we ran it through our Neural Network training it on a 14-year period of data for the S&P 500





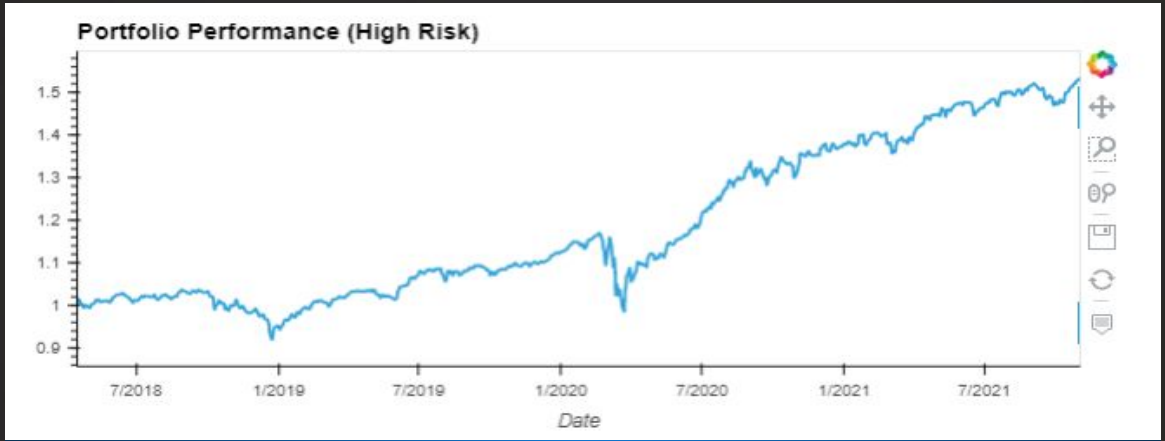
- In between each inner layer we used the dropout function to help prevent overfitting
- When training for individual sectors we called the already trained S&P Model and had it continue training on new data specific to each sector

Portfolio Construction

- Once we had all of our predictive models trained and tested we used the Yahoo! Finance API to pull current and historical price data to run our models on.
    - We used the models predictions to generate Expected Returns for each sector as well as a Covariance matrix to examine the correlation between the sectors
- Using our returns and covariance matrix (as well as the current 5-year Treasury rate) we were able to generate potential portfolios to form a rough efficiency frontier (Markowitz Bullet) from which we selected the allocation set that gave us the best sharpe ratio

Completed Portfolios

- Using our optimized allocation we constructed 3 portfolios for our users all with lower drawdowns than the S&P-500 over the same time period
- For comparison the S&P-500 has an annual compound growth rate of around 8.54%



Approximate Expected Annual Return

14.63%	12.02%	9.41%
Aggressive Portfolio	Moderate Portfolio	Conservative Portfolio
100% Equity allocations	80% Equity | 20% Bonds	60% Equity | 40% Bonds

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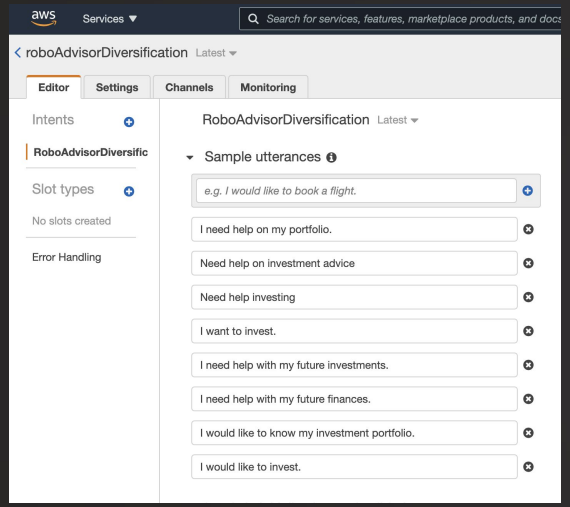
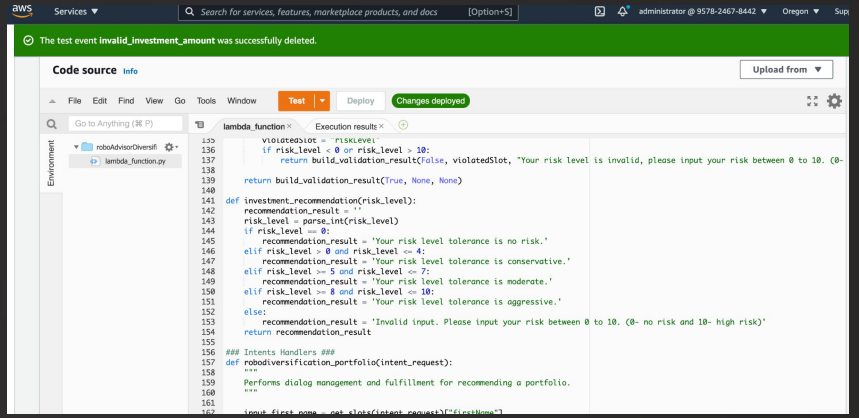
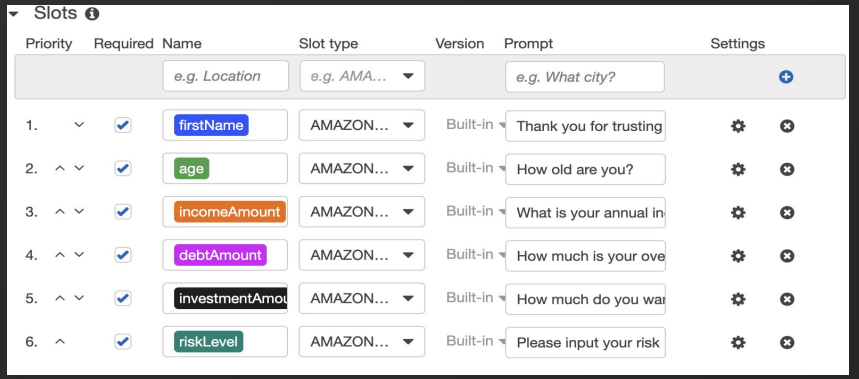
AWS ChatBot

With the use of Amazon Lex and Amazon Lambda, we created sample utterances and slots.







Why create an AWS Chatbot?

JSON: Correct dialog

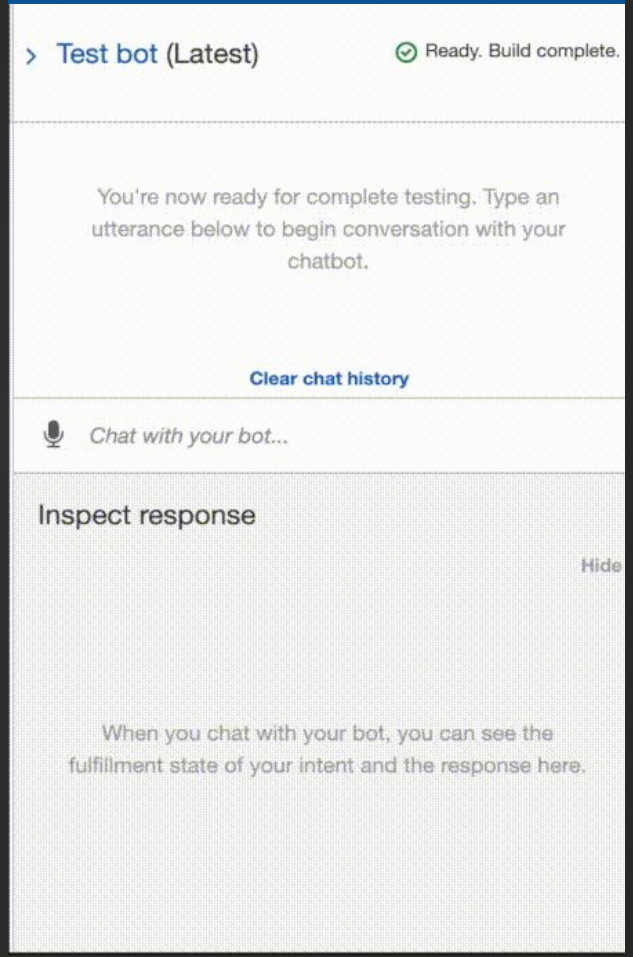
Saved Test Events

correctDialog

```
{
  "messageVersion": "1.0",
  "invocationSource": "DialogCodeHook",
  "userId": "Justine",
  "sessionAttributes": {},
  "bot": {
    "name": "roboAdvisorDiversification",
    "alias": "$LATEST",
    "version": "$LATEST"
  },
  "outputDialogMode": "Text",
  "currentIntent": {
    "name": "RoboAdvisorDiversification",
    "slots": {
      "firstName": "Justine",
      "age": "31",
      "incomeAmount": "130000",
      "debtAmount": "30000",
      "investmentAmount": "30000",
      "riskLevel": "6"
    },
    "confirmationStatus": "None"
  }
}
```

So now...How does the AWS Chatbot interact with the React website?

Demo of AWS Chatbot



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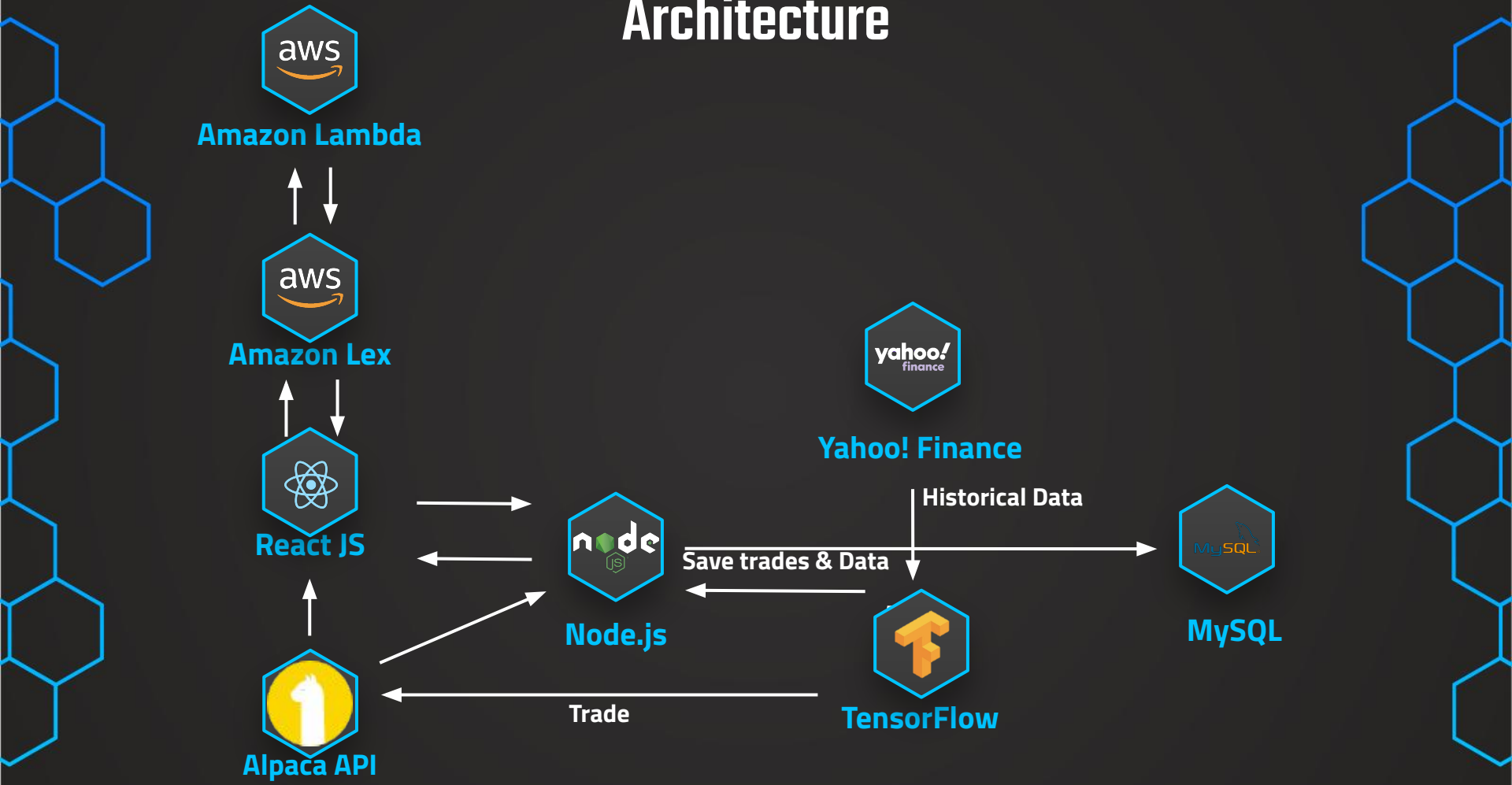
Technologies

Architecture



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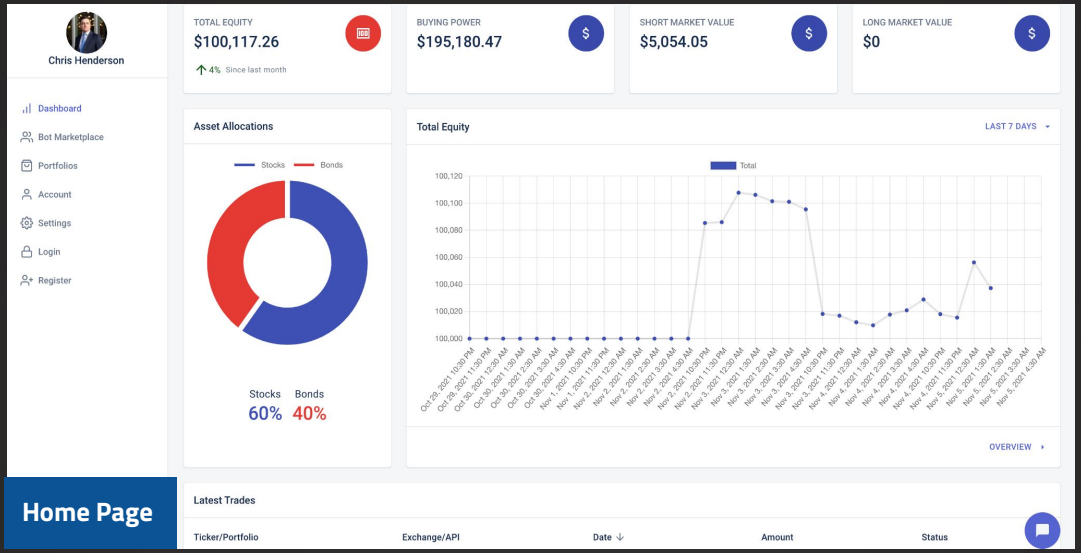
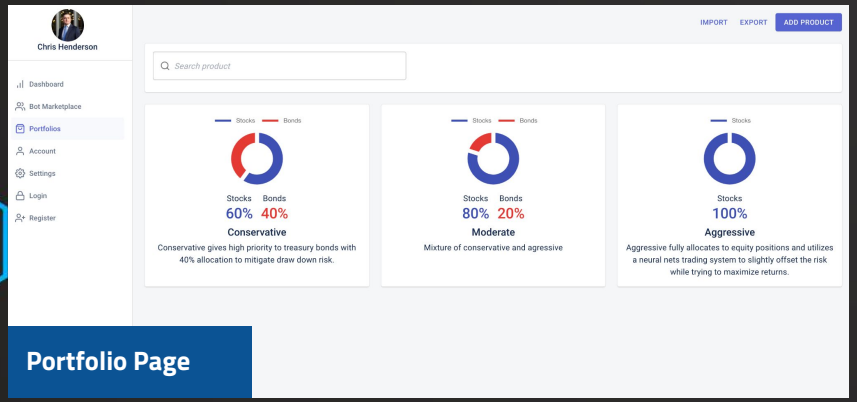
Sneak Peak

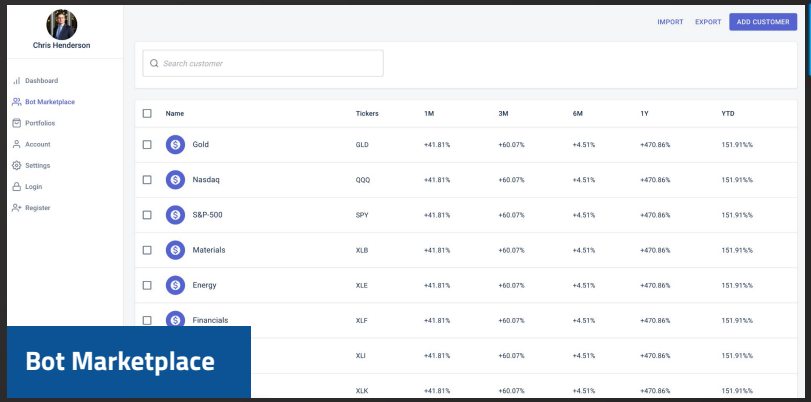
Project Demo



Home Page



Portfolio Page



Bot Marketplace

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Conclusion

Successes and Lessons Learned

- Managed to pull closing prices of respective stock ticker using Yahoo API.
- Created a robo chatbot using AWS Lex and using AWS Lambda function.
- Used React to create a frontend API.
- Connected bot to react frontend.
- Used the Alpaca API to display and visualize trades.
- The use of a new library called TQDM.

Challenges

- Using a Crypto ETF is not going to work since the ETF is still in early rollout (no historical data) and essentially charging fees to purchase bitcoin is not a smart investment
- Adding multiple answers on the Chatbot does not work... yet
- Automating Rebalance period for the portfolio allocations
- Improving the Neural Network (time commitment)
- Scaling some indicators with StandardScaler

Next Steps

- Additional topics to research:
  - Expanding the tickers pulled to other relevant stock tickers, and potentially cryptocurrencies.
  - To use a different machine learning model that can further improve its accuracy.
- Plan for future development:
  - Use different stock tickers and add new performance metrics.
  - Build the website more robust to build portfolios and bots.
  - Hookup ML bots to react frontend with a node.js server

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Project Members

Project Team Members and Tasks

01	**Colin Benjamin** in/colinbenjamin	• Created and charted performance metrics for our model. • Created Neural Networks to trade in and out of Sector Positions • Optimized Portfolio allocations with an efficiency frontier • Data import, clean up and save it to csv files
02	**Justine Cho** in/justinecho	• Created RoboAdvisor using AWS Lambda and Amazon Lex • Created the JSON test events • Compiled the README.md file.
03	**Christopher Henderson** in/chris-henderson123/	• Helped manage central project goals and scope of project • Suggested companies to provide analysis for • Helped establish scope of project for end-user
04	**Nathan Patterson** in/natepatterson/	• Data clean up and save it to csv files • Also created a React website from scratch • Merged the AWS Chatbot and the Machine learning trading algorithm

Welcome to Robo-Advisor Redux!

Thank you for listening to our presentation.
Any questions?

Type your message here

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