QUOPI

Quopi AI Trader
Whitepaper

Leveraging the power of Artificial Intelligence to develop trading tools of exceptional precision.

Overview of the concept of using AI powered, conversational, interactive systems to surpass the results of a regular day trading strategy implementation.

2022

QUOPI

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Quopi LTD
2022

Executive Summary

This whitepaper is written to explain the Quopi AI teams development of a fully automated trading bot using the GPT architecture, which we dubbed the “Quopi AI Trader”. The bot is designed to operate on the New York Stock Exchange and uses a combination of natural language processing techniques and technical indicators to make trading decisions.

The first step in developing the bot was to collect and preprocess financial data, including news articles and historical stock prices. This data was used to train the GPT model, which was then used to develop trading rules and strategies based on the insights gained from the data. Technical indicators were also incorporated to improve the accuracy of the bot's predictions.

After the bot was developed, it was backtested and evaluated to determine its effectiveness. Multiple iterations of testing were performed, during which the bot was tweaked and improved. Despite some challenges faced during development, the bot has not had a single day with a net loss at market closing.

The framework developed for the bot could be applied to other types of trades, such as crypto trading, and alternative bots are also in development. While the bot is mostly automated, some trades may still need to be manually closed before the end of the trading day.

The success of this bot is a proof of concept for the potential of AI in day trading, and suggests that AI can help bring profits from day trading to a wider audience. Furthermore, it is a sign of the rapid advances being made in AI, and the potential for AI to revolutionize various industries in the future.

Introduction

Technology underpins many functions in asset management and has for decades. Virtually all asset managers utilize technology, either developing their own tools or outsourcing specific functions to a third party provider. Simply processing large quantities of data from portfolio managers, exchanges, custodians, rating agencies, and pricing services requires some level of automation to ensure efficiency and accuracy.

Today, AI and ML are being employed to improve the customer experience, increase the efficiency and accuracy of operational workflows, and enhance performance by most, if not all successful and modern companies. Consistent with our view that technology in general can improve the quality and analysis of data for decisionmaking and drive risk mitigation, we are looking to embrace technological advances, including AI, that can help improve outcomes for our clients.

These technological tools are part of a larger ecosystem in which people make decisions using the information generated by computers in various aspects of asset management, where a myriad of regulations already apply. These regulations apply regardless of whether a process is performed manually or automated.

In this Whitepaper, we explore the untapped potential of the recently popular Generative Pre-Transformer in simplifying the process of research and preparation of day trading strategies for a predefined set of observed stocks. GPT is an AI family of language models that are generally trained on a large corpus of text to generate human-like text to respond to queries entered by a human.

The Quopi team went about researching this in a straightforward, exploratory manner. We built a completely custom made Generative Pre-Transformer, using existing language models, and combining them with vast amount of information on content related to day trading, stock value determination,

historical performance of various assets, and specific historical, anecdotal and statistic information of specific stocks that we planned to monitor and trade.

After doing this we mediated the process of creation of the AI trading Bot, AKA the Quopi AI Trader, through prompting the trained GPT to deliver us its' version of a successful day trading bot, based on predetermined risk comfort levels defined by the team. Afterwards, the bot was tweaked through prompting, with only direct human intervention being the programming part of the development, when errors and inefficiencies were fixed and and code cleaned up by our technical team.

During this process, we found that layering AI at conjuctions of decision making for the development of a trading bot delivers interesting, successful approaches to the trading process, which when outlined seem somewhat counterintuitive for a human trader. We also found the process of generating insights and finding directions for improving the results of the tool much simpler due to the humanlike feedback loop of the Quopi GPT to inputs.

The end result of the experiment can be considered a fantastic indicator of the unbelievable potential of Artificial Intelligence cobmined with competent controlling human intellect.

Cultural Context

Since the now famous company OpenAI released its blockbuster bot ChatGPT in November of 2022, an incredible amount of users have casually experimented with the tool, with Chat GPT becoming the fastest ever application to reach 1 million users, surpassing even TikTok and Instagram in terms of user adoption. This alone is a great indicator of the incredible potential to disrupt that this technology possesses.

But ChatGPT, the latest in technology known as "large language model tools," doesn't speak with sentience and doesn't "think" the way people do. That means that even though ChatGPT can explain quantum physics or write a poem on command, a full AI takeover isn't exactly imminent, according to experts. Regardless, our investor team saw an opportunity to change the way we approach the development of new tools for trading. One could argue, we speculated, that day trading is a field, where humanlike approach and pattern recognition can hurt your results, instead of enhancing them.

Millions of historical data points, decades of various cascading events, each with a varying degree of colleration and causation among each other. With so much data, the man who knows the most information might just end up being the most confused. An overlooked connection could be the difference between a successful trade and regretful transaction. The benefit of Artificial Intelligence is that it does not have human errror. Things which are entered, do not exit the memory due to the limitations of our long term memory. Considerations and calculations are not fudged due to us being overwhelmed by data. In the high speed world of day trading, removing these barriers can be the difference between winning and losing.

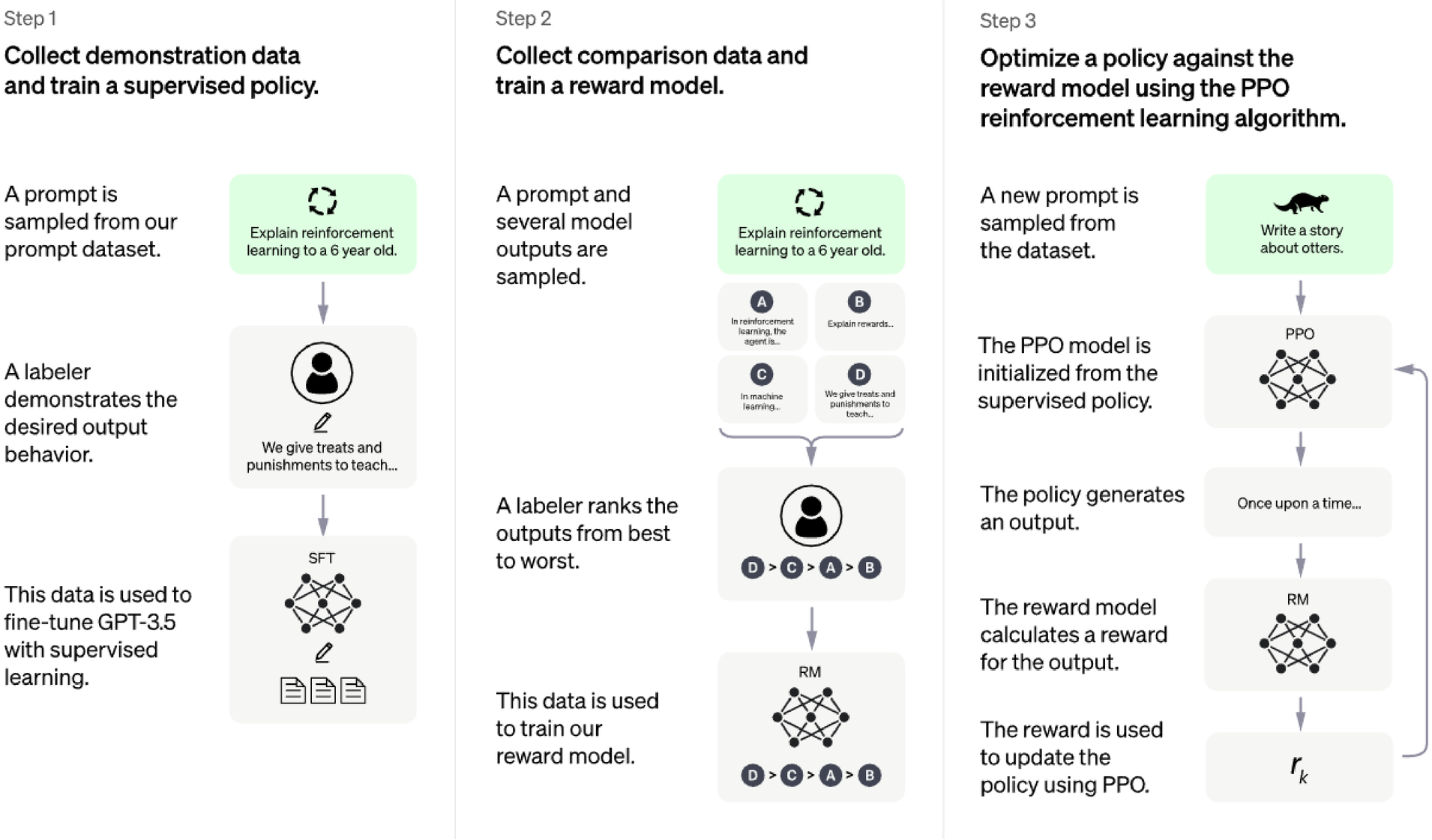
Our team decided to develop our very own GPT, basing our approach on the one documented by OpenAI, and use this GPT to deliver us, as we dubbed it, “The Ultimate Trading Bot”. We had two goals when first starting the project:

1. Find out whether management of AI lead tools with this alternative and

intuitive method can produce high quality results.

2. If successful, create a marketable product for retail investor use, both for profit and raising awareness of the capabilities of modern AI.

Process



Training a GPT (Generative Pre-trained Transformer) model to use it to develop an automated trading bot is a complicated process that requires extensive expertise in both natural language processing and financial trading. The steps our team took to create the Quopi AI Trader are as follows:

1. Data Collection: We collect a large amount of financial data, including market data, news articles, and other relevant data sources.

2. Preprocessing: We preprocess the data by cleaning, normalizing, and converting it into a format that can be used by the GPT model.

3. Training the GPT Model: We train the GPT model on the financial data to learn the patterns and relationships between different data points, such as market conditions, news events, and trading strategies.

4. Developing Trading Rules: we use the GPT model to develop trading rules and strategies based on the insights it has learned from the data.

5. Backtesting and Evaluation: we test the trading rules and strategies on historical data to evaluate their performance and make adjustments as needed.

6. Deploying the Trading Bot: Once the trading rules and strategies have been tested and evaluated, we deploy the trading bot to execute trades automatically based on the pre-defined rules and conditions.

7. Maintenance and monitoring: ensure that the bot is constantly monitored and adjusted to reflect changes in the market and to mitigate the risk of financial loss.

The steps outlined above can be summarized in three main phases: training the GPT model, developing the trading bot, and monitoring the bot once it is deployed.

In this paper, we will elaborate on each of these steps in detail. Specifically, we will begin by describing the data collection and preprocessing techniques used to train the GPT model on financial data. We will then discuss the process of using the GPT model to develop trading rules and strategies, including the development of backtesting and evaluation methods to assess the performance of the trading bot. Finally, we will address the critical importance of monitoring the bot once it is deployed, highlighting the challenges and opportunities associated with maintaining the bot's performance in the constantly changing financial markets.

Quopi GPT

We trained this model using Reinforcement Learning from Human Feedback (RLHF), using the same methods as OpenAI's InstructGPT, but with slight differences in the data collection setup. We trained an initial model using supervised fine-tuning: human AI trainers provided conversations in which they played both sides—the user and an AI assistant. We gave the trainers access to model-written suggestions to help them compose their responses. We mixed this new dialogue dataset with the pre-fed dataset, as well as introduced a massive amount of information about trading (approximately 140,000 pages total), which we transformed into a dialogue form.

To create a reward model for reinforcement learning, we needed to collect comparison data, which consisted of two or more model responses ranked by quality. To collect this data, we took conversations that AI trainers had with the chatbot. We randomly selected a model-written message, sampled several alternative completions, and had AI trainers rank them. Using these reward models, we can fine-tune the model using Proximal Policy Optimization. We performed several iterations of this process.

Functionality

The Quopi GPT uses a variety of underlying tools and libraries to implement its functionality. Here are some of the key tools and libraries that are used in the ChatGPT stack:

1. **Python**: The Quopi GPT codebase is written in Python, which is a popular programming language for building machine learning applications.

2. **PyTorch**: PyTorch is an open-source machine learning framework that is used to build and train deep neural networks. Quopi GPT is built on top of PyTorch, which provides the functionality for training and running the GPT.

3. **Transformers**: Transformers is a PyTorch library that provides a high-level API for building and training transformer-based models. Quopi GPT uses the transformers library to build and train the GPT-3.5 model.

4. **Hugging Face Datasets**: Hugging Face Datasets is a library that provides access to a large collection of text datasets. Quopi GPT uses Hugging Face Datasets to pre-process and clean the input data before feeding it to the model.

5. **Flask**: Flask is a popular Python web framework that is used to implement the Quopi GPT API. Flask provides a simple and easy-to-use interface for handling HTTP requests and responses.

6. **Docker**: Docker is a containerization platform that is used to package and deploy the Quopi GPT API. Docker allows Quopi GPT to be deployed easily on different platforms and environments.

7. **AWS EC2**: AWS EC2 is a cloud computing platform that is used to host the Quopi GPT API. The API is deployed on a high-performance EC2 instance that is optimized for running deep learning workloads.

Data preparation.

The financial markets generate vast amounts of data, and the ability to process this data and derive insights from it is a critical aspect of successful trading. In recent years, there has been growing interest in using natural language processing techniques, such as GPT models, to analyze financial data and develop automated trading bots. Further discussed is the process of data collection and preprocessing techniques used to train a GPT model on financial data.

Data Collection:
The first step in training a GPT model on financial data is to collect a large and diverse dataset. This dataset should include market data, news articles, social media posts, and other relevant sources, including historical information on stocks, the business surrounding them and even backgrounds of the people involved. The goal is to capture a broad range of market conditions, events, and sentiments that can be used to train the GPT model.

In our case, market data included historical stock prices, trading volumes, and other indicators that reflect market trends and sentiment. News articles and social media posts provided additional context, such as company news, analyst reports, and opinions from market participants.

In addition to dynamic pieces of content such as the ones mentioned in the paragraph above, we also used established literature to train the bot to be able to “think” like an expert day trader. This involved gathering books on trading and investing stocks from various sources, including as libraries, bookstores, and online databases.

Data Preprocessing:
Once the data has been collected, the next step is to preprocess it for training the GPT model. This involves cleaning, normalizing, and transforming the data into a format that can be used by the model.

Cleaning the data involves removing any irrelevant or duplicate information, as well as correcting any errors or inconsistencies in the data. Normalizing the data involves converting it into a standardized format, such as numerical or categorical data. Transforming the data involves converting it into a format that can be used by the GPT model, such as text or numerical data.

The technique that Quopi AI team implemented was for transforming financial data into a format that can be used by GPT models is to convert it into a sequence of tokens. These tokens can represent individual words, phrases, or

other data points, and they can be used to train the GPT model to recognize patterns and relationships between different data points.

The process of data collection and preprocessing is a critical aspect of training a GPT model on financial data. By collecting a diverse dataset and preprocessing it for use by the model, we can train the model to recognize patterns and relationships between different data points, and use these insights to develop automated trading bots. In the next section, we will discuss the process of using the GPT model to develop trading rules and strategies based on the insights gained from the data.

Quopi AI Trader

Overall, the goal of an automated trading bot is to remove human emotions and biases from trading decisions and to execute trades quickly and efficiently based on pre-defined rules and conditions. By doing so, automated trading bots can potentially generate profits while minimizing risk and maximizing efficiency. Before we continue, let’s quickly go through what defines an automated trading.

Automated trading bots, also known as algorithmic trading bots, are computer programs designed to execute trades in financial markets based on pre-defined rules and conditions. These bots are often used by traders to automate their trading strategies and to execute trades quickly and efficiently.

Once the data has been collected and preprocessed, the next step is to use the GPT model to develop trading rules and strategies. This involves analyzing the data to identify patterns and relationships between different data points, and using these insights to make trading decisions.

Defining success

Before we can effectively determine whether the bot is successful or not, we must first define what would constitute a successful automated trading bot in our eyes. The defining features are as follows:

Accuracy: The bot should be able to consistently make profitable trades.

Speed: The bot should be able to execute trades quickly and efficiently.

F**lexibility**: The bot should be able to adapt to changing market conditions and incorporate new data as it becomes available.

Robustness: The bot should be able to operate reliably and handle a variety of market conditions without breaking down.

User-friendliness and ease of use would be another factor that we decided to disqualify as our goal was to build a platform with this consideration without the help of the bot, and only use the GPT in the process of building the trading algorithm.

Method of Signal Identification

In order to make a bot that delivers the highest results, we defined methods for trade identification. The complete approach in essence is a price action trading approach for low volatility stocks. However, since the power of AI allows us to take into consideration of a massive amount of variables, we also set it to follow multiple identification methods, including:

Technical analysis: This involves using past price and volume data to identify patterns and trends that may indicate a good time to buy or sell a particular asset. Technical traders may use a variety of tools such as charts, trend lines, and oscillators to help identify trade opportunities.

Fundamental analysis: This involves analyzing a company's financial statements and other factors to determine the intrinsic value of its stock and whether it is undervalued or overvalued in the market. Fundamental traders may use tools such as financial ratios, earnings reports, and industry analysis to help identify trade opportunities.

News and events: Day traders may also keep an eye on news and events that could affect the price of an asset. This could include economic reports, company earnings announcements, and political developments.

Market sentiment: Traders may also consider the overall sentiment of the market or a particular asset when looking for trade opportunities. For example, if the market is generally bullish (optimistic), a trader may look for long (buy)

trades, whereas if the market is bearish (pessimistic), they may look for short (sell) trades

Algorithmic trading: Some day traders may use computer programs to automatically identify and execute trades based on predetermined criteria. These programs, known as trading bots, can scan the market for opportunities and make trades on behalf of the trader.

Defining Entry / Exit Points

When it comes to determining when to buy and sell, our bot looks for certain patterns in the technical indicators, such as moving averages or RSI, as well as market sentiment analysis to determine the overall trend of the stock. We also use price action analysis to identify support and resistance levels, which can be helpful in determining entry and exit points.

Once our bot has identified a potential trade, it uses the GPT model to analyze market sentiment and news articles to gauge overall market conditions and determine whether it's a good time to enter or exit the trade. Our bot's algorithm takes all of these factors into account before making a decision on whether to buy or sell.

Overall, our day trading bot is designed to be a comprehensive and data-driven approach to trading, using a combination of technical indicators, price action, and market sentiment analysis to make informed trading decisions. By leveraging the power of GPT and other advanced analytical tools, our bot can identify potential trades and execute them with speed and precision, increasing the accuracy and profitability of our day trading strategy.

Backtesting and Evaluation

Once the trading bot was developed, it was necessary to backtest and evaluate its performance to determine its effectiveness in delivering profitable trades. The first step in evaluating the bot was to test it on historical data to see how it would perform under real market conditions. This involved analyzing how the bot would have performed on past trades, and comparing its performance to that of a human trader.

During the testing phase, we made several changes to the trading bot to improve its performance. For instance, we added additional technical indicators to the GPT model to provide more accurate trading signals. We also fine-tuned the model to better identify market trends and volatility, and adjusted the risk management rules to minimize potential losses.

Over multiple iterations of testing, we found that these changes had a significant impact on the performance of the trading bot. With each iteration, the bot's accuracy and profitability improved, and we were able to identify and correct issues that arose.

Furthermore, we also used statistical analysis and other performance metrics to evaluate the bot's performance. We analyzed key indicators such as the Sharpe ratio, which measures the risk-adjusted return of an investment, and the maximum drawdown, which measures the largest percentage decline in equity experienced by a trading account. These metrics allowed us to gain a better understanding of the bot's performance and make informed decisions about future iterations and improvements.

Overall, the backtesting and evaluation process was crucial in determining the effectiveness of the trading bot and identifying areas for improvement. Through continuous testing and iteration, we were able to develop a incredibly accurate and profitable trading bot.

Challenges

While developing the fully automated trading bot with the help of GPT, we encountered several challenges that required careful consideration and problem-solving to overcome. Here are some of the major challenges we faced during the development process:

Data quality and preprocessing: The first challenge was to ensure that the data used to train the GPT model was of high quality and properly preprocessed. Financial data can be complex, and it was important to clean and transform the data to make it suitable for training the model. To address this challenge, we carefully selected the data sources and employed various preprocessing techniques such as normalization, scaling, and feature engineering.

Overfitting: Another challenge we faced was overfitting of the GPT model to the training data. This occurs when the model learns the training data too well and performs poorly on new data. To prevent overfitting, we employed techniques such as early stopping, dropout, and regularization to ensure the model generalizes well to new data.

Scalability: As the GPT model is computationally intensive, scaling it to handle large datasets and real-time trading data was a challenge. To overcome this, we used distributed computing techniques and optimized the model architecture to improve its efficiency and speed.

Market volatility: The financial markets are highly volatile and can change rapidly, making it difficult to predict future market movements accurately. To address this challenge, we incorporated risk management rules into the trading bot, allowing it to respond quickly to changes in market conditions and minimize potential losses.

Ethical considerations: There are ethical considerations surrounding the use

of AI in financial trading, such as the potential for market manipulation and unfair advantage. To ensure the trading bot was ethically sound, we followed industry regulations and guidelines, and implemented safeguards to prevent any misuse of the technology.

To overcome these challenges, we employed a range of strategies such as careful data selection and preprocessing, model optimization, risk management, and ethical considerations. Through these efforts, we were able to develop a highly effective and profitable trading bot that could help traders make more informed and successful trades.

Results and Conclusion

The Quopi fully automated trading bot developed using GPT has delivered exceptional results, with not a single day ending in a total net loss. The framework has been successful in predicting market movements and generating profitable trades for the user. This success has provided strong evidence to the idea that AI can help bring profits from day trading to everyone, and has marked a significant change in the financial industry.

The framework developed for this trading bot can also be applied to other types of trades, such as crypto trading. This has allowed us to explore alternative trading strategies, and we are currently developing new bots for other types of trades using similar AI models. While the bot has been able to generate profitable trades automatically, there are still some instances where we have to manually close trades to ensure that all trades are closed by the end of the trading day. However, we are continually working to improve the bot's performance and its ability to make fully automated trades.

The success of the trading bot has provided proof of concept to the idea that AI can be an effective tool for generating profits in day trading. It is a testament to the power of AI in finance and marks the beginning of a new era in financial trading. The rapid advancements in AI technology are sure to bring about many changes in various industries, and the financial industry is just one example of this. The fully automated trading bot developed using GPT is a prime example of how AI can be used to create efficient and effective solutions to complex problems.