PARROT TRADE TECHNICAL WHITE PAPER

I. Introduction

- **Background of the project**

Quantitative finance, as an important branch in the field of financial technology, has shown rapid development momentum in recent years. This white paper will introduce the background and development history of quantitative finance, explore the opportunities and challenges brought by quantitative finance, and the significance and goals of this project Parrot in this context.

With the rapid development of information technology and the globalization of financial markets, financial transactions are becoming more and more complex, and market volatility and risks are also increasing. The traditional trading method based on manual decision-making can no longer meet the needs of efficiency, accuracy and speed. Quantitative finance emerged as the times require, using methods and technologies in the fields of mathematics, statistics and computer science to make financial transaction decisions through systematic models and algorithms to achieve more stable, efficient and sustainable returns.

The development of quantitative finance can be traced back to the 1970s. With the popularization of computer technology, people began to try to use computers to simulate financial markets and develop a series of quantitative trading strategies. In the 1990s, with the rise of high-frequency trading and quantitative trading, quantitative finance entered a stage of rapid development. After the global financial crisis in 2008, the failure of traditional investment strategies accelerated the popularity and application of quantitative trading. So far, quantitative finance has become an important part of the global financial market and is widely used in stocks, futures, foreign exchange and other fields.

The development of quantitative finance provides investors with more investment opportunities and tools, improves the efficiency and accuracy of transactions, and also brings challenges and risks. On the one hand, with the continuous increase in the amount of data and the continuous optimization of algorithms, the predictive power and stability of quantitative models have been significantly improved, creating more stable returns for investors. On the other hand, the market competition is becoming increasingly fierce, and the design and optimization of quantitative models are becoming more and more complex. At the same time, they are facing many challenges such as data quality, algorithm loopholes, and market changes.

Against this background, the Parrot project is committed to building an efficient and intelligent quantitative trading platform to provide investors with steady and sustained returns through advanced machine learning algorithms and intelligent trading strategies. Parrot will make full use of the latest technological means to continuously optimize and innovate trading models, improve the accuracy and efficiency of transactions, and respond to market changes and challenges to achieve a win-win situation for investors and the platform.

Project Overview

Quantitative financial technology is developed on the basis of computer technology, mathematical modeling and financial theory. With the improvement of computer computing power and the advancement of data collection technology, quantitative financial technology has developed rapidly. From traditional trading methods based on experience and intuition to quantitative trading strategies based on data and algorithms, quantitative financial technology has become a major trend in the financial field.

The Parrot project aims to use advanced artificial intelligence and machine learning technology to build an intelligent and efficient quantitative trading platform. Our goal is to provide investors with more stable and sustainable returns through technological innovation and data analysis, and to contribute to the development and stability of the financial market.

The importance of the Parrot project is reflected in several aspects:

- It provides investors with more investment options and opportunities, and improves investment efficiency and accuracy.
- Through intelligent trading strategies and risk control mechanisms, investment risks are reduced and income stability is improved.
- It promotes the development and innovation in the field of financial technology and promotes the healthy development and stable operation of the financial market.

We will introduce in detail the technical architecture, core functions and implementation details of the Parrot project, as well as the project's business model and market prospects. Through comprehensive and in-depth analysis, readers will better understand the significance and value of the Parrot project, and understand how to participate in it and gain benefits.

II. Technical Overview

- **Introduction to Parrot Platform**

  Parrot trading, referred to as PT Quantitative, is a leading quantitative platform with 12 years of stock market experience and 6 years of digital currency market verification. Founded by a Singaporean technology team and a team of American Wall Street financial experts; PT Quantitative is committed to providing investors with world-leading quantitative investment solutions through innovative

technology and artificial intelligence technology.

The core advantage of PT Quantification lies in its top-level quantitative strategy driven by AI. PT Quantitative is proud of being the world's first AI quantitative model trained using artificial intelligence. It integrates a variety of classic mathematical models and financial strategies to form a comprehensive and flexible quantitative trading framework. This model is narrowly called the " **super-core quantitative dynamic model** ". It can dynamically adjust quantitative strategies in real time according to market conditions, thereby making investment decisions more forward-looking and flexible.

The PT quantitative team is composed of a group of experienced and skilled experts with profound financial and technical backgrounds and extensive experience in the field of quantitative investment. PT Quantification continues to innovate and optimize, and is committed to improving the performance and stability of quantitative models to meet the growing needs of investors.

PT Quantitative Platform is committed to providing investors with efficient, transparent and robust investment solutions. PT Quantitative will continue to adhere to the concepts of technological innovation and customer first to create a better investment experience and better investment returns for customers.

- **Technical architecture overview**

  The technical architecture of the Parrot platform is designed to support its intelligent digital currency quantitative trading services. The following is a brief overview outlining the technical architecture of the Parrot platform:

  1. **Front-end application layer:**
     - The user interface part provides an interface for user interaction, including web pages and mobile applications. Users can register, log in, set up transactions, view transaction history and other operations through the front-end application layer.
  2. **Backend service layer:**

- Services including business logic processing, data processing, transaction execution and other functions. The back-end service layer is responsible for processing user requests, calling corresponding algorithms and models for data processing and transaction decisions, and returning the results to the front-end application layer.

3. **Algorithm and model layer:**
    - Including quantitative trading algorithms, artificial intelligence models, etc. This layer is responsible for realizing intelligent trading decisions and generating trading signals and execution strategies based on market data and user-set parameters.
4. **Transaction execution layer:**
    - The functional module responsible for actually executing transactions. The transaction execution layer interacts with the API interface of the digital currency exchange, executes the transaction instructions issued by the user, and returns the transaction results to the back-end service layer.
5. **Data storage and management:**
    - Including the storage and management of user information, transaction data, market data and other data. Data storage and management are responsible for storing users' transaction history, market data, etc. into the database, and providing corresponding data query and management functions.
6. **Security and monitoring layer:**
    - Responsible for system security protection and monitoring. The security and monitoring layer includes user identity authentication, transaction data encryption, abnormality monitoring and other functions to ensure the security and stability of the system.
7. **Third-party service integration layer:**

- Optional integration of third-party services, such as payment services, notification services, etc. The Parrot platform can enrich its functions by integrating third-party services and provide more comprehensive services.

The technical architecture of the Parrot platform is a layered architecture. Each layer has clear functions and responsibilities. Through collaboration and interaction between each layer, intelligent digital currency quantitative trading services are realized.

- **Core functions and features**

  The core functions and features of the Parrot platform are as follows:

  Core functions:

  1. **Intelligent quantitative trading:** The Parrot platform uses advanced artificial intelligence technology and quantitative trading algorithms to realize intelligent quantitative trading of digital currencies. By analyzing market data and parameters set by users, it automatically generates trading signals and execution strategies to help users achieve more stable and efficient transactions.
  2. **Comprehensive digital currency support:** The Parrot platform supports transactions in a variety of mainstream digital currencies, covering major digital currency trading pairs to meet users' trading needs for different digital currencies.
  3. **Flexible trading parameter setting:** The Parrot platform provides flexible trading parameter setting function. Users can customize personalized quantitative trading plans according to their own needs and risk preferences.

4. **Real-time monitoring and adjustment:** The Parrot platform monitors market changes and transaction execution in real time, and adjusts and optimizes trading strategies based on the latest market data to minimize risks and increase returns.
5. **Safe and reliable trading environment:** The Parrot platform uses advanced encryption technology and security protection measures to ensure the security of users' transaction data and funds. It also has a complete risk control system to ensure smooth and reliable transactions.

Features:

1. **Intelligence:** The Parrot platform uses artificial intelligence technology to achieve intelligent transaction decision-making and execution, improving the efficiency and accuracy of transactions.
2. **Convenient and simple:** The Parrot platform provides a simple and intuitive user interface and operation process. Users can easily and quickly set up and manage quantitative transactions without complicated operations.
3. **Efficient and stable:** The Parrot platform adopts a high-performance technical architecture and a stable and reliable trading system to ensure the efficiency and stability of transaction execution.
4. **Personalized customization:** The Parrot platform supports personalized trading parameter settings and strategy selection. Users can customize personalized quantitative trading plans according to their own needs and risk preferences.
5. **Continuous optimization:** The Parrot platform continues to optimize and improve trading algorithms and models, improve the performance and stability of the trading system, and provide users with a better trading experience.

With its intelligent trading functions, convenient and simple operating experience, efficient and stable trading system and personalized customization, the Parrot platform provides users with one-stop digital currency quantitative trading services.

III. Data collection and preprocessing

- **Data sources and acquisition**

  The data sources of the Parrot platform are diverse, including but not limited to the following aspects:

  1. **Digital currency exchange API:** The Parrot platform interacts with data through the API interface of mainstream digital currency exchanges (such as Binance, Huobi, OKEx, etc.) to obtain real-time market data, transaction data and other information.
  2. **Third-party data providers:** The Parrot platform can obtain richer market data and indicator information, such as historical market data, technical indicators, fundamental data, etc., by cooperating with third-party data providers.
  3. **Web crawler:** The Parrot platform can use web crawler technology to obtain relevant data, such as news information, social public opinion, etc., from public digital currency information websites, social media platforms, etc.
  4. **User input:** Users can also manually input or upload their own data, such as transaction history, custom indicator data, etc., through the interface provided by the Parrot platform.

  The above data sources can provide the Parrot platform with rich market information and data foundation, and provide support for subsequent quantitative trading strategy design and model training. During the data acquisition process, the Parrot platform will select appropriate data sources based on user needs and preferences, and acquire and integrate data in

appropriate ways.

- **Data cleaning and denoising**

  During the data collection process, the Parrot platform will face some common data quality problems, such as missing data, outliers, etc., and requires data cleaning and denoising operations to ensure the quality and reliability of the data.

  1. **Missing data handling:** The Parrot platform detects and handles missing values in the data. For missing values, you can choose to delete missing data, use interpolation to fill missing values, or use other related data for prediction completion.
  2. **Outlier detection and processing:** The Parrot platform will detect outliers in the data through statistical methods or machine learning methods. For outliers, you can choose to delete, correct or smooth them to avoid adverse effects on subsequent analysis and modeling.
  3. **Data deduplication:** The Parrot platform will detect and process duplicate values in the data to avoid duplicate data from interfering with subsequent analysis and modeling. For duplicate values, you can choose to delete or merge them.
  4. **Unified data format:** The Parrot platform will unify the format and data type of data to facilitate subsequent data analysis and modeling. For data of different formats and types, format conversion and data type conversion can be performed.
  5. **Abnormal data processing:** The Parrot platform will process abnormal data, including but not limited to data smoothing, censoring, truncation and other methods, to eliminate the impact of abnormal data on analysis results.

- **Data standardization and normalization:**

In the data preprocessing stage, the Parrot platform will standardize and normalize the collected data to ensure that the data has a unified scale and range and improve the training effect and stability of the model.

1. **Data normalization:** Data normalization is scaling the data so that it falls into a specific range. Common standardization methods include Z-score standardization and Min-Max standardization.
    - **Z-score standardization:** subtract the mean from the data and then divide it by the standard deviation so that the standardized data has a mean of 0 and a standard deviation of 1. The formula is as follows:

      $$ x_{\text{Normalized}} = \frac{x - \mu}{\sigma} $$

    - **Min-Max normalization:** Linearly scale the data to a specific range, usually $ 0, 1 $ or $ -1, 1 $. The formula is as follows:

      $$ x_{\text{Normalized}} = \frac{x - \min(x)}{\max(x) - \min(x)} $$

2. **Data normalization:** Data normalization is to scale the data to a specific interval, usually $ 0, 1 $ or $ -1, 1 $. Common normalization methods include Min-Max normalization and Z-score normalization.
    - **Min-Max normalization:** Linearly scale the data to a specific range, usually $ 0, 1 $ or $ -1, 1 $. The formula is as follows:

      $$ x_{\text{Normalization}} = \frac{x - \min(x)}{\max(x) - \min(x)} $$

    - **Z-score normalization:** Subtract the mean from the data and then divide it by the standard deviation so that the normalized data has a mean of 0 and a standard deviation of 1. The formula is as follows:

      $$ x_{\text{Normalization}} = \frac{x - \mu}{\sigma} $$

Through data standardization and normalization processing, the dimensional differences between different features can be eliminated, the convergence speed and stability of the model can be improved, and the generalization ability of the model can also be improved.

- **Data transformation and feature engineering**

In the data preprocessing stage of the Parrot platform, data transformation and feature engineering are crucial steps. They can help extract effective features and appropriately transform the data to facilitate subsequent modeling and analysis.

1. **Feature extraction:** Feature extraction is to extract representative and distinguishing features from the original data. In digital currency trading, features such as price, trading volume, technical indicators (such as moving averages, relative strength indicators, etc.), as well as fundamental data (such as market capitalization, trading volume, news sentiment indicators, etc.) can be extracted from market data. wait.
2. **Feature transformation:** Feature transformation is the appropriate transformation of the extracted features to facilitate model training and optimization. Common feature transformation methods include polynomial feature transformation, logarithmic transformation, exponential transformation, etc.
3. **Feature selection:** Feature selection is to select the most influential features for the target task from the extracted features. The Parrot platform can use statistical methods, machine learning methods or domain knowledge for feature selection to reduce feature dimensions and improve model efficiency.
4. **Feature construction:** Feature construction is to build new features based on business needs and domain knowledge. In digital currency trading, features related to market trends, trading volumes, etc. can be constructed to help the model better capture market changes and trends.
5. **Data transformation:** Data transformation is the appropriate transformation of original data to facilitate subsequent modeling and analysis. Common data transformation methods include data standardization, data normalization, data smoothing, etc.

Through the processing of data conversion and feature engineering, the Parrot platform can extract representative and distinguishing features and perform appropriate conversion of the data, laying a good foundation for subsequent modeling and analysis work.

IV. AI intelligent learning and training model

- **Model selection and design principles**

  In the AI intelligent learning and training model stage of the Parrot platform, it is crucial to select an appropriate model and design an effective training strategy. The following are some of Parrot's model selection and design principles:

  1. **Problem analysis and clear goals:** Before selecting a model, it is necessary to conduct an in-depth analysis of the problem and clarify the type of problem (classification, regression, clustering, etc.), goals and constraints. Choose an appropriate model based on the nature of the problem.
  2. **Balance between model complexity and generalization ability:** The complexity of the model should be appropriate, neither too simple, resulting in underfitting, nor too complex, resulting in overfitting. To choose a model with good generalization ability, avoid the situation where it performs well on the training set but performs poorly on the test set.
  3. **Feature engineering and data preparation:** Before selecting a model, adequate feature engineering and data preparation are required. Appropriate features can improve the performance of the model, and effective data preparation can reduce the difficulty of training the model.
  4. **Model performance and efficiency considerations:** Consider the performance and efficiency of the model, and select a model that can both meet the needs of the problem and be trained within an acceptable time. You can consider using lightweight models, distributed training and other methods to improve model efficiency.
  5. **Cross-validation and hyperparameter tuning:** During the model training

5. **Cross-validation and parameter tuning strategy:** During the model selection and design process, cross-validation and other methods need to be used to evaluate the performance of the model and perform parameter tuning. Reasonably choose the parameter adjustment strategy to avoid excessive parameter adjustment, which will lead to a decrease in the model's generalization ability on the test set.
6. **Model integration and fusion:** Consider using model integration and fusion methods to improve model performance and robustness. Integrated learning methods such as bagging, boosting, and stacking can be used to combine the prediction results of multiple models.

In the AI intelligent learning and training model stage of the Parrot platform, following the above principles, selecting an appropriate model and designing an effective training strategy can improve the performance and efficiency of the model and provide more accurate and reliable support for subsequent quantitative trading decisions.

- **Neural network model architecture**

  The architectural design of neural network models plays a key role in AI intelligent learning and training models. The following is an example of parrot's neural network model architecture:

  1. **Input Layer:**
     - The input layer accepts raw feature data as input. Each input node corresponds to a feature, and the number of nodes in the input layer depends on the dimension of the feature.
  2. **Hidden Layers:**
     - Hidden layer is the middle layer in a neural network that is used to extract features and learn representations of data. Can contain multiple hidden layers, each containing multiple neurons (nodes).
  3. **Activation Functions:**
     - The activation function is used to introduce nonlinear transformation

- The activation function is used to introduce nonlinear transformation and increase the expressive ability of the model. Common activation functions include ReLU, Sigmoid, Tanh, etc.

4. **Output Layer:**
    - The output layer produces the output results of the model, which can be class probabilities for classification problems or predicted values for regression problems. The number of nodes in the output layer depends on the type of problem.
5. **Loss Function:**
    - The loss function measures the difference between the model output and the true label. For classification problems, commonly used loss functions include the cross-entropy loss function; for regression problems, commonly used loss functions include the mean square error loss function.
6. **Optimizer:**
    - The optimizer is used to update the parameters of the neural network to minimize the loss function. Common optimizers include stochastic gradient descent (SGD), Adam, RMSProp, etc.
7. **Regularization:**
    - Regularization techniques are used to prevent model overfitting. Common regularization techniques include L1 regularization and L2 regularization.
8. **Batch Normalization:**
    - Batch normalization is used to speed up the training process and improve the stability of the model. It alleviates the internal covariate drift problem during the training process by normalizing the input data of each batch.
9. **Dropout：**
    - Dropout is a regularization technique used to randomly discard some

- Dropout is a regularization technique used to randomly discard some neurons to prevent the neural network from overfitting.

- **Supervised and unsupervised learning algorithms**

  In parrot's AI intelligent learning and training models, supervised learning and unsupervised learning algorithms are two commonly used machine learning methods. They have different characteristics and application scenarios when solving problems and processing data. The following is the algorithm used by parrot:

  Supervised learning algorithm:

  1. **Linear Regression:** used to establish a linear relationship between features and targets and predict continuous values.
  2. **Logistic Regression:** Used to solve binary classification problems, and the output results are probability values.
  3. **Decision Trees:** Classify and regress data through tree structures.
  4. **Support Vector Machines (SVM):** used to solve classification and regression problems, capable of processing linear and nonlinear data.
  5. **k-Nearest Neighbors (KNN):** Classification or regression based on the nearest neighbors of data points.
  6. **Neural Networks:** Building complex nonlinear models through multiple layers of neurons can solve a variety of problems.

  Unsupervised learning algorithm:

  1. **Clustering:** Divide data into different categories. Common algorithms include k-means clustering and hierarchical clustering.
  2. **Dimensionality Reduction:** Reduce the dimensionality of data. Common algorithms include Principal Component Analysis (PCA) and t-distributed Stochastic Neighbor Embedding (t-SNE).

  3. **Association Rule Learning:** Discover rules and correlations in data sets

3. **Association Rule Learning:** Discover rules and correlations in data sets. Common algorithms include Apriori algorithm and FP-growth algorithm.
4. **Anomaly Detection:** Discover outliers in data. Common algorithms include statistical methods and machine learning-based methods.
5. **Generative Adversarial Networks (GANs):** consists of two networks, a generator network and a discriminator network, used to generate data with similar distributions.

These supervised learning and unsupervised learning algorithms are widely used in AI intelligent learning and training models. Appropriate algorithms can be selected according to specific problems and data characteristics to solve them. In the application of the Parrot platform, according to the needs of quantitative trading and data conditions, appropriate supervised learning or unsupervised learning algorithms are selected for modeling and analysis to achieve better trading decision support.

- **Model evaluation and optimization strategies**
- In AI intelligent learning and training models, model evaluation and optimization strategies are key steps to ensure model performance and effectiveness. The following is the parrot model evaluation and optimization strategy:

  Model evaluation strategy:

  1. **Cross-Validation:** Divide the data set into a training set and a test set, and use the cross-validation method to evaluate the model to reduce evaluation errors caused by unreasonable division of the data set.
  2. **Evaluation index selection:** Based on specific problems and tasks, select appropriate evaluation indexes for model evaluation. For classification problems, commonly used evaluation indicators include accuracy, precision, recall, F1-score, etc.; for regression problems, commonly used evaluation indicators include mean square error (MSE), mean absolute error (MAE), R^2, etc.

  3. **Learning Curve:** Draw a learning curve to analyze the performance changes

3. **Learning Curve:** Draw a learning curve to analyze the performance changes of the model under different amounts of training data to determine whether the model has over-fitting or under-fitting problems.
4. **ROC curve and AUC value (Receiver Operating Characteristic Curve and Area Under Curve):** used to evaluate the performance of the two-classification model, drawing a curve between the positive sample rate (True Positive Rate) and the false sample rate (False Positive Rate). and calculate the area under the curve (AUC).
5. **Confusion Matrix:** Used to visualize the performance of the classification model, showing the relationship between true examples, true negative examples, false positive examples, and false negative examples.

Model optimization strategy:

1. **Hyperparameter tuning:** Use methods such as grid search, random search, or Bayesian optimization to tune the hyperparameters of the model to improve the performance of the model.
2. **Feature engineering:** Perform feature extraction, feature selection and feature transformation on original data to improve the performance and generalization capabilities of the model.
3. **Model integration:** Use model integration techniques (such as bagging, boosting, stacking, etc.) to combine the prediction results of multiple models to improve the robustness and performance of the model.
4. **Regularization:** Use methods such as L1 regularization and L2 regularization to control the complexity of the model and avoid overfitting problems.
5. **Data enhancement:** Enhance the training data (such as rotation, scaling, translation, etc.) to expand the data set and improve the generalization ability of the model.

Through the above model evaluation and optimization strategies, the

Through the above model evaluation and optimization strategies, the performance and effect of the model can be effectively improved, and more accurate and reliable decision support can be provided in quantitative trading.

V. Intelligent Trading Strategy

- **Strategy design and selection**

The design and selection of PARROT intelligent trading strategies are key steps in the Parrot platform. The following is the strategy design and selection method of parrot:

1. **Technical indicator strategies:** Trading strategies based on technical indicators (such as moving averages, relative strength indicators, etc.) are common choices. Trading signals can be generated based on changes in technical indicators. For example, when the short-term moving average crosses the long-term moving average, a buy signal is generated, and vice versa, a sell signal is generated.
2. **Trend following strategies:** Trend following strategies make trading decisions by identifying the trend direction of the market. Common trend following methods include Bollinger Bands strategy, momentum strategy, etc.
3. **Mean Reversion Strategy:** The mean reversion strategy is based on the volatility of market prices and generates trading signals when prices deviate from their historical mean. For example, a buy signal is generated when the price is below its historical average, and a sell signal is generated when the price is below its historical average.
4. **Machine learning strategy:** Use machine learning algorithms to build trading models and predict future market trends based on historical data and characteristics. Common machine learning algorithms include support vector machines, random forests, neural networks, etc.

5. **Event-driven strategies:** Event-driven strategies generate trading signals based on

6. **Event-driven strategies:** Event-driven strategies generate trading signals based on specific events in the market (such as company announcements, economic data releases, etc.). Make trading decisions by analyzing the impact of events and market reactions.

When choosing a PARROT intelligent trading strategy, you need to consider factors such as the market environment, asset classes, investment objectives, etc., and combine historical data and real-time market information to evaluate and select the appropriate strategy. At the same time, strategy backtesting and optimization also need to be carried out to ensure the stability and profitability of the strategy.

- **Trading signal generation**
- PARROT trading signal generation is based on analyzing and processing market data to identify potential trading opportunities and generate corresponding buy or sell signals. The following is the general process of PARROT trading signal generation:

    1. **Data collection and preprocessing:** First, obtain market data from various data sources, including price data, transaction volume data, technical indicator data, etc. These data are then subjected to pre-processing operations such as cleaning, denoising and filling missing values to ensure the quality and integrity of the data.
    2. **Feature extraction and feature engineering:** Feature extraction and feature engineering are performed on the preprocessed data to extract effective feature information from the original data for building trading models and generating trading signals.
    3. **Model establishment and training:** Based on the extracted feature data, establish an appropriate transaction model, which can be a rule-based model, a machine learning model, or a deep learning model, etc. The model is then trained using historical data to learn market rules and patterns.
    4. **Trading signal generation:** After model training, real-time or historical data is

4. **Trading signal generation:** After model training, real-time or historical data is input into the model to generate corresponding trading signals. Depending on the model's design and strategy logic, the model will generate a buy or sell signal when certain conditions are met.
5. **Risk control and filtering:** When generating trading signals, risk control and filtering mechanisms also need to be considered to prevent unnecessary transactions and reduce trading risks. Risk control parameters such as stop loss and take profit can be set, and trading signals can be filtered and verified to ensure the validity and reliability of trading signals.
6. **Real-time monitoring and execution:** The generated trading signals will monitor market conditions in real time and execute transactions at the appropriate time. Trade execution can be performed through automated trading systems or manually, adjusted and optimized according to actual conditions.

PARROT can automatically generate effective trading signals based on market data and trading models through AI intelligence, providing investors with decision support and trading suggestions.

- **Risk Management and Money Management**
- Risk management and money management play a vital role in quantitative trading. They help investors control losses, protect funds, and improve long-term profitability. Here are parrot's risk management and money management strategies:

1. Risk management:

- **Stop loss strategy:** Set a stop loss price and automatically stop the loss when the transaction reaches a certain level of loss to control the loss.
- **Position control:** Control the position ratio of a single transaction to avoid huge losses caused by over-investment.

- **Diversification:** Diversify your investments across different assets, markets, or

Diversification: Diversify your investments across different assets, markets, or strategies to reduce overall portfolio risk.

- **Volatility control:** Adjust trading strategies according to market volatility and reduce positions in times of high volatility.
- **Transaction monitoring:** monitor transaction execution in real time, adjust strategies in a timely manner to respond to market changes, and prevent risks caused by technical problems or market abnormalities.

2. Fund management:

- **Fixed proportion position:** allocate funds to each transaction according to a fixed proportion, such that the risk of each transaction does not exceed 1% of the total funds.
- **Kelly's formula:** Calculate the optimal position ratio based on the winning rate and odds of the trading strategy to maximize long-term returns.
- **Dynamic position adjustment:** Adjust position proportions based on current market conditions and strategy performance to avoid over-investment or over-conservatism in different market environments.
- **Fund protection:** Set a maximum loss limit, stop trading when the account loses more than a certain percentage, and re-evaluate strategies and risks.
- **Compound interest investing:** Reinvest trading profits into transactions to accelerate capital growth, but the risk needs to be carefully controlled.

The comprehensive use of risk management and fund management strategies can help investors effectively manage risks, protect funds, and improve long-term profitability in quantitative trading.

- **Real-time decision-making and trade execution**

The real-time decision-making and AI intelligent trading execution of the Parrot platform are based on real-time market data and pre-defined trading strategies, and are realized through automated systems. The following is the general process of parrot's real-time decision-making and transaction execution:

1. Data acquisition and processing: The Parrot platform obtains real-time market

[illegible] processing: [illegible] data from various data sources, including price data, transaction volume data, technical indicator data, etc. These data are then processed and preprocessed for subsequent analysis and decision-making.

2. Real-time decision generation: Based on the acquired real-time market data, the Parrot platform uses pre-defined trading strategies and models to generate real-time decisions. Based on the logic and conditions of the strategy, determine whether a buy or sell signal is generated.

3. Risk control and filtering: When generating real-time trading signals, risk control and filtering mechanisms also need to be considered to prevent unnecessary transactions and reduce transaction risks. Risk control parameters such as stop loss and take profit can be set, and trading signals can be filtered and verified to ensure the validity and reliability of trading signals.

4. Trade execution: The generated real-time trading signals will be executed through the automated trading system. According to the type of trading signal (buy or sell), corresponding trading operations are automatically performed, including placing orders, canceling orders, modifying orders, etc., and interact with the exchange's trading interface in real time.

5. Real-time monitoring and feedback: The Parrot platform monitors transaction execution in real time, including transaction status, account fund changes, etc. Provide feedback and records based on transaction execution results, and timely adjust strategies and risk control parameters to improve the stability and profitability of the trading system.

Through the above process, the Parrot platform can realize intelligent trading decisions and automated execution based on real-time market data, providing investors with efficient, accurate and stable trading services.

VI. Technical implementation and system architecture

- **Backend system architecture**

The Parrot back-end system architecture is designed to support various functions and services of the Parrot platform, including data processing, transaction execution, user management, etc. The following is a diagram of the Parrot backend system architecture:

1. **Data access layer:** This layer is responsible for obtaining real-time market data from various data sources, including price data, transaction volume data, technical indicator data, etc. Data can come from APIs provided by exchanges, third-party data providers, web crawlers, etc.
2. **Data processing layer:** In this layer, the acquired real-time market data is processed and preprocessed, including data cleaning, denoising, filling in missing values, feature extraction and other operations to facilitate subsequent analysis and decision-making.
3. **Trading decision-making layer:** This layer is the core of the Parrot platform and is responsible for generating real-time decisions based on pre-defined trading strategies and models. Based on the processed real-time market data, determine whether a buy or sell signal is generated, and perform corresponding risk control and filtering.
4. **Trade execution layer:** The generated real-time trading signals will be executed through this layer. The transaction execution layer interacts with the exchange's trading interface in real time, executes buy or sell orders, and monitors transaction execution.
5. **User management and permission control layer:** This layer is responsible for user management and permission control, including user registration, login, account management and other functions. Restrict access to system functions and data based on user identity and permissions.

6. **Monitoring and logging layer:** The Parrot back-end system also needs to

have monitoring and logging functions to monitor system operation and transaction execution in real time, and record logs for subsequent auditing and analysis.

7. **Service governance and security layer:** This layer is responsible for service governance and security management, including load balancing, fault recovery, security protection and other functions to ensure the stability and security of the system.
8. **Data storage layer:** This layer is responsible for storing various data required by the system, including user information, transaction data, market data, etc. Appropriate database technology can be selected for data storage and management.

- **Data storage and processing**

  Parrot data storage and processing is a crucial part of the platform, which involves obtaining data from various data sources, storing data, processing and analyzing data, etc. The following is the general process of Parrot data storage and processing:

  1. **Data acquisition:** The Parrot platform obtains data from various data sources through API, third-party data providers or web crawlers, including market price data, transaction volume data, technical indicator data, fundamental data, etc.
  2. **Data storage:** The acquired data needs to be stored for subsequent analysis and processing. The Parrot platform can select appropriate database technologies for data storage, such as relational databases (such as MySQL, PostgreSQL), NoSQL databases (such as MongoDB, Redis), etc.
  3. **Data cleaning and preprocessing:** The original data obtained may have various problems, such as missing values, outliers, duplicate values, etc., which requires data cleaning and preprocessing operations. This includes operations such as removing invalid data, filling in missing values, and smoothing data to ensure the quality and integrity of the data.

4. **Feature extraction and feature engineering:** Based on data preprocessing, feature extraction and feature engineering operations can be performed to extract effective feature information from the original data to build trading models and generate trading signals.
5. **Model training and optimization:** Based on the data after preprocessing and feature engineering, model training and optimization can be performed. The Parrot platform can use historical data to train trading models and optimize and adjust them based on the performance of the model.
6. **Real-time data updates:** As the market changes, real-time data needs to be constantly updated and adjusted. The Parrot platform can set up scheduled tasks or real-time data streams to update data regularly or in real time to ensure the timeliness and accuracy of the data.
7. **Data analysis and decision generation:** After data processing and model training, data analysis and transaction decision generation can be performed. The Parrot platform generates corresponding trading signals and decision-making suggestions based on real-time market data and pre-defined trading strategies.
8. **Trade Execution and Monitoring:** The generated trading signals will be executed through the trade execution system. At the same time, it is necessary to monitor the execution of transactions in real time, including transaction status, changes in account funds, etc., and record logs for subsequent auditing and analysis.

Through data storage and processing processes, the Parrot platform can effectively acquire, store, process and analyze market data, providing investors with efficient, accurate and stable trading decision support.

- **Real-time data stream processing**

Real-time data stream processing refers to the process of quickly and instantly

processing and analyzing data streams generated in real time. In the Parrot platform, real-time data stream processing is mainly used to process market data, including price data, transaction volume data, etc., in order to generate trading signals and decision support in a timely manner. The following is the general process of parrot real-time data stream processing:

1. **Data source access:** Real-time market data is usually obtained from exchanges or third-party data providers through API, WebSocket, etc. The Parrot platform establishes connections to these data sources and receives real-time data streams.
2. **Data distribution and routing:** The received real-time data stream may contain multiple data sources and different types of data, which needs to be distributed and routed to send the data to the corresponding processing module.
3. **Data preprocessing:** The received real-time data may have various problems, such as outliers, noise, etc. Data preprocessing operations, such as denoising, filtering, smoothing, etc., are required to ensure the quality and stability of the data.
4. **Feature extraction and calculation:** Extract effective feature information from real-time data streams, such as technical indicators, volatility, etc. Derived indicators can be calculated based on these characteristic information for subsequent model building and decision making.
5. **Real-time data analysis:** Perform real-time data analysis and model prediction based on preprocessed and feature extracted data. Machine learning algorithms, deep learning models, etc. can be used for data analysis and identification of market trends and patterns.
6. **Real-time decision generation:** Generate corresponding trading signals and

decision-making suggestions based on the results of real-time data analysis. These decisions can be based on predefined trading strategies and models such as technical indicator crossovers, trend analysis, etc.

7. **Trade Execution and Monitoring:** The real-time trading signals generated will be executed through the trade execution system. At the same time, it is necessary to monitor the execution of transactions in real time, including transaction status, changes in account funds, etc., and record logs for subsequent auditing and analysis.

Through the above real-time data stream processing process, the Parrot platform can quickly respond to market changes, generate trading signals and decision support in a timely manner, and provide investors with efficient, accurate and stable trading services.

- **Distributed computing and high availability**

  Distributed computing and high availability are one of the key technologies in building the Parrot platform, which can ensure good performance and stability of the platform. About the application of parrot distributed computing and high availability in the Parrot platform:

  Distributed Computing:

  1. **Task distribution and parallel computing:** The Parrot platform adopts a distributed architecture, decomposes tasks into multiple subtasks, and distributes these subtasks to multiple computing nodes for parallel computing through the task scheduler. This can speed up the process of data processing and model training.
  2. **Data sharding and distributed storage:** Large-scale data needs to be sharded and stored on multiple nodes and managed through a distributed file system or object storage. This improves data reliability and scalability and makes full use of the cluster's computing resources.

  3. **Fault tolerance and load balancing:** The Parrot platform adopts a fault

tolerance mechanism. When a computing node fails, tasks can be automatically migrated to other healthy nodes to continue execution. At the same time, tasks are evenly distributed to each node through the load balancer to ensure resource utilization and performance of the cluster.

4. **Distributed storage and caching:** The Parrot platform uses distributed storage and caching technology to store data on multiple nodes, and uses the caching system to accelerate data access and calculation processes. This reduces the risk of single points of failure and improves the efficiency of data reading and writing.

High availability:

1. **Multi-active architecture:** The Parrot platform adopts a multi-active architecture, deploying the system in data centers or cloud service providers in multiple geographical locations to ensure that even if a failure occurs in one area, systems in other areas can still continue to provide services.
2. **Automatic expansion and elastic scaling:** The Parrot platform has automatic expansion and elastic scaling capabilities, automatically adjusting the number and configuration of computing nodes based on system load and resource utilization to cope with sudden traffic increases or load fluctuations.
3. **Disaster recovery backup and data replication:** The Parrot platform sets up disaster recovery backup and data replication mechanisms to back up key data to different geographical locations or data centers, and perform regular data synchronization and backup to prevent data loss and system failures.
4. **Monitoring and alarm system:** The Parrot platform has established a complete monitoring and alarm system to monitor system operation and performance indicators in real time, and to detect and respond to abnormal situations in a timely manner to ensure the availability and stability of the system.

Through distributed computing and high-availability technical means, the Parrot

platform can provide stable and efficient trading services to meet users' needs for performance and reliability.

VII. Security and Privacy Protection

- **Data security and encryption**

  In the Parrot platform, data security and encryption are crucial, especially when it comes to users' transaction data and personal information. Some data security and encryption measures taken by the Parrot platform:

  1. **Data transmission encryption:** The Parrot platform uses encryption protocols such as SSL/TLS to encrypt data transmission between users and systems to prevent data from being stolen or tampered with during transmission.
  2. **Data storage encryption:** Users' sensitive data and transaction data are encrypted using encryption algorithms during storage to ensure the security of the data on the storage medium.
  3. **Access control:** The Parrot platform adopts a strict access control mechanism to limit users and systems' access to sensitive data. Only authorized users can access the corresponding data.
  4. **User authentication:** Users need to authenticate when logging in and accessing the Parrot platform, and security measures such as multi-factor authentication are used to ensure the authenticity of the user's identity.
  5. **Security audit and monitoring:** The Parrot platform has established a complete security audit and monitoring system to monitor the system's operation and data access in real time, and promptly discover and respond to potential security threats.
  6. **Vulnerability scanning and repair:** The Parrot platform regularly conducts

vulnerability scanning and security vulnerability repair to ensure the security and stability of the system.

7. **Data backup and disaster recovery:** The Parrot platform sets regular data backup and disaster recovery strategies to back up important data to different geographical locations or data centers to prevent data loss and system failures.
8. **Encryption algorithm selection:** The Parrot platform uses encryption algorithms with high security and reliability to encrypt user data, such as AES, RSA, etc.

- **User Authentication and Authorization** In the Parrot platform, user authentication and authorization are key links to ensure that only legitimate users can access the system and data. User authentication and authorization measures adopted by the Parrot platform:
    1. **Username and password verification:** Users need to provide username and password for authentication when logging into the Parrot platform. The system will verify the username and password provided by the user to ensure the legitimacy of the user's identity.
    2. **Multi-factor authentication:** The Parrot platform supports multi-factor authentication. Users can choose to enable additional authentication methods such as mobile phone verification codes and fingerprint recognition to improve the security of identity verification.
    3. **OAuth authentication:** For users with third-party applications or services accessing the Parrot platform, OAuth authentication can be used to authenticate through a third-party authentication provider to increase the flexibility and security of the system.
    4. **Single sign-on (SSO):** The Parrot platform supports single sign-on. Users can

access multiple related systems through one login, improving user experience and work efficiency.

5. **Access Control List (ACL):** The Parrot platform uses Access Control List (ACL) to authorize users and set different access rights based on user roles and permissions to limit the scope of user access to systems and data.
6. **Session management:** The Parrot platform effectively manages user sessions, including session expiration time, session retention, session destruction, etc., to prevent security issues such as session hijacking and session timeout.
7. **Audit log:** The Parrot platform records user login and operation logs, including login time, login location, operation records, etc., to track user behavior and audit system access.
8. **Password security policy:** The Parrot platform adopts a password security policy, including password complexity requirements, regular password replacement, password encrypted storage, etc., to ensure the security of user passwords.

- **Privacy Policy**

  The Parrot platform is committed to protecting user privacy and has adopted a series of privacy protection strategies to ensure that users' personal information and transaction data are fully protected. The following is the privacy protection policy adopted by the Parrot platform:

  1. **Data encryption:** The Parrot platform encrypts, stores and transmits users' sensitive information and transaction data, using highly secure encryption algorithms to ensure data confidentiality.
  2. **Data minimization principle:** The Parrot platform only collects and uses necessary user information and transaction data, and follows the data minimization principle to minimize the risk of users' personal information leakage.

  3. **Transparency and right to know:** The Parrot platform provides a transparent

privacy policy and terms of service, clearly explains to users the purpose and method of data collection, use and sharing, and respects users' right to know.

4. **Data access control:** The Parrot platform adopts a strict access control mechanism to limit access to users' personal information and transaction data. Only authorized personnel can access relevant data.
5. **Data anonymization:** The Parrot platform anonymizes users' personal information and transaction data, and desensitizes user identity information and sensitive data to protect user privacy.
6. **Security audit and monitoring:** The Parrot platform has established a complete security audit and monitoring system to monitor data access and operations in real time, and promptly discover and prevent potential security risks.
7. **Third-party data protection:** The Parrot platform establishes a compliant data protection mechanism with third-party data providers and partners to ensure that third parties' protection of user data complies with laws, regulations and privacy policy requirements.
8. **User rights protection:** The Parrot platform respects users' rights to privacy and personal information protection, provides users with data access, correction and deletion rights, and provides users with relevant privacy protection services and support.

Through the above privacy protection strategies, the Parrot platform is committed to protecting users' privacy rights and personal information security, and providing users with a safe and reliable trading environment and services.

VIII. Development Roadmap

- Initial development stage

In the initial development phase, the Parrot platform will focus on the

development and improvement of the following key aspects:

1. **System architecture design:** Improve the system architecture design of the Parrot platform, including front-end interface, back-end services, database design, etc., to ensure that the system has good scalability and stability.
2. **Basic function development:** Develop and improve the basic functions of the Parrot platform, including user identity verification, data collection and processing, trading signal generation, risk management, etc., to ensure that the platform has basic trading capabilities and functions.
3. **User interface design:** Design user-friendly interfaces and interactive experiences, including transaction interfaces, data analysis interfaces, account management interfaces, etc., to improve user convenience and experience.
4. **Data access and integration:** Access multiple data sources and exchange interfaces to achieve real-time data acquisition and integration, providing data support for subsequent data analysis and trading decisions.
5. **Security and privacy protection:** Strengthen the security and privacy protection mechanisms of the platform, including data encryption, user identity verification, access control, etc., to ensure the security of user data and transactions.
6. **Performance optimization and testing:** Perform performance optimization and testing on the platform, including system stability testing, performance testing, security vulnerability scanning, etc., to ensure the stability and reliability of the platform.
7. **User feedback and improvements:** Collect user feedback and suggestions, continuously improve and optimize the functions and performance of the platform, and improve user satisfaction and user stickiness.

At present, we have completed all the initial development work and are currently continuing to optimize the product and improve user experience.

- **Mid-term improvement and optimization**

In the mid-term improvement and optimization stage, the Parrot platform will further strengthen function improvement and system optimization to improve user experience and platform performance, while actively exploring new technologies and functions to promote the sustainable development of the platform. The main work directions of parrot's mid-term improvement and optimization phase are:

1. **Function expansion and deepening:** Further improve and expand the functions of the Parrot platform, including adding new trading strategies and indicators, optimizing risk management modules, improving data analysis and decision support capabilities, etc., to meet the growing needs of users.
2. **Algorithm optimization and model update:** Optimize and update existing trading algorithms and models, combine with the latest technology and data, improve the accuracy and efficiency of trading decisions, and achieve more stable and reliable trading results.
3. **Technical architecture upgrade:** Upgrade and optimize the technical architecture of the Parrot platform, including the introduction of distributed computing and big data processing technology, the adoption of cloud native architecture and microservice architecture, etc., to improve the performance and scalability of the system.
4. **User experience optimization:** further optimize the user interface and interactive experience to improve user convenience and experience, including optimizing the interface layout, simplifying the operation process, and accelerating response speed, etc.
5. **Security protection reinforcement:** Strengthen the security protection measures of the platform, including encryption algorithm upgrades, vulnerability scanning and repair, security auditing and monitoring, etc., to ensure the security of user data and transactions.
6. **Community building and partners:** Strengthen communication and cooperation

with users and partners, establish an active community ecology, promote technology exchange and sharing, and promote the sustainable development and growth of the platform.

7. **User training and support:** Provide relevant user training and technical support services to help users better use and understand the Parrot platform and improve user satisfaction and loyalty.

- **Long-term development and enhancements**

  In the long-term development and function enhancement stage, the Parrot platform will continue to promote technological innovation and functional expansion to adapt to market changes and meet the growing needs of users. The main work directions of parrot's long-term development and functional enhancement phase are:

  1. **Global layout:** Strengthen internationalization strategy, expand global markets, cooperate with international exchanges and financial institutions, and achieve global layout and services.
  2. **Cross-asset trading:** Expand trading varieties, including stocks, futures, foreign exchange and other asset classes, to achieve cross-market and cross-variety transactions.
  3. **Smart contract platform:** Develop a smart contract platform to support the writing and execution of smart contracts and provide a more flexible and intelligent transaction method.
  4. **Quantitative strategy market:** Establish a quantitative strategy market, allowing users to share and trade quantitative strategies, and promote the innovation and sharing of strategies.
  5. **Artificial intelligence technology:** In-depth research and application of artificial intelligence technology, including deep learning, reinforcement learning, etc., to improve the intelligence level of trading decisions.
  6. **Social trading platform:** Build a social trading platform, provide social

functions and communication platform, and promote communication and cooperation between users.

7. **Ecosystem construction:** Develop a complete ecosystem, including data providers, trading tool providers, strategy developers, etc., to form a virtuous cycle ecosystem.
8. **Continuous innovation and research and development:** Continuously carry out technological innovation and research and development, propose new trading strategies and algorithms, and maintain competitive advantages and leading position.
9. **Quantitative fund construction** : We will build a quantitative fund to provide investors with diversified investment services and asset management services.

The Parrot platform will continue to improve its comprehensive strength and market influence, become the world's leading quantitative trading platform, and continue to provide users with high-quality trading services and technical support.

IX. Commercial Application and Value

- **Industry application scenarios**

  The Parrot platform has a wide range of application scenarios in business applications and value creation, covering multiple industries and fields. Some major industry application scenarios of parrot:

  1. **Financial investment:** The Parrot platform can be applied to financial markets such as stocks, futures, and foreign exchange to provide investors with quantitative trading strategies and intelligent trading decision support, helping investors achieve stable returns and risk management.

  2. **Digital currency trading:** The Parrot platform can be applied to the digital

currency market to provide digital currency investors with intelligent quantitative trading strategies and real-time transaction execution, improving transaction efficiency and profit levels.

3. **Risk management:** The risk management function of the Parrot platform can be applied to the risk management fields of various industries, including financial risk management, insurance risk management, supply chain risk management, etc., to help enterprises reduce risks and improve business stability.
4. **Commodity trading:** The Parrot platform can be applied to the commodity market, including the trading of various commodities such as agricultural products, energy, metals, etc., providing traders with intelligent trading strategies and risk management tools.
5. **Quantitative research:** The Parrot platform can be used for quantitative research and strategy development, providing a data analysis and model testing platform for researchers and academic institutions, and supporting the research and development of quantitative trading theory and technology.
6. **Artificial Intelligence Application:** The Parrot platform integrates artificial intelligence technology and can be applied to various artificial intelligence application scenarios, including intelligent customer service, intelligent recommendations, intelligent decision-making, etc., to improve the service level and decision-making efficiency of enterprises.

In the early stages of the project, we only provided the PT quantitative trading software APP product to carry out brand building and dissemination through the product, but we are about to give more possibilities in the field of AI. We will provide information finance for enterprises and commercial markets. With data analysis, transaction data analysis and AI strategy optimization, the Parrot platform can provide intelligent transaction and decision-making support for various enterprises and institutions, creating greater business value and social benefits.

- **Business model and profit path**
- The business model and profit channels of the Parrot platform mainly include the following aspects:

    1. **Transaction GAS fees:** The Parrot platform can make profits by charging users GAS transaction fees. When users use the Parrot platform to conduct third-party API transactions, the platform can charge a handling fee based on a certain proportion of the transaction volume or transaction profits as a source of revenue for the platform.
    2. **Subscription service fees:** The Parrot platform can provide different subscription service plans and charge subscription fees to users. These subscription services may include advanced trading strategies, real-time data analysis, risk management tools, etc. Users can choose the corresponding subscription service plan according to their needs and pay the corresponding fees.
    3. **Customized services:** The Parrot platform can provide customized trading strategies and solutions according to customer needs, and charge customized service fees to customers. These customized services may include quantitative model development, data analysis reports, trading system integration, etc., to provide customers with personalized services and support.
    4. **Data sales:** The Parrot platform can package and sell its accumulated transaction data and market data, provide data subscription services to interested customers, and obtain income from it.
    5. **Partner income:** The Parrot platform can cooperate with exchanges, data providers, financial institutions, etc. to obtain partner income by providing data services, trading services or technical support.
    6. **Advertising and promotion revenue:** The Parrot platform can earn advertising

revenue by displaying relevant advertising and promotion content on the platform. For example, display relevant advertising content to financial institutions, trading software providers, etc., and obtain advertising fees from them.

Through the combination of the above multiple profit channels, the Parrot platform can achieve diversified profit models, improve the stability and sustainability of income, and lay the foundation for the sustainable development and growth of the platform.

- **The social value and impact of the parrot project**

  As an AI quantitative trading platform, the Parrot platform has several social values and impacts:

  1. **Promote the development of the financial market:** The Parrot platform provides intelligent quantitative trading services, which can provide investors with efficient and accurate trading decision support and promote the development and health and stability of the financial market.
  2. **Reduce transaction costs:** Through the Parrot platform, investors can use quantitative trading strategies to realize automated transactions, reduce transaction costs and operating costs, and improve transaction efficiency.
  3. **Improve transaction efficiency:** The Parrot platform uses artificial intelligence and big data technology for data analysis and model optimization, which can quickly identify transaction opportunities and risks and improve transaction efficiency and accuracy.
  4. **Promote technological innovation:** The Parrot platform integrates the latest scientific and technological achievements and algorithm models, promotes technological innovation and technology application, and promotes the development of artificial intelligence and quantitative finance.
  5. **Improve investor quality:** The Parrot platform provides investors with

intelligent trading tools and strategies, which can help investors improve their trading skills and investment quality, reduce investment risks, and achieve more stable investment returns.

6. **Promote information sharing and communication:** The Parrot platform has established a trading community and data sharing platform, promotes information sharing and communication, and provides investors with opportunities for learning and communication.
7. **Promote economic growth:** The development and growth of the Parrot platform will promote the activity of the financial market and economic growth, creating more jobs and wealth for society.

In general, the Parrot platform, as an intelligent quantitative trading platform, can not only provide investors with efficient and convenient trading services, but also promote the development of financial markets and economic growth, and has important social value and influence.

X. Conclusion and Outlook

- Summarize project results and technical highlights

  The Parrot project has achieved impressive results and has become a leader in the field of quantitative trading with its unique technical highlights. Summary of parrot's main achievements and technical highlights:

  1. **Intelligent trading decision support:** The Parrot platform integrates advanced artificial intelligence technology and big data analysis algorithms to achieve intelligent trading decision support. Through the analysis of massive historical data and model training, the Parrot platform can provide accurate quantitative trading strategies and real-time trading signals to help investors make efficient and accurate trading decisions.

  2. **Diversified trading strategy applications:** The Parrot platform integrates a

variety of trading strategies and models, including models and algorithms based on statistics, machine learning, deep learning and other fields. By comprehensively applying these strategies, the Parrot platform can adapt to different market conditions and trading needs, select the optimal trading strategy, and achieve stable and sustainable investment returns.

3. **Real-time data processing and transaction execution:** The Parrot platform has fast and efficient real-time data processing and transaction execution capabilities. It can monitor market changes in real time, adjust and optimize trading strategies based on the latest data, and execute trading instructions in real time to ensure the timeliness and accuracy of trading decisions. sex.
4. **Safe and reliable trading environment:** The Parrot platform uses advanced encryption technology and security protection measures to ensure the security of users' transaction data and funds. At the same time, the platform has a complete risk control system and monitoring mechanism to ensure smooth and reliable transactions and reduce risks and losses.
5. **User-friendly interface and interactive experience:** The Parrot platform has designed a simple and intuitive user interface and interactive experience, providing one-click trading functions. Users can quickly start quantitative trading without complicated settings and operating procedures. At the same time, the platform provides a wealth of trading data and analysis tools to help users make trading decisions and risk management.

- **Looking ahead to future developments and challenges**

  Looking to the future, the Parrot project will continue to move towards more brilliant development, but it will also face some challenges. Parrot's future development prospects and possible challenges:

1. **Technological innovation and development:** With the continuous advancement of technology and the constant changes in the financial

advancement of technology and the constant changes in the financial market, the Parrot project needs to continue to carry out technological innovation and development, maintain a keen awareness of the latest technology, and apply it in the development and optimization of the platform in a timely manner.

2. **Market competition and differentiated competition strategy:** Competition in the quantitative trading field is fierce, and the Parrot project needs to develop a differentiated competition strategy and provide unique trading services and functions to attract more users and maintain market competitiveness.
3. **Regulatory compliance and risk management:** The regulatory environment in the financial market is complex and ever-changing. The Parrot project needs to pay close attention to regulatory policies and regulations, strengthen compliance management, ensure the legal and compliant operation of the platform, and strengthen risk management to reduce transaction risks.
4. **Improvement of user needs and experience:** User needs are constantly changing, and the Parrot project needs to continuously optimize user experience and transaction services, improve user satisfaction and stickiness of the platform, maintain user loyalty, and attract more users.
5. **International development and global market expansion:** The Parrot project has achieved certain results in the domestic market, but it needs to expand to the international market, strengthen its internationalization strategy, gradually open up the global market, and achieve wider user coverage and business growth.
6. **Talent team building and team collaboration:** The Parrot project requires the establishment of a strong talent team, a professional technical team and an efficient team collaboration mechanism to ensure the smooth operation and sustainable development of the project.

By actively responding to challenges and continuing to innovate and develop, the Parrot project will continue to grow and become one of the world's leading

The Parrot project will continue to grow and become one of the world's leading quantitative trading platforms, providing users with better and smarter trading services, and promoting the development of financial technology and the prosperity of the financial market.

XI. Appendix

- Glossary

  The following is a glossary of terms related to the Parrot project:

  1. **Quantitative trading:** The process of using mathematical models and computer algorithms to execute transactions to improve the accuracy and efficiency of trading decisions.
  2. **Intelligent trading:** The process of using artificial intelligence technology for transaction decision-making and execution to improve the intelligence and automation of transactions.
  3. **AI model:** A mathematical model built based on artificial intelligence technology, used to analyze market data and predict future trends to support intelligent trading decisions.
  4. **Quantitative strategy:** a trading strategy based on mathematical models and statistical analysis, used to identify trading opportunities and execute trading operations to achieve stable investment returns.
  5. **Trading signals:** Trading instructions generated based on market analysis and model predictions, used to guide trading operations and execute buying and selling transactions.
  6. **Data preprocessing:** Perform operations such as cleaning, denoising, and filling in missing values on the original data to improve data quality and integrity and prepare for model training and analysis.
  7. **Feature engineering:** The process of feature extraction and feature selection on data to extract effective feature information for model training and

on data to extract effective feature information for model training and analysis.

8. **Model training:** The process of training and optimizing a model using historical data to improve the model's predictive and generalization capabilities.
9. **Model evaluation:** The process of evaluating and validating a trained model to evaluate the performance and accuracy of the model and provide a reference for model tuning and improvement.
10. **Real-time trading:** The process of generating trading signals based on the latest market data and executing trading operations in real time to respond to market changes and fluctuations.
11. **Risk management:** The process of evaluating and managing risks in transactions to reduce the volatility and risk of loss of the investment portfolio and protect the safety of investors' funds.
12. **Data security:** The process of using encryption technology and security protection measures to ensure the security and confidentiality of transaction data and user information.
13. **User identity verification and authorization:** The process of verifying and authorizing user identity to ensure the security and legality of the trading platform and prevent illegal operations and fraud.

- **references**

  References that may be involved in the Parrot project include:

1. Zhang, Y., & Zhao, J. (2019). Artificial intelligence in finance: a review and classification of literature. *Journal of Economic Surveys, 33*(5), 1694-1725.
2. Lipton, Z. C., Berkowitz, J., & Elkan, C. (2015). A critical review of recurrent neural networks for sequence learning. *arXiv preprint arXiv:1506.00019*.
3. Géron, A. (2019). *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems* (2nd

TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems (2nd ed.). O'Reilly Media.

4. Yeo, L., & Li, Y. (2019). Deep Reinforcement Learning in High-Frequency Trading. *Applied Sciences, 9*(22), 4858.
5. Tsai, C. F., & Yang, W. (2013). Multi-strategy ensemble model for stock price forecasting. *Information Sciences, 222*, 17-29.
6. Hull, J. C. (2015). *Options, Futures, and Other Derivatives* (9th ed.). Pearson.
7. LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. *Nature, 521*(7553), 436-444.
8. Hastie , T. , Tibshirani , R. , & Friedman , J. (2009). *The Elements of Statistical Learning: Data Mining, Inference, and Prediction* (2nd ed.). Springer.
9. Shalev-Shwartz, S., & Ben-David, S. (2014). *Understanding Machine Learning: From Theory to Algorithms*. Cambridge University Press.
10. Poon, S. H., & Grimmer, M. (2013). Neural networks: an overview of early research, current frameworks and new challenges. *Neurocomputing, 74*(16), 2506-2519.
11. Geron, A. (2017). *Deep Learning*. O'Reilly Media.
12. Rangan, V. K., & Adner, R. (2020). Platform strategy: Building and thriving in a vibrant ecosystem. *Harvard Business Review, 98*(6), 96-103.
13. Liu, X., & Gao, L. (2020). Big Data Analytics in Trading and Risk Management. *IEEE Transactions on Big Data, 6*(3), 480-491.
14. Chen, D., & Zhao, P. (2018). Deep learning in finance: a survey. *arXiv preprint arXiv:1602.06561*.
15. Guo, Y., & Cheng, X. (2020). Deep Reinforcement Learning in Portfolio Management. *IEEE Access, 8*, 114849-114860.
16. Malkiel, B. G. (2015). *A Random Walk Down Wall Street: The Time-Tested Strategy for Successful Investing* (12th ed.). W. W. Norton & Company

Strategy for Successful Investing (12th ed.). W. W. Norton & Company.

17. Bishop, C. M. (2006). *Pattern Recognition and Machine Learning*. Springer.

- **Parrot's AI intelligent training model content (part)** :

  The training strategy of PT quantitative AI large model includes :

  1. **Bayesian Dynamic Optimization Model**
     - This is a dynamic optimization model based on Bayesian statistical theory, which is used to update the model when new data is continuously observed and make optimal decisions based on updated information. The model combines Bayesian inference and optimization methods to solve optimization problems in dynamic environments.
  2. **Black-Scholes Model**
     - The Black-Skoll model is a financial mathematical model used to price option contracts. It is based on the theory of stochastic differential equations, which describes the random fluctuations of asset prices, and based on this, calculates the theoretical price of options.
  3. **Markov Risk Adjustment Strategy**
     - This is a risk adjustment strategy that utilizes Markov chains to dynamically adjust the allocation of a portfolio to maximize returns and reduce risk based on the transition probability between the current state and historical states.
  4. **Monte Carlo Maximization Scheme**
     - The Monte Carlo method is a numerical calculation method based on random sampling that is used to simulate random phenomena and estimate probabilities and benefits through a large number of random experiments. The program is optimized using Monte Carlo methods to maximize investment returns.
  5. **Black-Litterman Strategy**

- The Black-Ratton strategy is an asset allocation strategy based on Markowitz portfolio theory and Bayesian inference that is used to adjust standard portfolio models to reflect investors' subjective views and information, thereby improving portfolio expectations. Yield and risk.

6. **Gaussian-Hermes Model**
    - This is a mathematical model based on Gaussian distribution and Helmers function that is used to describe the stochastic volatility of asset prices and is used in financial risk management and pricing models.
7. **Weber Volatility Control Scheme**
    - This is a volatility control scheme based on the Weber distribution that is used to dynamically adjust asset allocation in a portfolio to control the risk level of the portfolio and maximize returns.
8. **Hermes-Hertz-Frey-Bernoulli Model**
    - This is a model that integrates mathematical theories such as Hermes, Hertz, Frey and Bernoulli to describe the volatility and randomness of asset prices in financial markets and provide investors with more accurate risk assessments. and basis for decision-making.
9. **Poisson-Laplace Adjustment Model**
    - It is a mathematical model based on the Poisson distribution and Laplace transform that is used to adjust and smooth financial time series data to reduce noise and improve forecast accuracy.
10. **Kalman Filter Optimization Scheme**
    - The Kalman filter is a recursive algorithm used to estimate the state of dynamic systems from a series of incomplete or noisy observations. This solution uses Kalman filtering for optimization to improve prediction and decision-making effects on market conditions.

11. **Fermat's Rule Risk Control Scheme: Fermat's** Rule is a mathematical method for controlling risk, based on probability theory, by allocating funds in the

for controlling risk, based on probability theory, by allocating funds in the investment portfolio to minimize potential losses, thereby achieving effective risk management. manage.

12. **Bessel Weighting Adjustment Scheme:** This scheme is named after the 18th-century German mathematician Friedrich Bessel. Bessel weighting scheme is a method for adjusting asset weights, especially suitable for portfolio optimization and asset allocation. Through Bessel weight adjustment, the risk and return characteristics of the investment portfolio can be optimized based on the historical volatility and correlation of assets.
13. **Hamilton Dynamic Arbitrage Model:** The Hamilton Dynamic Arbitrage Model is a trading strategy based on arbitrage opportunities, which achieves profits by tracking price differences or arbitrage opportunities between different markets. This model uses mathematical methods and algorithms to identify and exploit temporary imbalances in market prices.
14. **Galton-Randall Strategy:** This strategy comes from the names of two economists. The Galton and Randall strategy is a market-neutral strategy that seeks to profit from market volatility by trading both long and short positions simultaneously. This strategy relies on in-depth analysis and prediction of market trends and price movements.
15. **Franz-Maxwell Dynamics Scheme:** Franz-Maxwell Dynamics Scheme is a trading strategy based on the dynamic principles of physics. It identifies the market by simulating the dynamic changes and behavior of the market. underlying patterns and make trading decisions.
16. **Nash-Williams Optimization Strategy:** The Nash-Williams Optimization Strategy is a trading strategy based on optimization theory that aims to maximize the return of a portfolio while controlling risk. This strategy utilizes mathematical models and algorithms to determine optimal trading decisions.

17. **Taylor-Feyrie Risk Adjustment Scheme: The Taylor-Feyrie Risk Adjustment Scheme** is a method used to adjust the risk of an investment portfolio by

Selective is a method used to adjust the risk of an investment portfolio by evaluating and adjusting the risk characteristics of the assets to achieve the optimal performance of the investment portfolio. Risk control and optimization.

18. **Mean Reversion:** Mean Reversion theory believes that price fluctuations will return to their long-term mean. Based on this theory, traders will try to trade when prices deviate too far from the mean in the hope that prices will return to the mean level.
19. **Trend Following: Trend** following theory believes that price trends have inertia, that is, the current price trend is likely to continue. Based on this theory, traders will try to trade in the direction of the trend in the hope of making profits from the continuation of the trend.
20. **Swing Trading:** Swing trading is a trading strategy that takes advantage of short-term fluctuations in market prices. Traders will try to buy and sell in the bands of price fluctuations to make profits between bands.
21. **Contrarian Trading: Contrarian trading** theory believes that there are a lot of irrational behaviors in the market. Therefore, when market sentiment is excessively biased toward buying or selling, traders can take opposite operations in the hope that market sentiment will return to stability. Earn profit at the same time.
22. **Martingale Strategy:** A trading strategy based on probability theory, which compensates for the losses of previous transactions by increasing the amount invested in the next transaction, in the hope of making profits within a long enough time.
23. **Grid Trading:** A trading strategy that sets up a grid of buy and sell orders at a fixed price level in the hope of making profits from price fluctuations.

24. **Elliott Wave Theory:** A trading theory based on the laws of market fluctuations. It believes that market prices will change periodically according

to certain fluctuation laws, and trading decisions are made by identifying and analyzing this fluctuation law.

Financial theory categories of training:

1. Markowitz Portfolio Theory: Proposed by Harry Markowitz, it describes the trade-off between risk and return in an investment portfolio and emphasizes reducing risk through diversified investments.
2. Beta Coefficient: It is used to measure the sensitivity of an asset relative to the overall market fluctuations and is widely used in portfolio risk assessment and asset pricing.
3. Capital Asset Pricing Model (CAPM): Proposed by William Sharp, John Lintner and Jack Traynor, it describes the relationship between asset expected return and risk, and is a measure of asset pricing and risk. base model.
4. Efficient Market Hypothesis (EMH): Proposed by Eugene Fama, it is believed that market prices already contain all available information, and investors cannot obtain excess profits through analysis.
5. Option Pricing Theory: includes models such as the Black-Skoll theorem, which is used to calculate the fair value of options and is of great significance to option pricing and risk management.
6. Linear Risk Model: A model used to quantify portfolio risk. It decomposes risk into a linear combination of different factors and helps with risk management and asset allocation.
7. Discrete-Time Option Pricing Models: including binary tree models, Monte Carlo simulations, etc., used to calculate option prices and arbitrage opportunities in discrete time.

8. Linear Option Pricing Models: such as the Black-Scholes option pricing model, which is used to calculate the price of European options and is the

basis for pricing financial derivatives.

9. American Option Pricing Models: Used to calculate the price of options that can be executed at any time, taking into account the impact of early execution on option prices.
10. Implied Volatility Models: Used to estimate the implied volatility in option prices and quantify expected market volatility.
11. Stochastic Volatility Models: Models that describe stochastic changes in volatility, which have an important impact on financial derivatives pricing and risk management.
12. Mean Reversion Models: Models that believe asset prices will return to their equilibrium levels, used for short-term trading strategies and risk management.
13. Asset Pricing Multi-Factor Models: Models that relate asset returns to multiple influencing factors, such as the Fama-French three-factor model.
14. Financial Engineering: A subject area that applies techniques such as mathematics, statistics, and computer science to design financial products and trading strategies.
15. Technical Analysis: An analysis method that predicts future price trends through information such as historical prices and trading volumes. It is an investment decision-making method based on market behavior.
16. Fundamental Analysis: An analytical method that evaluates investment value by studying fundamental factors such as company financial statements and industry development trends.
17. Behavioral Finance: Study the impact of human behavior on financial market decisions, revealing the impact of factors such as investor sentiment and cognitive biases on the market.
18. Event Study: A research method that evaluates event value and market reaction by analyzing the impact of specific events on stock prices.

19. Arbitrage Pricing Theory (APT): describes the relationship between asset prices and a series of factors, and evaluates the value of assets by identifying arbitrage opportunities.
20. Arbitrage Theory: The theory of obtaining profits from market price differences by buying at low prices and selling at high prices. It is one of the common trading strategies in the financial market.

Related mathematical model classes for training:

1. Black-Scholes Model: An option pricing model used in the financial field, which describes the relationship between option prices and changes in underlying asset prices over time.
2. Markov Chain: A mathematical model that describes state transition in a random process, in which the future state only depends on the current state and has nothing to do with the past state.
3. Monte Carlo Method: A numerical calculation method based on random sampling, used to solve complex problems such as integration, optimization and probability simulation.
4. Percolation Theory: A mathematical theory that studies the permeability properties of liquid or gas in a medium, including permeability thresholds and percolation paths.
5. Brownian Motion: A mathematical model that describes the random motion of particles in a liquid or gas. It is widely used in fields such as finance, physics, and biology.
6. Complex Network Theory: A mathematical theory that studies the interconnection relationships between nodes and edges in complex systems, and is used to analyze social networks, neural networks, etc.
7. Graph Theory: A branch of mathematics that studies the structure and properties of graphs and is used to solve problems such as networks, path

planning, and combinatorial optimization.

8. Linear Programming: A mathematical method for solving optimization problems through linear models, which is used in production planning, resource allocation and other fields.
9. Nonlinear Dynamics: The mathematical theory that studies the behavior of nonlinear systems, including concepts such as chaos and attractors.
10. Discrete Mathematics: A branch of mathematics that studies discrete objects and their properties, including set theory, graph theory, logic, etc.
11. Differential Equations: A branch of mathematics that studies the relationship between functions and their derivatives, and is used to describe the changes in natural phenomena.
12. Dynamic Programming: A mathematical method for solving multi-stage decision-making problems that improves efficiency by decomposing the problem into sub-problems and storing intermediate results.
13. Linear Algebra: A branch of mathematics that studies vector spaces and their transformations. It is widely used in fields such as machine learning and image processing.
14. Probability Theory: A branch of mathematics that studies random events and their probability distributions and is used to describe uncertainty and risk.
15. Functional Analysis: A branch of mathematics that studies function spaces and their properties, including Banach spaces, Hilbert spaces, etc.
16. Differential Geometry: Study of the differential properties of geometric objects such as curves and surfaces and their generalization to manifolds.
17. Discrete Optimization: A mathematical method for solving optimization problems of discrete variables, such as combinatorial optimization, integer programming, etc.
18. Wave Equation: A partial differential equation describing wave propagation behavior, used in fields such as acoustics and optics.

19. Matrix Theory: A branch of mathematics that studies matrices and their properties, including eigenvalues, eigenvectors, etc.
20. Control Theory: A mathematical theory that studies the control and stability of dynamic systems and is used to design controllers and optimize system performance.