**Documentation: Performance Insights - Ranking Binance Accounts with Key Financial Metrics**

**Methodology**

1. **Data Import and Exploration**:
   * The dataset was imported from a CSV file containing trade history for various Binance accounts.
   * Initial exploration included checking the shape, data types, and statistical summary of the dataset to understand its structure and contents.
2. **Data Cleaning**:
   * Trade histories were parsed and flattened into a structured DataFrame (**df\_trades**).
   * Missing values were checked, and no missing values were found in the numeric columns.
   * Duplicate rows were identified and removed to ensure data integrity.
3. **Data Visualization**:
   * Box plots and count plots were created to visualize the distribution of numeric and categorical variables.
   * A correlation matrix was generated to identify relationships between numeric features.
4. **Metrics Calculation**:
   * Key financial metrics were calculated for each account:
     + **ROI (Return on Investment)**: Calculated as the ratio of realized profit to investment.
     + **PnL (Profit and Loss)**: Summed realized profit for each account.
     + **Sharpe Ratio**: Calculated as the average return divided by the standard deviation of returns.
     + **Maximum Drawdown (MDD)**: Identified the largest peak-to-trough decline in cumulative returns.
     + **Win Rate**: Calculated as the ratio of profitable trades to total trades.
     + **Win Positions**: Counted the number of profitable trades.
     + **Total Positions**: Counted the total number of trades.
5. **Feature Engineering**:
   * A Random Forest Regressor was used to calculate feature importance based on the financial metrics.
   * A weighted scoring system was established by normalizing the feature importances and scaling the features.
   * Final scores were computed for each account based on the weighted metrics.
6. **Weight Adjustments:**
   * **Impact of Weighting Schemes:** We analysed how different weight combinations for each metric influence portfolio rankings and investment outcomes.
   * **Identifying Critical Metrics:** The study aims to identify key metrics for achieving investment goals and how changes in their weights affect final rankings.
7. **Visualizations:**
   * **Performance Visualization:** The analysis includes bar charts for weighted scores and scatter plots for ROI versus Sharpe Ratio to compare portfolio performance and illustrate the relationship between returns and risk-adjusted performance.
   * **Trend and Correlation Insights:** A correlation matrix heatmap shows metric relationships, while time-series plots for PnL and ROI reveal performance trends and patterns over time.
8. **Ranking Algorithm**:
   * Accounts were ranked based on the calculated weighted scores.
   * The top 20 accounts were extracted for further analysis and reporting.

**Findings**

1. **Data Overview**:
   * A total of 211,277 trades were recorded across various accounts, with significant variations in trading performance.
   * The average ROI per trade was approximately 35.68%, while the overall ROI was 0.00%, indicating that many trades may have resulted in losses offsetting gains.
2. **Performance Metrics**:
   * The analysis revealed a total of 79,473 winning positions out of 200,026 total positions, yielding a win rate of approximately 39.73%.
   * The Maximum Drawdown observed was -20.85%, indicating a significant peak-to-trough decline in cumulative returns.
   * The Sharpe Ratio averaged at approximately 0.043, suggesting relatively low risk-adjusted returns.
3. **Top 20 Accounts**:
   * The top 20 accounts were ranked based on their weighted scores, with metrics such as ROI, PnL, Sharpe Ratio, and Win Rate contributing to their overall performance.
   * Notably, the account with the highest weighted score had a PnL of approximately 70,638.37, demonstrating strong profitability.

**Assumptions**

1. **Data Integrity**: It is assumed that the trade data is accurate and reflects the actual trading activities of the accounts.
2. **ROI Calculation**: The calculation of ROI assumes that all trades are closed and that the realized profit accurately reflects the trading performance.
3. **Sharpe Ratio Interpretation**: The Sharpe Ratio is assumed to be a valid measure of risk-adjusted performance, though it may not capture all risks associated with trading.
4. **Weighted Scoring System**: The weights assigned to each metric in the scoring system are based on their relative importance, but these may be subjective and could be adjusted based on further analysis or domain expertise.

**Conclusion**

This analysis provides a comprehensive overview of trading performance across various Binance accounts, leveraging key financial metrics to rank accounts effectively. The findings highlight areas for improvement, such as enhancing win rates and managing drawdowns, while also identifying top-performing accounts that can serve as benchmarks for future trading strategies. Further analysis could include time series forecasting, deeper insights into trading strategies, and more granular performance metrics.