

CRYPTO MAVERICKS

Zelta Automations
untrade

Curating Alphas on BTC and ETH
Cryptocurrency Market

Background & Problem Description

Objective: Develop an advanced crypto trading strategy using K-Means clustering to identify market patterns and optimize trading decisions.

Data Sources: Leverage historical price data, technical indicators, and market sentiment to create clusters representing different market conditions.

Innovation: Utilize various ML strategies like K-Means and normal indicator based strategies to categorize crypto market regimes and design strategies that adapt to changing market states, focusing on risk-adjusted returns.

Competition Goal: Build a trading alpha that outperforms traditional strategies by accurately predicting market movements and managing risks.

CHALLENGES FACED

Lack of Concrete Data & Scientific Validation – The impact of the moon cycle on markets lacks strong statistical evidence, making it difficult to establish a reliable edge.

Behavioral Patterns Are Not Always Predictable – Human behavior in trading is influenced by multiple factors, and past patterns may not always repeat due to evolving market conditions.

High Noise-to-Signal Ratio – Market movements are driven by multiple factors, and isolating the effect of the moon cycle or past behavioral trends is challenging.

Backtesting & Optimization Difficulties – Limited historical data for such niche strategies makes robust backtesting and parameter optimization complex.

PROGRESS UPDATE

K means strategy for crypto trading

Core Concepts

Unsupervised Learning: Groups similar data points into clusters.

Centroids & Clusters: Identifies central points representing different market states.

Why K-Means for Trading?

Market Phases: Detects bullish, bearish, and sideways markets.

Improved Signals: Refines entry and exit points based on market behavior.

Alpha Creation

Adaptive Strategies: Tailors trading actions to evolving market conditions.

Optimized Decisions: Enhances risk management by identifying market regimes.



DATA
COLLECTION

PRE
PROCESSING

CLUSTERING

DESIGNING

BACK
TESTING

Core Concepts

STRATEGY OVERVIEW

Preprocessing: Data cleaning and feature engineering to ensure accurate inputs for analysis.

Technical Indicators: Essential for identifying market trends and conditions (RSI, MACD, EMA, etc.).

K-Means Clustering: Unsupervised learning method to categorize market data into distinct clusters based on similarity.

Trading Strategy: Rule-based conditions to enter and exit positions using the outputs of technical indicators and K-Means clusters.

Performance Tracking: Evaluating strategy effectiveness with metrics like net profit, winning/losing trades, and balance changes.



1. Data Preprocessing

Data Cleaning: Ensures all columns (e.g., open, close, high, low) are present and non-null values exist for analysis.

Heikin-Ashi Candles: Smooths price data by calculating the average of open, high, low, and close values, giving a clearer market trend view.

Missing Value Handling: Fills missing data using forward fill, ensuring no interruptions in time series data for accurate analysis.



2. Technical Indicators Calculation

RSI (Relative Strength Index): Indicates overbought/oversold conditions, helping identify potential reversals.



MACD (Moving Average Convergence Divergence): Measures the momentum of price changes and helps signal trend reversals.



EMA (Exponential Moving Average): Tracks short and long-term trends for better timing of entries and exits.

ADX (Average Directional Index): Measures trend strength, aiding in identifying strong market phases.



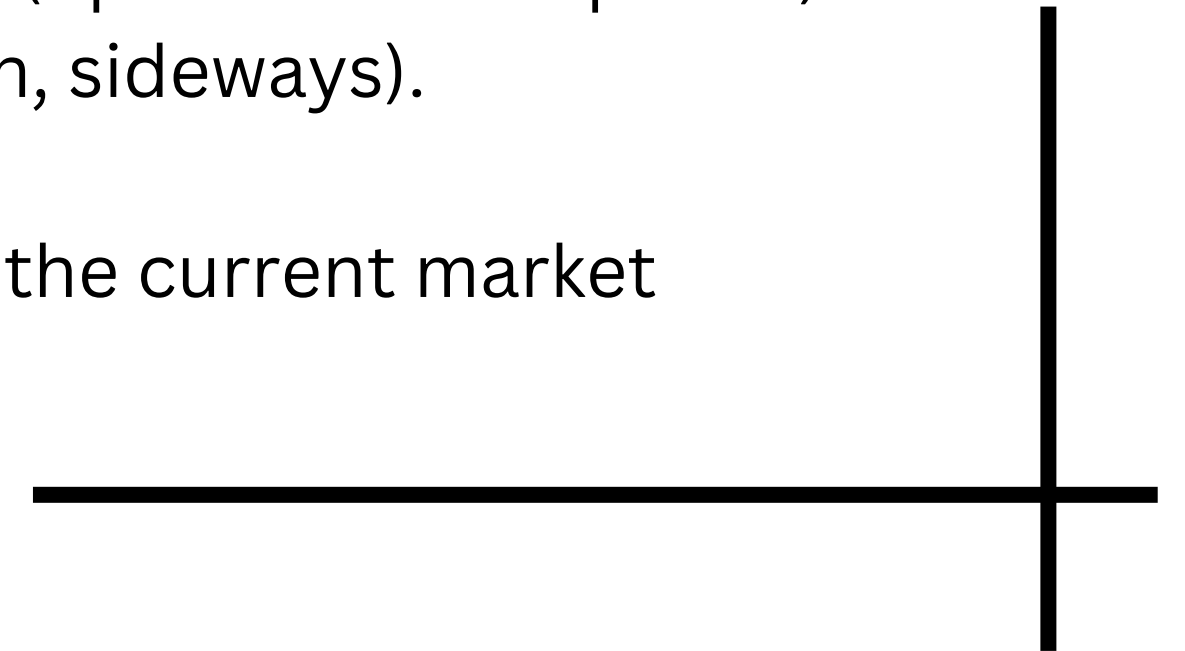
PSAR (Parabolic Stop and Reverse): Helps identify potential price reversals and stops for risk management.



3. K-Means Clustering

Clustering with K-Means: Applies K-Means to historical market data (open and close prices) to categorize market conditions into 3 distinct clusters (bullish, bearish, sideways).

Cluster Prediction: For each new data point, predicts which cluster the current market behavior belongs to, providing a forecast of future trends.





4. Strategy & Backtesting

Buy/Sell Conditions: Combines technical indicators and cluster predictions to trigger trades (e.g., buying when RSI is low and market is in a bullish cluster).

Position Management: Tracks open positions (long or short), executing trades based on predefined exit conditions (e.g., when price hits PSAR or when RSI signals an overbought market).

Performance Evaluation: Calculates net profit, tracks winning/losing trades, and adjusts strategy for better performance.

Trading Strategy & Conditions

Buy Condition:

- *RSI > 30*
- *EMA(10) > EMA(30)*
- *MACD > MACD Signal*
- *Price above EMA(10) & PSAR*
- *ADX > 25, ADX_Pos > ADX_Neg*
- *Future Cluster Prediction = Bullish*

Sell Condition:

- *RSI < 60*
- *MACD < MACD Signal*
- *Price below PSAR*
- *ADX < 25*

PERFORMANCE METRICS

Benchmark Return(%)": 325.632937

"Profit Percentage": **539.252458**

"Maximum Drawdown": **6.802217,**

"Average Drawdown": **1.212784,**

"Max Portfolio Balance": **6392.524579,**

"Minimumm Portfolio Balance": **1000.0,**

"Final Balance": **6392.524579,**

"Sharpe Ratio": **15.161929,**

"Maximum Adverse Excursion": **4.983827,**

"Average Adverse Excursion": **2.737776,**

"Sortino Ratio": **396.326936,**

Time to Recovery(TTR)": **76.000000 days**

FUTURE IMPROVEMENTS

- 1. Optimizing feature selection for clustering.**
- 2. Dynamic cluster recalibration based on market conditions.**
- 3. Incorporating more advanced ML models (HMM, LSTMs) for better forecasting.**
- 4. New ML integrated strategies would also be tried by the team in the remaining 1 month.**



CONCLUSIONS

- 1.K-Means clustering enhances decision-making in algorithmic trading.**
- 2.Combining it with technical indicators improves trade execution.**
- 3.Our strategy provides high returns while managing risk effectively.**