# INTER IIT
# TECH MEET 13.0

High Prep

# Zelta Automations
# untrade

# CURATING ALPHAS ON BTC AND USDT CRYPTO MARKET

# Domain Description

Algorithmic trading is a domain within the finance industry that involves the use of computer programs and mathematical models to execute trading strategies. It requires a deep understanding of financial markets, data analysis, statistical modeling, and programming expertise.

Participants are encouraged to leverage their expertise to create strategies that can outperform benchmarks, safeguard capital, and operate with statistical soundness.

# Problem Description

The problem statement consists of developing algorithmic trading strategies for the BTC/USDT and ETH/USDT cryptocurrency markets, aiming to outperform benchmark returns.
Participants are required to create trading algorithms that can generate returns while managing risk effectively in both the BTC/USDT and ETH/USDT markets.

The problem can be divided into the following tasks:

1. **Data Acquisition:** Participants are advised to use historical price and trading volume data for the BTC/USDT and ETH/USDT trading pairs from January 1, 2020, to December 31, 2023, for strategy development and testing.

2. **Data Preprocessing:** Clean and preprocess the acquired data for both trading pairs, with a specific focus on the provided timeframes (January 1, 2020, to December 31, 2023). Ensure data quality and compatibility for analysis, handle missing data, adjust for splits, and perform any necessary data transformations within this defined period.

3. **Strategy Design:** Design algorithmic trading strategies that utilize statistical and mathematical models tailored to the BTC/USDT and ETH/USDT markets. This may include trend-following, mean-reversion, momentum-centric, machine learning, or other quantitative approaches.

**4. Backtesting:** Implement the strategies and conduct extensive backtesting using historical data of the BTC/USDT and ETH/USDT markets to assess their performance. Participants should take into account transaction costs and slippage in their simulations, specifically at a rate of 0.15 percent per transaction.

**5.Risk Management:** Develop risk management rules and mechanisms specific to the BTC/USDT and ETH/USDT markets to protect capital and reduce drawdowns.

6**. Optimization:** Fine-tune the strategies to maximize returns while maintaining acceptable risk levels in both the BTC/USDT and ETH/USDT markets. Participants may need to adjust parameters and rules based on the backtesting results.

## Data and Resources

Access to historical data for the BTC/USDT and ETH/USDT trading pairs from January 1, 2020, to December 31, 2023, will be provided for all frequencies/timeframes. Participants have the liberty to choose any frequency for their analysis.

## Deliverables

**1. Algorithm Code:** Candidates are expected to develop and create 2 algorithmic trading strategies on BTC/USDT and ETH/USDT based on the dataset provided to them.

The source code of the algorithmic trading strategies developed for the BTC/USDT and ETH/USDT markets, along with documentation explaining the logic and parameters used. Code submissions must be made using Zelta's Jupyter Notebook that will be shared along with the release of the problem statement at Zelta Announcements (Discord)

**2.Backtesting Results:** Detailed backtesting results specific to the BTC/USDT and ETH/USDT markets, using the four-year historical data, including performance metrics (e.g., Sharpe ratio, annualized returns, maximum drawdown) and visualizations (e.g., equity curve, trade history). A SDK library would also be shared along with the problem statement at Zelta Announcements for rigorous backtesting.

**3. Risk Management Plan:** A clear description of the risk management mechanisms specific to the BTC/USDT and ETH/USDT markets, including stop-loss rules and risk-reward ratios.

**4.Report:** A comprehensive report detailing the development process, strategy optimization, and any insights gained during the project, with a focus on both the BTC/USDT and ETH/USDT markets.

**5. Final Presentation:** A presentation summarizing the strategy for both BTC/USDT and ETH/USDT, its rationale, backtesting results, and risk management approach.

# Judging Criteria

**1. Performance (30 points):** Evaluation of the strategies' historical performance in both the BTC/USDT and ETH/USDT markets, including risk-adjusted returns, consistency, and drawdowns.
In this competition, excellence is defined by strategies that maintain narrow drawdowns with good time-to-recovery rates and beat benchmarks 50-70% of the time in the last 16 quarters (2020-2023, i.e., 4 years).

Here is a pointer to your inspiration (just an example) :-
One of the major highlights will be to assess the performance of the strategies on unseen data patches, including some hidden patches that will not be released to participants. Strategies created on the training set should be efficient enough to perform similarly on the test set (unseen data patch). Participants who craft such strategies will have a distinct advantage and an edge in leaderboard ranking.

**2.Strategy Logic (20 points):** Assessment of the soundness and effectiveness of the mathematical and statistical models used in the strategies, with a focus on BTC/USDT and ETH/USDT market dynamics.

**3. Risk Management (15 points):** Evaluation of the risk management mechanisms in strategies specific to the BTC/USDT and ETH/USDT markets, and their effectiveness in preserving capital and maintaining narrow drawdowns.

**4. Code Quality and Data Visualization (10 points):** Review of the clarity, organization, and efficiency of the code tailored to both the BTC/USDT and ETH/USDT markets. Zelta will also assess the implementation of Object-Oriented Programming (OOP) principles, which promote code modularity and maintainability.
The use of any external library in submitted code is strictly prohibited (e.g., backtrader, backtesting.py, etc.) and will lead to serious penalties in the leaderboard rankings.

**5. Report (15 points):** Evaluation of the completeness and depth of the mid-term report (5 points) and final presentation report (10 points), with a specific emphasis on insights and analysis related to both the BTC/USDT and ETH/USDT markets.

**6. Final Presentation (10 points):** Assessment of the quality and clarity of the presentation materials in English, focusing on the BTC/USDT and ETH/USDT markets.

# ML Approaches

Zelta encourages teams to prioritize statistical approaches to generate alphas in this competition, rather than resorting to ML methods. However, for teams opting for ML approaches to excel in this competition, Zelta has established specific guidelines for them to follow.

**Explainability and Interpretability:**
Machine learning models, while potentially profitable on training data, often lack explainability and interpretability. This can lead to challenges in live trading like failure of producing same results on out-of-sample scenarios.

**Integrated Approach:**
Even for teams curious to apply ML in this competition, Zelta encourages teams to leverage both statistical models and machine learning models synergistically to develop sophisticated, data-driven solutions for algorithmic trading.

The objective is to harness the strengths of statistical methods in capturing market dynamics and the predictive power of machine learning to enhance the robustness and adaptability of trading algorithms.

Zelta looks forward to witnessing how teams integrate these methodologies to deliver sophisticated, noise-free, data-driven alpha models.

In the pursuit of implementing profitable ML models for algorithmic trading, use approaches like state-of-the-art explainability techniques, including SHAP, model-agnostic methods such as LIME, Partial Dependence Plots (PDP) etc.

Zelta emphasizes the significance of these techniques in not only enhancing model explainability and transparency but also contribute to the continual advancement of explainable AI in the finance domain, facilitating informed decision-making for algorithmic trading strategies.

Explore strategies to improve generalization including reducing capacity, early stopping, weight decay, ensembles, input transformations, and stochastic regularization.

## Avoiding Overfitting

Participants are strongly advised to be vigilant against overfitting when developing algorithmic trading strategies for the BTC/USDT & ETH/USDT cryptocurrency market.
Overfit strategies may appear highly profitable during backtesting, but they often lack robustness and can result in significant losses in unseen data patch and live trading (front test of strategy).

## Metrics for Strategy

Zelta Automations require participants to organize and assess their trading strategies based on a set of comprehensive metrics.

An SDK (Software Development Kit) library will be provided by us containing a set of tools and functions designed to facilitate backtesting which involves testing a trading strategy against historical data.

Use of SDK:
Historical Data Access: The SDK typically provides access to historical price data for assets like BTC/USDT. This data is crucial for simulating past market conditions and executing trades based on your strategy.

Trade Execution Simulation: The SDK can simulate trade execution, allowing you to see how your strategy would have performed in backtest, including handling slippage, fills, and order types.

Certainly, here are the metrics presented in numerical order that will come out of sdk library:

1. Gross Profit
2. Net Profit
3. Total Closed Trades
4. Win Rate (Profitability %)
5. Max Drawdown
6. Gross Loss
7. Average Winning Trade (in USDT)
8. Average Losing Trade (in USDT)
9. Buy and Hold Return of BTC
10. Largest Losing Trade (in USDT)
11. Largest Winning Trade (in USDT)
12. Sharpe Ratio
13. Sortino Ratio
14. Average Holding Duration per trade
15. Maximum Holding Duration per trade
16. Max Dip (reference to this is given in submission rules doc)

# Periodic Check-In System

To ensure the smooth progression of the project, Zelta will allocate a dedicated team for periodic check-ins. This team will be available to address any queries or concerns faced by participating teams in their algorithmic trading strategy development.

Your expertise and innovation are vital to this challenge. Best of luck in crafting strategies that redefine success. It's not just about the profits but the journey of discovery and learning.

# Additional Reference Points

### 1.Triumph of Jim Simons

Jim Simons, a mathematician who achieved legendary status as a hedge fund manager. He harnessed mathematics and statistics to consistently beat the financial markets. His algorithms analyzed data, identified patterns, and consistently outperformed traditional strategies, making him the most successful manager on Wall Street. Simons' story illustrates the transformative power of math and statistics in trading, serving as inspiration for participants aiming to craft innovative and profitable strategies for the BTC/USDT market.

### 2. Trading Insights

TradingView, a widely used online platform, provides a wealth of resources for traders and investors. It offers real-time market data, advanced charting tools and participants are encouraged to explore TradingView for insights, chart analysis, and strategy development. It can be an invaluable reference to stay informed about market trends.

# Resources

1. Zelta Automations has drafted a document for all participants to understand the nuances of algorithmic trading and in that journey strive to find their edge.
https://docs.google.com/document/d/1ctfMRZQGGoHB1_3K_ey7H19BN
L9WxhUzsIIaVnMO-c8/edit

2. FAQ's that will help you in your journey ahead:
https://docs.google.com/document/d/1QxtuenI9DwEVrYR9SGSB7dUD1
OiqH-eXjUskWPhnHo/edit

3. Anyone looking to use ML in their strategy , go through this:
https://docs.google.com/document/d/1hTGi98AjRZoQm7ggedppUhIcmcj
mQIemJqiF89T101g/edit