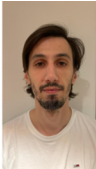# Innovative Quantitative Trading Strategies

Implementing Large Language Models for Signal Generation in Statistical Arbitrage Trading Models

**Graduate**

Andrija Kljajic

Introduction: This thesis investigates whether Large Language Models (LLMs) can be applied to anomaly detection in time series as a foundation for signal generation in pair trading. While anomaly detection is typically used in fields such as industrial monitoring, medical diagnostics, or IT security, this work explores its application in the financial domain. The goal is to combine a novel prototype-based transformer approach with financial trading and compare it against a well-established benchmark strategy in a realistic setting.
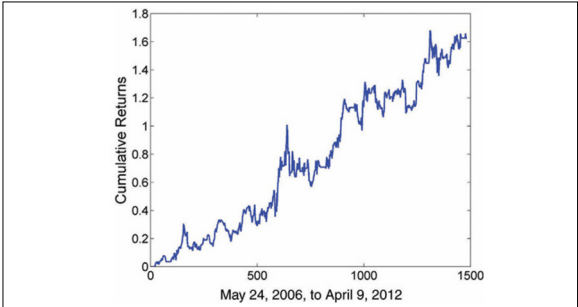
Approach: The methodology consists of four main steps. First, a classical Z-score-based strategy is implemented to serve as a reference. Second, the new model is developed, trained, and evaluated on historical financial time series. Both approaches are assessed using the same datasets and metrics, including Annual Percentage Return (APR) and Sharpe Ratio. Finally, the model is tested in a paper trading environment on live market data, providing additional insights into its practical feasibility.

Result: The results show that the proposed approach is able to detect anomalies and generate trading signals, but in practice it clearly underperforms compared to the benchmark strategy (APR = -6 % vs. 10.9 %; Sharpe Ratio = -0.5 vs. 0.59). The main challenges are the extensive training effort required, the complexity of the model architecture, and difficulties in hyperparameter tuning.
Despite its limited performance, the study provides a solid basis for future research. Improvements in training, optimization, and data preprocessing could significantly enhance the model's effectiveness. In the long run, this opens up the possibility of developing LLM-based anomaly detection into a competitive alternative for algorithmic trading.
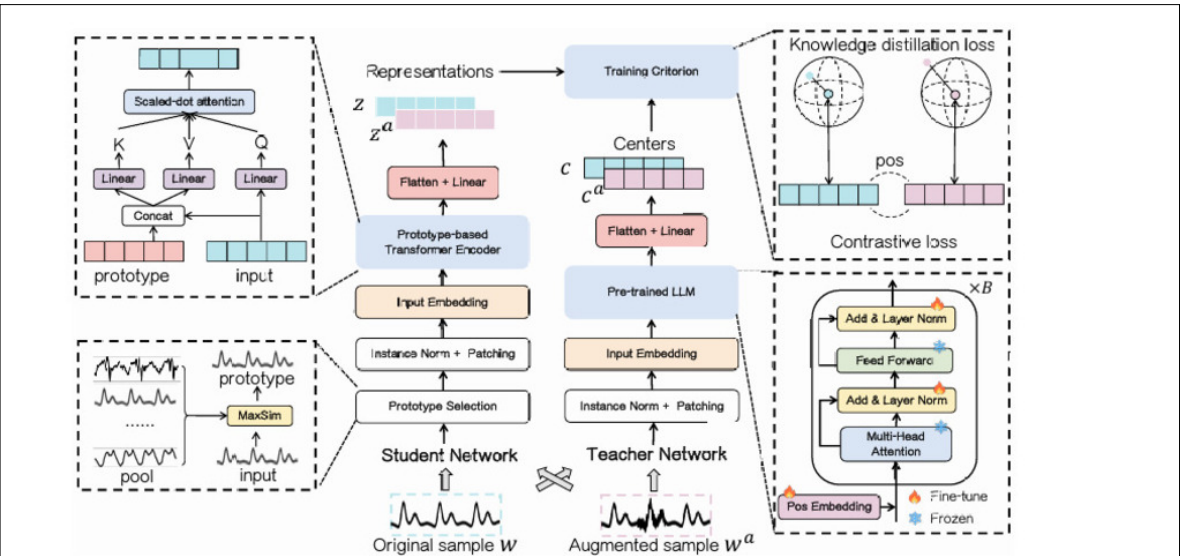
Spread Pair
Own illustration
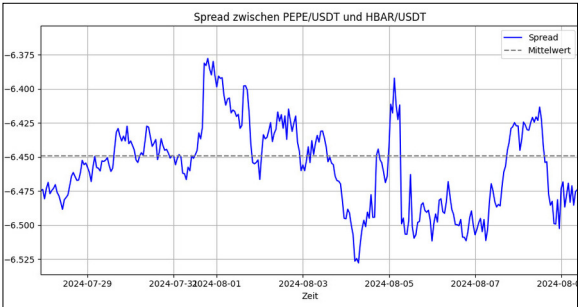
APR Comparison strategy
Algorithmic Trading Ernest P.Chan

Model Structure
https://arxiv.org/pdf/2401.15123

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Subject Area
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