

# ZHAOLI CAO

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## EDUCATION

### The University of Hong Kong

*Master of Finance in Financial Technology*

Hong Kong, China

2025.09 – 2027.06

### Fudan University

*Bachelor of Science in Mathematics (Minor: Economics & Finance)*

Shanghai, China

2020.09 – 2025.06(major downgrade)

- **Honors:** Vice President of the HKU Elite Club (Fintech) | **GPA: 4.0/4.0**

- **Core courses:** Mathematical Modeling, Numerical Solution of Differential Equations, Real Analysis, Complex Analysis, Probability Theory and Mathematical Statistics, Ordinary Differential Equations, Financial Engineering, Econometrics, Python

- **Honors:** First-Class Scholarship of Fudan University(2024), WorldQuant Challenge Gold Medal(2025), IMC Prosperity3 Global Top 2% (2025), Kaggle Crypto Market Prediction Top 10% (2025), MCM Meritorious Winner (2023)

## PROFESSIONAL EXPERIENCE

### Matrixport, Quantitative Trader

Hong Kong, Sep 2025 – Nov 2025

*Conducted crypto microstructure research, focusing on L2 signal extraction and multi-frequency factor modeling.*

- **Microstructure & Regime Detection:** Based on L2 order book and funding rate data, extracted market microstructure features and employed a Hidden Markov Model to identify latent market states, enabling dynamic signal adaptation.
- **Multimodal Temporal Modeling:** Optimized an end-to-end time-series modeling framework that integrates L2 order book data with NLP-based sentiment features, utilizing LSTM/Transformer to capture market dynamics.

### Geek Union Fund, Quantitative Research

Shanghai, Jun 2025 – Aug 2025

*Responsible for factor mining on daily and hourly CTA data, as well as multi-window factor training and portfolio construction.*

- **Factor Mining:** Conducted daily/hourly CTA factor research via multi-window training, dynamic smoothing, and IC-return filtering to build a library of 80+ signals. Applied regime-sensitive sampling to improve robustness across market states
- **Operator Development:** Refactored core signal modules, achieving ~77% runtime improvement via Numba JIT and pybind11-based C++ extensions with SIMD (AVX2). Integrated multi-horizon operators, cross-sectional allocation, and risk-budget weighting to speed up tuning and portfolio construction
- **Loss & Statistical Regularization:** Designed a robust loss (winsorization, Huber, directional penalties) and applied Newey-West adjustments to address heteroskedasticity and autocorrelation in factor evaluation
- **Rule-Based Features & Portfolio:** Extracted rule-based K-line features (IC up to 0.12) and built multi-factor portfolios using SGD-based allocation + KMeans, achieving Sharpe 2.64 / Calmar 4.15 out-of-sample

### KR Capital, Quantitative Research

Shanghai, Jan 2025 – May 2025

*Responsible for CTA strategy and stock strategy research, backtesting, and deployment in simulation and live trading*

- **Cross-Sectional Futures Alpha:** Built minute-level multi-factor long–short strategies using roll yield, basis momentum, and other high-frequency features. Applied XGBoost with feature-importance weighting and Newey–West residual adjustments, achieving Sharpe 1.78, max drawdown 9.6%
- **Global Regime Rotation:** Developed momentum-based ETF rotation strategies for volatile, regime-switching markets. Used GMM + EM to cluster regimes and dynamically adjust allocations. Two-month simulations achieved Sharpe 2.65 with controlled drawdowns and were deployed live on Ptrade
- **High-Frequency Statistical Arbitrage:** Identified cointegrated TSLA-NVDA pairs via 5-min bars. Engineered a dynamic- $\beta$  hedged Z-score signal with rolling GLS regression, achieving a backtest Sharpe of 3.435.

## PROJECT EXPERIENCE

### IMC Trading Prosperity3 High-Frequency Trading Competition (Global Top 2%)

Apr 2025

*Served as team leader, overseeing case studies and strategy development; led quantitative strategy design and manual trading*

- Strategies included: order book market making (spread & inventory control), ETF premium arbitrage (intra-day dislocations), options mispricing via Black–Scholes/IV bias, cross-asset relative value, and signal-based momentum following.

### Fake News Detection Based on Natural Language Processing(MIT-supervised project)

Mar 2025 - May 2025

*Integrated RoBERTa and XLNet, improving classification performance via five-fold cross-validation.*

- Designed an uncertainty-based pseudo-labeling algorithm combined with label smoothing, consistency regularization, and learning rate warmup to stabilize semi-supervised training, achieving  $F1 = 0.985$ .
- Error analysis and ensemble calibration, comparing soft/hard voting and stacking meta-ensembles for model selection.

### Bitcoin Price Prediction and Quantitative Trading Strategy Based on Machine Learning

Feb 2025 - May 2025

*Constructed bitcoin price prediction model and designed optimized quantitative trading strategy*

- Developed a multi-model prediction framework with feature engineering on adjusted Bitcoin price series. Integrated regime segmentation and feature drift detection to enhance model adaptability across market states.
- Bayesian optimization + walk-forward backtesting + transaction cost modeling for multi-factor strategy (Sharpe 2.704)

## SKILLS

**Programming:** Python (NumPy, Pandas, Matplotlib, QuantLib, Pytorch, Tensorflow), Linux, C++, R, MATLAB, LATEX

**Language:** Chinese (native), English (fluent, TOEFL: 109 (Reading: 30; Listening: 29; Speaking: 25; Writing: 25))

# 曹肇立

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## 教育背景

### 香港大学, 金融科技 | GPA(4.0/4.0)

香港, 2025.09 - 2027.06

- 荣誉职位: 香港大学精英协会金融科技协会副会长

### 复旦大学, 数学与应用数学 (辅修专业: 经济学&金融学)

上海, 2020.09 - 2025.06(转降)

- 核心课程: 金融工程、随机分析、微分方程数值解、实分析、复分析、概率论与数理统计、计量经济学、Python

- 荣誉奖项: Kaggle Crypto Market Prediction 全球前10%(2025)、WorldQuant金牌(2025)、高频交易比赛IMC Prosperity 全球前2%(2025)、美赛M奖(2023)、复旦大学一等奖学金

## 实习经历

### Matrixport, 量化交易

香港, 2025.09 – 2025.11

#### 负责Crypto市场的量化研究与交易, 高频因子挖掘、验证与优化

- 基于L2订单簿与资金费率数据提取盘口特征, 采用隐马尔可夫模型识别隐含状态, 以实现信号动态适应
- 优化端到端时序建模框架, 融合L2订单簿数据与NLP情绪特征, 通过LSTM/Transformer捕捉市场动态模式

### 积优基金, 量化研究

上海, 2025.06 – 2025.08

#### CTA日频及小时频因子挖掘、因子多窗口期训练及组合

- 单因子训练: CTA日频与小时频因子研究, 运用多窗口期信号训练与动态平滑算子, 结合IC-收益联合筛选, 构建涵盖80+信号的因子库, 并引入状态分层采样提升因子在异质市场状态下的稳健性
- 框架优化: 重构底层信号模块, 通过 Numba JIT 加速与Pytorch加速, 采用 SIMD(AVX2)向量化优化, 运行效率提升约 77%。引入多周期预测算子、横截面分配与风险预算权重机制, 加速超参数调优与多因子组合生成
- 损失函数及统计修正: 设计自定义损失函数, 结合95分位数winsorize、Huber Loss与方向一致性惩罚, 增强异常值鲁棒性与信号稳健性; 在因子评估中引入Newey - West回归修正, 应对异方差与自相关问题
- 规则类与多因子组合: 基于K线模式提取规则类特征, 单因子IC值0.12; 采用基于SGD的base分钱方法与Kmeans聚类构建多因子组合, 五因子组合在超样本中实现Sharpe 2.64、Calmar 4.15

### KR Capital, 量化研究

上海, 2025.01 – 2025.05

#### 负责期货截面策略和股票量化策略的研究回测及模拟盘实盘部署

- 期货截面Alpha建模: 基于分钟级期货数据构建多因子多空策略, 结合展期收益率、基差动量等因子, 使用XGBoost+特征重要性动态权重+Newey - West残差修正, 实现夏普1.78、最大回撤9.6%
- 全球宏观轮动策略: 针对高波动、状态频繁切换的市场环境, 利用GMM+EM聚类划分市场状态并动态调整ETF配置, 两个月模拟盘Sharpe 2.65, 回撤可控, 已在Ptrade成功实盘部署
- 高频统计套利: 针对TSLA与NVDA的5分钟K线识别价格-成交量协整关系, 利用滚动回归和GLS估计构建动态  $\beta$  对冲的Z-score信号, 并进行残差平稳性与异方差调整, 回测Sharpe达3.435

## 项目经历

### IMC Prosperity3高频交易竞赛 (全球前2%)

上海, 2025.04

#### 担任队长, 带领团队学习往年案例, 分析数据, 构建并优化策略, 并负责开发量化策略及所有手动交易

- 构建基于订单簿深度与价格波动的做市报价模型、利用ETF市场价与组件净值间价差的跨品种套利机制、结合Black-Scholes期权定价与隐含波动率偏差的定价套利模型、基于协整与价差Z-score构造的跨资产价差回归策略

### 基于自然语言处理的假新闻检测 (MIT课题)

上海, 2025.03 – 2025.05

#### 结合RoBERTa、XLNet等预训练模型与传统机器学习方法, 通过五折交叉验证提升分类性能

- 设计并应用伪标签算法进行数据增强, 引入标签平滑与学习率预热等训练策略, 使模型F1分数提升至0.985
- 开展误差分析与模型校准, 对比软投票、硬投票与stacking meta-ensemble的性能差异, 为不同应用场景提供最优模型选择方案

### 基于机器学习的比特币价格预测与量化交易策略研究 (优秀毕业论文)

上海, 2025.02 – 2025.05

#### 构建比特币价格预测模型, 并设计优化的量化交易策略

- 构建多模型预测框架, 对复权价格序列进行特征工程, 引入市场状态划分与特征漂移检测, 准确率提升37%
- 采用贝叶斯超参数优化与滚动回测, 结合交易成本建模, 设计多因子量化策略, 策略 Sharpe 比率达 2.704

## 个人技能

编程语言: Python(NumPy、Pandas、Numba、Pytorch、Tensorflow)、Linux、C++、R、MATLAB、LaTeX

语言能力: 中文(母语)、英文(流利, TOEFL: 109; 阅读: 30, 听力: 29, 口语: 25, 写作: 25)