Sahong Park

Curriculum Vitae

Republic of Korea — justin4396@hufs.ac.kr — LinkedIn

I am an undergraduate researcher at HUFS working at the intersection of quantitative finance and machine learning, with research interests in Portfolio Optimization, Decision-Focused Learning, and LLMs in Finance. I plan to pursue an integrated M.S./Ph.D. in Financial Engineering beginning in 2027.

EDUCATION & EMPLOYMENT HISTORY

Bachelor of AI Convergence
Year of completion: 2027 (Anticipated)
Institution: Hankuk University of Foreign Studies
Department: Division of Finance & AI
GPA: 4.23 / 4.5 Credits Earned: 131 / 134

Undergraduate Researcher
Time Period: 2025-07 - Present
Institution: Hankuk University of Foreign Studies
Department: Division of Finance & AI

Visiting Research Student
Time Period: 2026-03 - 2026-07 / 2026-10 - Present
Institution: Korea Finance Telecommunications & Clearings Institue (KFTC)
Description: Enhancing Suspicious Money Laundering Transaction Detection Using AI-based Payment Network Analysis (Academic-industrial Project outsourced by UNIST)

Department Assistant
Time Period: 2024-09 - 2026-02
Main Role: Server Scheduling & Maintenance

RESEARCH INTERESTS

Primary: **Portfolio Optimization, Large Language Model, Decision-Focused Learning, AI in Finance**
Secondary: Graph Neural Networks, Synthetic Data, Explainable AI

PUBLICATIONS

· **Gerber-Shrinkage Covariance:**
Global Minimum Variance Portfolio via Correlation-Based Dynamic Blending
Sahong Park, Hyeongwoo Kong *Korean Institute of Industrial Engineers Spring Conference 2026*

RESEARCH EXPERIENCE

Research Assistant March 2026 – July 2026
UNIST, Supervisor: Prof. Yongjae Lee (external collaboration)
Enhancing Suspicious Money Laundering Transaction Detection Using AI-based Payment Network Analysis

Undergraduate Researcher July 2025 – Present
Hankuk University of Foreign Studies, Supervisor: Prof. Hyeongwoo Kong
**Fully Funded (March 2026 ∼)*

PROJECTS

Summer 2026

· **Fund Tracking Portfolio Optimization** *Python*
Industry-Academic Collaboration Project
Developing a portfolio to track a target U.S. fund using tradable ETFs, with asymmetric penalties for underperformance and regime-aware dynamic allocation.

Spring 2026

· **What Determines Weight Allocation in GMVP** *Python*

Used rolling cross-sectional OLS on S&P 100 stocks to identify GMVP weight determinants; total variance, systematic variance share, and correlation were negatively associated with portfolio weights.

Winter 2025

· **Decision-Focused Learning for Minimum Variance Portfolio Optimization** *Python, CVXPYLayers*

Sahong Park, Minju Woo, Hyeongwoo Kong *HUFS Winter 2025 Departmental Research Symposium*

Built an end-to-end DFL framework combining graph-based covariance estimation with differentiable GMVP optimization, improving portfolio performance over conventional covariance estimation baselines.

Fall 2025

· **Estimating Practical Volatility for Optimal Hedging Strategy** *Python*

Compared rolling volatility, EWMA, and GARCH(1,1); EWMA produced hedge ratios closest to the Oracle Hedge Ratio.

· **Factor Investing with a Deep Multi-Factor Model: KOSPI Implementation** *PyTorch*

Implemented DMFM on KOSPI and achieved superior risk-adjusted portfolio performance against linear and neural baselines.

· **Does Sentiment Matter Differently Across Cities? Evidence from Airbnb Listings** *Python*

Tested sentiment features in Airbnb pricing and analyzed city-specific keyword effects using SHAP and lift.

Summer 2025

· **LLM-Based Owner Risk Sentiment and Stock Return Analysis** *Python*

Applied GPT-4.1 nano, LLaMA, and BERT to owner-related news and tested sentiment–return relationships using event-based Spearman correlations.

Sahong Park, Hyeongwoo Kong *HUFS Summer 2025 Departmental Research Symposium*

Spring 2025

· **New York Times Article & Comment Analysis** *Python*

Applied BERTopic and XLNet to extract article topics and analyze sentiment in reader comments.

· **Small Language Model Performance Comparison** *PyTorch*

Compared GPT-2, Phi-2, and BitNet in response quality and inference speed.

· **Impact of Korea's Green License Plate Policy on Imported Car Registrations** *Python*

Used Welch's t-tests to evaluate policy effects, finding significant registration declines across several premium car brands.

Fall 2024

· **Interest Rates and KOSPI: Correlation and Forecasting** *R*

Applied ARIMA, distributed-lag models, and Granger causality tests to analyze macroeconomic effects on KOSPI and forecast its future direction.

Spring 2024

· **Formula 1 Grand Prix Attendance Analysis** *R*

OLS analysis found attendance significantly associated with hosting experience, local F1 driver history, and first hosting year.

· **Manchester United Stock Return Analysis** *Python*

Analyzed stock returns against sporting and financial performance; no significant predictors were found, while points and attendance showed a strong linear relationship.

FELLOWSHIPS & SCHOLARSHIPS

External

Funded

Award Name: Academic Excellence Scholarship
Funding Agency: Gumi City Scholarship Foundation
Award Amount: KRW 1,979,000
Coverage Period: March 2024 – June 2024

Award Name: Choi Eon-do Scholarship
Funding Agency: AB Choi Family Foundation
Award Amount: KRW 3,000,000
Coverage Period: March 2025 – December 2025

Internal

Funded

Award Name: Graduate Assistantship
Funding Agency: Hankuk University of Foreign Studies
Award Amount: KRW 5,035,800
Coverage Period: September 2024 – December 2025

Award Name: Academic Merit Scholarship
Funding Agency: Hankuk University of Foreign Studies
Award Amount: KRW 4,480,000
Coverage Period: March 2025 – June 2026

ORGANIZING & ADVISING

Academic Society

Society Name: Data Analysis & Technology (DAT) [LinkedIn]
Role: Executive Member (Spring 2025) → President (Fall 2025) → Advisor (Spring 2026)
Approximate Membership: ∼25 students per semester
Additional Information: Student-led academic society at HUFS focused on data analysis and technology.

Society Name: ITDA — Seoul Metropolitan Data Science Society [Instagram]
Role: Advisor (Topic Proposal & Preliminary Reviewer)
Member Universities: Sogang University, Sungkyunkwan University, Inha University, Kyung Hee University, Hankuk University of Foreign Studies
Term: Spring 2026
Additional Information: Proposed the inaugural research topic — *Graph Neural Network-Based Abusive Review Detection in E-Commerce* — and participated as a preliminary reviewer in the paper selection process.

Journal Club Presentations

Summer 2026

· **Solving the Index Tracking Problem Based on a Convex Reformulation for Cointegration** [Paper] [PPT]^{ENG}
Leonardo Riegel Sant'Anna, Alan Delgado de Oliveira, Tiago Pascoal Filomena, João Frois Caldeira *Finance Research Letters 2020 (Q1)*

Motivated by an ongoing fund tracking project, this presentation studies a cointegration-based index tracking model with a cardinality constraint for endogenous stock selection. The resulting convex MINLP jointly selects assets and portfolio weights while prohibiting short positions. Experiments on the S&P 100, Ibovespa, and our own fund-tracking setting show competitive tracking performance and highlight the limits of sparse replication for harder active funds.

Spring 2026

· **Decision-Focused Learning via Tangent-Space Projection of Prediction Error** [Paper] [PPT]^{ENG}
Junhyeong Lee, Sangjin Jin, Yongjae Lee *ICML 2026*

Motivated by a sustained interest in decision-focused learning (DFL) introduced at the close of the JPM 2024 portfolio optimization review, this presentation covers PEAR (ICML 2026), which shows that the regret gradient admits a closed-form geometric

expression $\nabla_{\hat{c}}\mathcal{R} = P_H e$—the prediction error $e = \hat{c} - c$ projected onto the feasible tangent space via an H-orthogonal projector P_H. This formulation bypasses the costly cone-reformulated KKT backward pass of CVXPYLayers with a lightweight Schur-complement solve, while empirically dominating competing DFL methods on real-world mean–variance optimization.

· **Estimating Covariance for Global Minimum Variance Portfolio: A Decision-Focused Learning Approach** [Paper] [PPT]$^{\text{ENG}}$

Juchan Kim, Inwoo Tae, Yongjae Lee *ICAIF 2025*

· **coVariance Neural Networks** [Paper] [PPT]$^{\text{ENG}}$

Saurabh Sihag, Gonzalo Mateos, Corey McMillan, Alejandro Ribeiro *NeurIPS 2022*

· **Nonparametric Stein-type Shrinkage Covariance Matrix Estimators in High-Dimensional Settings** [Paper] [PPT]$^{\text{ENG}}$

Anestis Touloumis *Computational Statistics and Data Analysis 2015 (Q1)*

Read to resolve a concrete problem encountered during S&P 500 portfolio optimization, as part of an ongoing personal research effort to combine the Gerber statistic with a shrinkage estimator $\hat{\Sigma}_{\text{hybrid}} = (1-\alpha)\hat{\Sigma}_{\text{LW}} + \alpha\hat{\Sigma}_{\text{GS}}$; the paper's nonparametric U-statistic approach to estimating $\hat{\lambda}$ was the key reference, but the derivations were honestly beyond comfortable reading level at the time.

· **The Gerber Statistic: A Robust Co-Movement Measure for Portfolio Optimization** [Paper] [PPT]$^{\text{ENG}}$

Sander Gerber, Harry M. Markowitz, Philip A. Ernst, Yinsen Miao, Babak Javid, and Paul Sargen *The Journal of Portfolio Management 2022 (Q2)*

· **ProtoHedge: Interpretable Hedging with Market Prototypes** [Paper] [PPT]$^{\text{ENG}}$

Lisa Faloughi, Ce Guo, Wayne Luk *ICAIF 2025*

· **Enhancing mean–variance portfolio optimization through GANs-based anomaly detection** [Paper] [PPT]$^{\text{ENG}}$

Jang Ho Kim, Seyoung Kim, Yongjae Lee, Woo Chang Kim, Frank J. Fabozzi *Annals of Operations Research 2025 (Q1)*

· **War Discourse & Disaster Premium: 160 Years of Evidence from the Stock Market** [Paper] [PPT]$^{\text{ENG}}$

David Hirshlefifer, Dat Mai, Kuntara Pukthuanthong *The Review of Financial Studies 2025 (Q1)*

Reviewed as a first foray into top-tier empirical finance, motivated by curiosity about how a Q1 journal (RFS) structures long-horizon evidence; the paper's use of sLDA to extract a war discourse measure τ_t^{war} from 160 years of newspaper articles served as a concrete entry point into text-based asset pricing.

Winter 2025

· **Association-Focused Path Aggregation for Graph Fraud Detection** [Paper] [PPT]$^{\text{ENG}}$

Tian Qiu, Wenda Li, Zunlei Feng, Jie Lei, Tao Wang, Yi Gao, Mingli Song, Yang Gao *NeurIPS 2025*

Also reviewed as part of the UNIST industry–academia project reference survey alongside D-EMAML, serving as a contrasting path-based approach to D-EMAML's motif-based formulation for graph fraud detection; both target long-range structural dependencies that local-aware GNNs fail to capture, but differ in how they define and aggregate higher-order structure.

· **Beyond Single Transactions: D-EMAML—Dual-Edge Motif Neural Networks for Enhanced Anti-Money Laundering Detection** [Paper] [PPT]$^{\text{ENG}}$

Dongmei Han, Min Min, Yuchen Wang, Guoming Xu, Xiaofeng Zhou *AAAI 2026*

Reviewed as part of a reference survey for an industry-academia research project (*Enhancing Suspicious Money Laundering Transaction Detection Using AI-based Payment Network Analysis*, UNIST) following the AAAI visit. Proposes D-EMAML, a dual-edge motif-aware graph neural network for anti-money laundering detection that models transaction patterns beyond individual edges by capturing higher-order subgraph motifs.

· **Regime-Aware Risk Parity: Conditioning the Covariance Matrix on Macroeconomic and Stock Market Regimes** [Paper] [PPT]$^{\text{ENG}}$

Alessio de Longis, David Happersberger, Scott Hixon, Han Liang, and Ingmar Nolte *The Journal of Portfolio Management 2026 (Q2)*

· **Pretraining task diversity and the emergence of non-Bayesian in-context learning for regression** [Paper] [PPT]$^{\text{KR}}$

Allan Raventós, Mansheej Paul, Feng Chen, Surya Ganguli *NeurIPS 2023*

Fall 2025

· **KAN: Kolmogorov–Arnold Networks** [Paper] [PPT]$^{\text{ENG}}$

Ziming Liu, Yixuan Wang, Sachin Vaidya, Fabian Ruehle, James Halverson, Marin Soljačić, Thomas Y. Hou, Max Tegmark *ICLR 2025*

· **An Overview of Machine Learning for Portfolio Optimization** [Paper] [PPT]$^{\text{ENG}}$

Yongjae Lee, Jang Ho Kim, Woo Chang Kim, Frank J. Fabozzi *The Journal of Portfolio Management 2024 (Q2)*

A survey paper read after the ICAIF 2024 visit as an entry point into portfolio optimization and Decision-Focused Learning. Covers the two-stage ML pipeline for MVO — parameter estimation (μ, Σ) and convex optimization — and concludes with Decision-Focused Learning, which directly backpropagates decision loss through the optimizer rather than minimizing prediction error alone. Marks the transition to English-language slides and a consistent presentation format adopted for subsequent journal club sessions.

· **Attention Factors for Statistical Arbitrage** [Paper] [PPT]$^{\text{KR}}$

Elliot L. Epstein, Rose Wang, Jaewon Choi, Markus Pelger *ICAIF 2025*

· **NeuralBeta: Estimating Beta Using Deep Learning** [Paper] [PPT]$^{\text{KR}}$

Yuxin Liu, Jimin Lin, Achintya Gopal *ICAIF 2025*

Appreciated for how cleanly deep learning integrates into classical regression: the encoder learns per-sample importance weights, which are plugged directly into the WLS closed-form to estimate $\hat{\beta}$ — preserving the interpretability of linear regression while capturing nonlinear temporal patterns in the lookback window.

· **Denoising Diffusion Probabilistic Model for Realistic Financial Correlation Matrices** [Paper] [PPT]$^{\text{KR}}$

Szymon Kubiak, Tillman Weyde, Oleksandr Galkin, Daniel Philps, Ram Gopal *ICAIF 2024*

Reviewed alongside the ICAIF 2024 conference visit as a first entry into the AI-in-finance literature. The presentation emphasized the forward/reverse diffusion mechanics in depth but left the domain-specific components — particularly the Higham projection for positive definiteness and the conditional DDPM (CDM) variant — underexplored.

Summer 2025

· **Accurate Multivariate Stock Movement Prediction via Data-Axis Transformer with Multi-Level Contexts** [Paper] [PPT]$^{\text{KR}}$

Jaemin Yoo, Yeun Soun, Yong-chan Park, U Kang *KDD 2021*

· **Multiply Robust Estimation for Local Distribution Shifts with Multiple Domains** [Paper] [PPT]$^{\text{KR}}$

Steven Wilkins-Reeves, Xu Chen, Qi Ma, Christine Agarwal, Aude Hofleitner *ICML 2024*

Proposes a segment-aware domain adaptation framework that handles local distribution shifts across multiple domains via importance-weighted ensemble estimation. Reviewed alongside supplementary material on MMD and KL Divergence to build the necessary theoretical background in distributional distance measures.

· **TabM: Advancing Tabular Deep Learning with Parameter-Efficient Ensembling** [Paper] [PPT]$^{\text{KR}}$

Yury Gorishniy, Akim Kotelnikov, Artem Babenko *ICLR 2025*

Spring 2025

· **XGBoost: A Scalable Tree Boosting System** [Paper] [PPT]$^{\text{KR}}$

Tianqi Chen, Carlos Guestrin *KDD 2016*

My first-ever paper presentation, conducted as part of a Data Mining course (slides in Korean). The mathematical treatment was limited — particularly the second-order Taylor approximation of the loss function and the derivation of the optimal leaf weight and gain-based split criterion.