Ali Habibnia

Virginia Tech

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Current Appointments

2018– Assistant Professor, Department of Economics, Virginia Tech

2018– Core Faculty, Computational Modeling and Data Analytics (CMDA), College of Science, Virginia Tech

2024– Founding Director, Dataism Laboratory for Quantitative Finance (DLQF)
Lead a multidisciplinary research lab of 30+ members, shaping its scientific agenda and advancing methodological research.

2022– Affiliated Faculty, Kellogg Center for Philosophy, Politics, and Economics, Virginia Tech

Education

2017 PH.D. in Statistics, **London School of Economics and Political Science**
Thesis: Essays in High-Dimensional Nonlinear Time Series Analysis. [thesis]
Principal supervisor: Matteo Barigozzi.

2012 M.S. in Quantitative Finance, **Bayes Business School (formerly Cass Business School)**

2010 M.S. in Economics, **University of Tehran**

2007 B.S. in Economics, **University of Tehran**

Research Interests

Statistical and Causal Machine Learning • High-Dimensional and Nonlinear Econometrics • Time-Series Forecasting • Financial Networks and Systemic Risk • LLMs and Agentic AI • Quantum Machine Learning

Previous Academic Appointments

2021–2024 Visiting Faculty (hybrid), Deep Learning Program, NMIMS University, India

2021–2023 Visiting Faculty (hybrid), Machine Learning Program, Indian Institute of Technology Kharagpur

2016–2018 Scientific Chair of Big Data Economics, Tehran Institute for Advanced Studies (TeIAS), Iran

2015–2018 Founding Board Member, Tehran Institute for Advanced Studies (TeIAS), Iran

2012–2017 Research Fellow (during doctoral studies), London School of Economics, UK
Systemic Risk Centre; Time Series and Statistical Learning Group

Industry Experience

2013 Quantitative Research Analyst, Pantheon Ventures LLP, London, UK (summer)

2007–2011 Head of Equity Market and Research Department, Rahbord Investment Company, Tehran, Iran

2009–2011 Co-Founder and Chair of the Board, Behineh Sazan Pargar, Tehran, Iran

2009–2010 Derivatives Trading Strategist and Team Lead, Wise Enterprises FZCO, Dubai, UAE

2004–2006 Stock Market Analyst Intern, Nikan Capital, Tehran, Iran

Publications

Journal Articles

2026 Li, Q., Mukhopadhyay, C., Bayat, A., & **Habibnia, A.** "Quantum Reservoir Computing for Realized Volatility Forecasting." *Physical Review Research*, 8, 023028. DOI.

2026 **Habibnia, A.**, & Golshani Nasab, P. "Trading on Emotion: Behavioral and Predictive Determinants of Algorithmic Trading Adoption." *Journal of Behavioral Finance*, 27(2), 238–251. Special Issue on Statistical and Machine Learning for Investor Modelling. DOI.

2025 Ardalankia, J., **Habibnia, A.**, Ausloos, M., & Jafari, G. R. "Hidden Community Interlayer Spillover Detection in Financial Multilayer Networks: Generalization of Hierarchical Clustering to Multilayer Networks." *PLOS ONE*, 20(9), e0330372. DOI.

2024 Saffar, M., Kalhor, A., & **Habibnia, A.** "A Geometric Approach for Accelerating Neural Networks Designed for Classification Problems." *Scientific Reports*, 14, 17590. DOI.

2021 **Habibnia, A.**, & Maasoumi, E. "Forecasting in Big Data Environments: An Adaptable and Automated Shrinkage Estimation of Neural Networks (AAShNet)." *Journal of Quantitative Economics*, 19(Suppl 1), 363–381. Special issue in honor of Anirudh Lal Nagar. DOI.

2011 Haeri, A., Rabbani, M., & **Habibnia, A.** "The Proposed Mathematical Models for Decision-Making & Forecasting on Euro-Yen in Foreign Exchange Market." *Iranian Economic Review*, 16(30), 67–91. DOI.

Manuscripts Under Review and Revision

Habibnia, A., Maasoumi, E., & Shah, G. "Double Machine Learning for Panel Data: Identification, Specification, and a Bank Regulation Effect." Under review at *Econometric Reviews*.

Zahedian, M., Ardalankia, J., Hosseiny, A., **Habibnia, A.**, & Jafari, G. R. "Bullish and Bearish Regimes in Cryptocurrencies: Information Flow Networks and Balance Model Features." Revise and resubmit at *Physica A: Statistical Mechanics and its Applications*.

Gendron, J., & **Habibnia, A.** "Evaluating Meta-Regression Techniques: A Simulation Study on Heterogeneity in Location and Time." Under review at *Oxford Bulletin of Economics and Statistics*. Earlier version: [arXiv:2504.16696].

Book Chapter

2024 Razavi, H., & **Habibnia, A.** "The Rise of AI in Middle Eastern Fintech With the Case Studies From the UAE and Turkey." In H. Taherdoost, N. Le, M. Madanchian, and Y. Farhaoui (eds.), *Exploring Global FinTech Advancement and Applications*, 259–297. IGI Global. DOI.

Workshop, Conference, and Discussion Papers

2026 Abolghasemi, A., Tavakoli, S. R., Naderi, P., Mirzaei, N., Jahani, B., Yousefzade, S., Javaheri, T., Rohban, M. H., Alirezaie, M., Aminian, G., & **Habibnia, A.** "StochLOB: Heavy-Tailed Score Matching for Robust Limit Order Book Trend Prediction." Accepted for oral presentation at *NeurIPS 2026 Workshop on AI for Stochastic Dynamics (STODY)*. [OpenReview].

2026 Tavakoli, M., Tavakoli, S. R., Salmani, F., Amini, A., Rohban, M. H., Aminian, G., & **Habibnia, A.** "Certifying Reward Alignment in Portfolio Reinforcement Learning." Accepted for presentation at *Workshop on Interpretability and Alignment of Financial Models (IAFM)*, ACM ICAIF 2026.

2026 Yousefi, N., Ghafouri, M., Tavakoli, S. R., Gharegozlou, M. J., Khaledian, A., Rahimikia, E., Amini, A., Aminian, G., Alirezaie, M., & **Habibnia, A.** "RiskReason: A Benchmark for Verifiable Financial Risk Reasoning." Accepted for poster presentation at *3rd Workshop on LLMs and Generative AI for Finance (AI4F)*, ACM ICAIF 2026. Non-archival workshop. [OpenReview].

2017/18 Etesami, J., **Habibnia, A.**, & Kiyavash, N. "Econometric Modeling of Systemic Risk: Going Beyond Pairwise Comparison and Allowing for Nonlinearity." *LSE Systemic Risk Centre Discussion Paper No. 66*, 2017. [discussion paper]. Refereed version: "Econometric Modeling of Systemic Risk: A Time Series Approach", MiLeTS at KDD, London, 2018. [workshop paper].

2013 **Habibnia, A.** "Foreign Exchange Rate Risk Measurement and Management." *5th Conference on Development of Financing System*, Tehran, Iran. DOI.

Working Papers and Manuscripts

Chao, Y., Gökhan, R., Etesami, J., & **Habibnia, A.** "Learning Nonlinear Factor Models with Unknown Monotone Links from Incomplete and Noisy Data." [arXiv:2605.26271].

Etesami, J., **Habibnia, A.**, & Kiyavash, N. "Modeling Systemic Risk: A Time-Varying Nonparametric Causal Inference Framework." [arXiv:2312.16707].

Ardaiz, A., Budati, V., & **Habibnia, A.** "Mixture-of-Experts for Cryptocurrency Order Execution: Training Stability, Tail Risk, and Failure Modes." [arXiv:2610.03369].

Khaleti, M., Tavakoli, S. R., Hoseini, B., Nouri, A., Khaledian, A., Alirezaie, M., Amini, A., Aslansefat, K., & **Habibnia, A.** "Evaluating Reasoning Budgets for LLM Decision Services: Auction Utility, Calculator Gaps, and Resource Accounting." [OpenReview].

Abolghasemi, A., Tavakoli, S. R., Mirzaei, N., Rohban, M. H., Amini, A., & **Habibnia, A.** "Integrating Financial News, Market Triggers, and Predictive Uncertainty for Small-Capitalization Portfolios."

Koushki, A., **Habibnia, A.**, Sioofy Khoojine, A., & Farkhondeh Rouz, O. "Dynamic Analysis of Systemic Risk in the Banking Sector Through Transfer Entropy and Temporal Measures."

Habibnia, A., & Soltanzadeh, M. "Optimizing Portfolio with Two-Sided Transactions and Lending: A Reinforcement Learning Framework." [arXiv:2408.05382].

Habibnia, A., Gendron, J., & Jaimes Sandoval, A. "Testing Dependence: Why Permutation Tests Deserve More Attention."

Gendron, J., & **Habibnia, A.** "Filling the Gaps in Meta-Regressions: Machine Learning in Realistic Heterogeneity Structures."

Research in Progress

Habibnia, A., & Golshani Nasab, P. "Artificial Intelligence Adoption by Financial Decision-Makers: A Review and Meta-Analysis."

Amini, A. A., **Habibnia, A.**, & Sadeghi, H. "Online Detection of Change in Correlation for Dynamic Asset Allocation."

Habibnia, A., & Lunkad, R. "Beyond Separability: A Study of Higher-Order Metrics on Latent Space."

Ardalankia, J., & **Habibnia, A.** "A Multiplex Network Approach to Portfolio Selection."

Habibnia, A. "Testing for Nonlinearity in Time Series: A Practitioner's Guide."

Grants and Fellowships

2022 Kellogg Center PPE Research Fellowship, Virginia Tech. Principal Investigator; $3,500 research funding and $500 travel support.
Project: The History and New Trends of Measuring Dependence: From Bayes, Galton, and Pearson to the 21st Century.

2021 Lay Nam Chang Dean's Discovery Fund Grant, Virginia Tech College of Science. Co-Principal Investigator with Russell J. Hewett; $20,000 total award for one year. Supported Dawson J. Miller's master's research in deep learning for nonlinear common-factor modeling and forecasting in economics.

2013–2017 Doctoral Fellowship, ESRC and LSE Systemic Risk Centre; tuition and living support.

2012–2013 Ph.D. Scholarship, LSE Department of Statistics; first-year doctoral funding.

Honors and Awards

2024 Finalist (Top 5), ADIA Lab Best Paper Award, "Modeling Systemic Risk: A Time-Varying Nonparametric Causal Inference Framework."

2023 Outstanding Faculty in Undergraduate Teaching, Department of Economics, Virginia Tech.

2015 Highly Commended Research Prize, LSE Research Festival.

2010 Recognized as a Scientific Elite, Iran National Elites Foundation.

2007 Exceptional Talent Recognition, National Organization for Development of Exceptional Talents.

Invited Seminars and Talks

2025 Realized Volatility Forecasting with Quantum Reservoir Learning, *Department of Economics Seminar, University of Kansas*

2023 The History and New Trends of Measuring Dependence, *Kellogg Center PPE Research Fellow Panel*

2023 Quantum Computing Solutions for Econometrics, *Physics of Quantum Information Technology (PQIT) Group, University of Electronic Science and Technology of China*

2023 Enhancing Economic Analysis and Policy-Making: The Synergy of AI, Big Data, and HPC, *Perspectives on the Human AI Event, ICAT, Virginia Tech*

2023 Topics in Advanced Financial Econometrics, *University of Tehran, Faculty of Economics*

2023 Algorithmic Trading and Intelligent Investment Strategies, *Kharazmi University*

2022 Quantum Computing & Quantum Machine Learning Solutions for Economics and Finance, *University of Electronic Science and Technology of China (UESTC)*

2021 Information Theory & Financial Network Analysis, *University of Tehran, Dept. of Economics*

2020 Machine Learning for Econometricians, *North Carolina State University, Dept. of Economics*

2019 Adaptable and Automated Shrinkage Estimation of Neural Networks (AAShNet), *Stanford Institute for Theoretical Economics – Asset Pricing Theory and Computation Summer Workshop*

2019 Big Data and Machine Learning for Policymaking, *International Monetary Fund, Strategy, Policy, and Review Department*

2018 Financial Time Series Analysis: Deep Learning Approach, *MathWorks Computational Finance*

2018 Text Mining & Sentiment Analysis in Trading, *Tehran Stock Exchange*

2018 Introduction and Overview of Applications of Artificial Intelligence and Machine Learning in Scientific Research, *Virginia Tech*

2016 Machine Learning for Economic and Financial Forecasting, *The Technical Analyst*

2012 Time Series Forecasting Using Wavelet Kernel Support Vector Machine, *LSE*

Conference and Workshop Presentations

2026 Causal Effects of Financial Deregulation on Bank Risk: Insights from Double Machine Learning with Panel Data, *QFFE 2026 International Conference*; *Camp Econometrics XX.*

2026 Systemic Risk and Cryptocurrency Spillovers: Time-Varying Directed Information Graphs, *QFFE 2026 International Conference*

2026 Learning Nonlinear Factor Models with Unknown Monotone Links from Incomplete and Noisy Data, *7th Vienna Workshop on High-Dimensional Time Series in Macroeconomics and Finance*; *RCEA International Conference in Economics, Econometrics, and Finance.*

2025 Policy Analysis of Reduced Regulatory Supervision on Bank Risk Using Double Machine Learning for Panel Data, *Southern Economic Association, 95th Annual Conference, Session on High-Dimensional Econometrics and Machine Learning*

2024 Realized Volatility Forecasting with Quantum Reservoir Learning, *The 5th Annual DC-MD-VA Econometrics Workshop*

2023 A Time-Varying Causal Inference Framework for Modeling Systemic Risk in High-Dimensional Financial Networks, *The 4th Annual DC-MD-VA Econometrics Workshop*

2021 Shrinkage Estimation of Neural Networks, *41st International Symposium on Forecasting*

2015 Nonlinear Forecasting with Many Predictors by Neural Network Factor Models, *LSE Research Festival*, London School of Economics. [LSE record] (poster); *35th International Symposium on Forecasting (ISF)*, Riverside, California.

2014 Forecasting in Big Data Environments: Shrinkage Estimation of Neural Networks, *International Conference on Computational and Financial Econometrics (CFE-ERCIM)*, University of Pisa

2013 Foreign Exchange Rate Risk Measurement and Management, *5th Conference on Development of Financing System, Tehran, Iran*

Teaching

Virginia Tech

Designed and taught all four courses listed below.

Advanced Big Data Economics (ECON 5314G, Ph.D.); Big Data Economics (ECON 4314 / CMDA 4314, undergraduate); Data Science for Quantitative Finance (ECON 4984 / CMDA 4984; ECON 5984, graduate); Machine Learning & Data Classifiers (C7 module, Program in Business Analytics).

***Student evaluations* (SPOT, 29 course sections, 2019–2026):** overall teaching effectiveness 5.52 out of 6 (219 responses), compared with 5.02 for the Department of Economics and 5.05 for the College of Science. Ratings on every other SPOT item were also above both averages. Full reports available upon request.

NMIMS and IIT Kharagpur

2021–2024 Machine & Deep Learning from Theory to Practice, module for M.Tech. in Data Science.

2024 Invited Instructor, Applications of Machine Learning, B.Tech. in Data Science, NMIMS University.

London School of Economics and London Business School

2012–2017 *Instructor, London School of Economics.* Elementary Statistical Theory (ST102); Quantitative Methods (ST107); Time Series Forecasting (ST304); Applied Regression with R (ST211); Factor Models in Time Series, Summer Programme with Matteo Barigozzi. Full responsibility for teaching, office hours, examinations, assignments, and grading.

2013 London Business School: teaching assistant, Global Business Environment (MBA).

University of Tehran

2008–2012 Econometrics (graduate); Macroeconomics I and II (undergraduate); Machine Learning Applied to Finance (graduate).

Selected Professional and Executive Education

AI-Based Algorithmic Trading with Python, for practitioners and firms (recurring)

2022 Big Data & Machine Learning for Causal Inference and Treatment Effects with Python, *TeIAS, Iran*

2018 Linear Algebra & Probability for Machine Learning in Python; Time Series Forecasting with Python, *Tehran Stock Exchange.*

2017 Algorithmic Trading with Python; Deep Learning & Machine Learning Applied to Trading, *Tehran Stock Exchange.*

2015 Econometrics of Monetary Policy (postgraduate), *Khatam University*

2008–2016 Technical Analysis of Financial Markets, *More than 25 times in various universities and institutes*

Research Supervision and Advising

Doctoral Supervision at Virginia Tech

2026 Jonathan Gendron, Ph.D. Economics; advisor and committee chair.
Dissertation: Evaluating Meta-Regression Models with Simulation Studies and Machine Learning Driven Imputation.
Placement: Assistant Professor, Business Analytics and Information Systems, Xavier University (Williams College of Business).

Current Jamshid Ardalankia, Ph.D. Economics (expected May 2027); advisor and committee chair.

Master's Supervision at Virginia Tech

2025 Gaurav K. Shah, M.S. Computer Science and Applications; co-chair and research advisor.

2022 Dawson J. Miller, M.S. Mathematics; committee member and research co-advisor.

Doctoral Committee Membership at Virginia Tech

Arin Shahbazian (Economics, 2026); Austin E. Bradley (Economics, 2024); Brian Arthur D'Orazio (Economics, 2023); Mohammad Mahdi Banasaz (Economics, 2022); He Jiang (Economics, 2022).

Undergraduate Research

2026 *Summer research*: Viraj Chawda, Tensor-Based Factor Models for Economic Forecasting; Laird Sutherland, Causal Machine Learning for Economic Policy Evaluation; Chuyang Zhang, Nonlinear Dependence Measures in Economics and Finance.

2024–2025 *Undergraduate research course in economics*: Nicole Raphael, Permutation Tests for Correlation; Max Brenner, Forecasting Sports Outcomes via Machine Learning.

Other Institutions

University of Tehran

Current Farnam Shahba, Ph.D. Economics and Econometrics (expected May 2027); advisor.

2024 Soheil Aeen, Ph.D. Economics and Econometrics; co-advisor.

2023 Mohsen Saffar, Ph.D. Electrical and Computer Engineering; co-advisor.

2023 Mahdi Bagheri, Ph.D. Electrical and Computer Engineering; committee member.

Tehran Institute for Advanced Studies (TeIAS)

2023 Mahdi Soltanzadeh, M.S. Financial Engineering; advisor.

K. N. Toosi University of Technology

2017 Mahsa Rajabi, Ph.D. Electrical Engineering; committee member.

2017 Raheleh Shahrokhi, Ph.D. Electrical Engineering; committee member.

Khatam University

2016 Emad Habibzadeh, M.S. Financial Engineering; advisor.

2016 Fatemeh Ghasempour, M.S. Risk Management; advisor.

Professional Service

Departmental and University Service

2019–2020 Organizer, weekly departmental seminars, Department of Economics, Virginia Tech.

2019–2020 Faculty search committee member, Department of Economics, Virginia Tech.
Contributed to development of the department's master's program and to CMDA program activities.

2011–2012 Student Experience Committee Member, M.Sc. Quantitative Finance, City University London.

Research Seminars

2026 Organizer, DLQF Seminars, focusing on large language models (LLMs) and agentic AI.

Editorial Board

2023– International Editorial Board, *Journal of Countries Studies*.

Journal Refereeing

Journal of Business and Economic Statistics; Econometric Reviews; Econometrics; International Journal of Forecasting; Applied Economic Perspectives and Policy; Proceedings of the National Academy of Sciences (PNAS); Risks; Entropy; Economic Modelling; Journal of Economic Behavior and Organization; INFORMS Journal on Computing.

Conference and Workshop Reviewing

2026 Reviewer, 7th ACM International Conference on AI in Finance (ICAIF); NeurIPS Workshop EconML; NeurIPS Workshop on AI for Stochastic Dynamics (STODY).

Research Software and Teaching Resources

2023 **Habibnia, A.** "Algorithmic Trading with Python." Open-source curriculum covering market microstructure, strategy backtesting, broker & exchange APIs, with live execution. GitHub (550 stars; October 2026).

2018 **Habibnia, A.**, & Rahimikia, E. "A Nonlinearity Test for Principal Component Analysis." MATLAB code, MATLAB Central File Exchange; archived release v1.0.0, Zenodo (2026). DOI.

2017 **Habibnia, A.**, & Rahimikia, E. "MATLAB Tutorial for Data Science." MathWorks. DOI.

Technical Skills

Programming and Statistical Software: Python, R, MATLAB, Stata, EViews, G@RCH, OxMetrics, JMulTi; working familiarity with C.

Machine Learning: Keras, PyTorch, TensorFlow, scikit-learn.

Computing: Git, Linux; working knowledge of AWS.

Financial Platforms and Data: Bloomberg Terminal, WRDS, broker and exchange APIs, Binance, Crypto Lake; limit order book and alternative data.