

Faisal Shah Khan

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ACADEMIC PROFILE

Educator and mathematical scientist committed to teaching mathematics as a tool for reasoning, modeling, and discovery. My courses emphasize conceptual clarity and applied context. In research, I work at the intersection of quantum information, game theory, and information geometry, with applications to finance and the emerging notions of quantum data. I mentor undergraduates in research that connects mathematical theory with practical problems in science and technology.

EDUCATION

- **Ph.D.**, Mathematical Sciences, Portland State University, 2009.
- **M.S.**, Mathematics, Portland State University, 2003.
- **B.S.**, Mathematics, Santa Clara University, 1997.

ACADEMIC APPOINTMENTS

- **SKEMA Business School (Raleigh, NC)** Aug 2021–present
Adjunct Professor. Courses include Consulting Methods in AI, Data Science, Business Intelligence, AI & Deep Learning, International Finance, and Statistics for Business Decisions. Faculty adviser to the Data Science & Quantum AI student club.
- **Khalifa University (Abu Dhabi, UAE)** Jan 2010–Jun 2020
Assistant Professor of Mathematics; later PI, Center on Cyber-Physical Systems (C2PS). Founding faculty member of the Department of Mathematics; co-developed and launched the B.Sc. program (tracks in Statistics and Mathematical Finance); supervised undergraduate and graduate research; taught the full lower-division catalog and graduate courses in Information Theory, Stochastic Processes, and Differential Equations.
- **University of Portland (Portland, OR)** Jun 2007–Dec 2009
Adjunct Assistant Professor. Taught undergraduate mathematics and statistics to business, mathematics, and engineering majors.

RESEARCH AND CONSULTING APPOINTMENTS

- **RETHINC Labs, Kenan Institute of Private Enterprise, UNC (Chapel Hill, NC)** 2023–present
Research Fellow. Investigating data-driven and computational methods for decision systems in finance and operations. Collaborate on interdisciplinary projects at the intersection of business analytics and applied mathematics; mentor student researchers in quantitative modeling.

- **DP World (Dubai, UAE; remote)** 2021–2022
Senior Project Consultant. Developed operations research models for container yard optimization and supervised engineers implementing quantum algorithms (D-Wave). Work bridged applied mathematics, logistics, and computational optimization.

TEACHING PROFILE

I emphasize mathematics as a practical and conceptual tool, introducing abstraction through real decisions, systems, and data rather than definitions alone.

Selected Practices:

- **Calculus:** Introduce optimization early via authentic engineering/design problems to anchor abstraction in relevance.
- **Modern Algebra:** Connect finite fields to error-correcting codes, illustrating how algebra prevents cosmic-ray bit flips and highlighting real-world impact.
- **Applied/Financial Math:** Use market data (Bloomberg or Yahoo Finance) to model hedging behavior and pricing equilibria, integrating mathematical reasoning with computation and real market contexts.

Teaching Breadth. Experience across the full undergraduate curriculum (calculus, linear algebra, discrete math, probability, statistics) and advanced topics (information theory, stochastic processes, game theory). Recent courses integrate Python/MATLAB for data-driven applications.

Mentoring. Supervised undergraduate research leading to publications and presentations in graph theory, quantum finance, and optimization; advise student data science groups.

Improvement. Revise pacing, scaffolding, and visuals based on student feedback to continually refine teaching.

RESEARCH PROFILE

My research explores the interface of *game theory*, *quantum information*, and *financial systems*. Highlights include:

- A game-theoretic analysis of *quantum advantage in trading*, combining tools from both economics and quantum computing.
- Development of a *quantum analogue of Kuhn's theorem*, introducing new insights into strategic recall and information in games.

I also maintain an interest in the use of tools from information geometry, such as embedding theorems, and state tomography methods in quantum physics as tools to identify quantum data in future markets.

SELECTED PUBLICATIONS

- *When Recall Fails, Discord Remembers: A Quantum Analogue of Kuhn's Theorem*, Quantum Economics and Finance, 2025, online first: <https://doi.org/10.1177/29767032251377077>.
- *Quantum Advantage in Trading: A Game-Theoretic Approach*, (with N.M. Linke et al.), Quantum Economics and Finance, 2(1), 40-51, 2025.
- *Calculating Nash equilibrium on quantum annealers* (with O. Okrut et al.), to appear in *Annals of Operations Research*, 2024.
- *Hybrid-quantum approach for the optimal lockdown* (with S. Zaman et al.), *IET Quantum Communication*, 2023.
- *Quantum information technology and innovation* (with D. La Torre), *Technology Analysis & Strategic Management*, 2021.
- *Quantum prisoner's dilemma and high-frequency trading on the quantum cloud* (with N. Bao), *Frontiers in AI*, 2021.
- *Partitions of correlated n-qubit systems* (with S.J.D. Phoenix and B. Teklu), *Quantum Information Processing*, 2021.

Full publication list available on Google Scholar.

BOOKS

- **Editor**, *Artificial Intelligence and Beyond for Finance*, World Scientific, 2024. A contributed volume exploring the intersection of artificial intelligence, quantum computing, and financial strategy.
- **Editor**, *Unlocking Quantum Information Technology: Opportunities for Business and Management*, World Scientific, 2024. A cross-disciplinary volume focused on quantum information systems with applications in business and enterprise.
- **Author**, *The Little Book of Games: Examples and Insights for Everyone*, Independently published, December 2024. A creative and accessible introduction to game theory using puzzles and applied reasoning.

RESEARCH GRANTS

- **Collaborator**, QLab–IonQ Access Program (University of Maryland), *Research access to IonQ hardware and simulation credits*, 2025–present.
- **Principle Investigator**, C2PS (Khalifa University), *Enhancing the Cyber-Physical System with Quantum*, 2018–2022.
- **Investigator**, Khalifa University Level 2 Internal Research Award, *Towards a Quantum-Safe Security Infrastructure in the UAE*, 2016–2018.

- **Senior Researcher**, STINT (Sweden), *Gaming the Quantum for Constrained Optimization*, 2014–2015.

SELECTED TALKS AND PRESENTATIONS

- *When memory fails, quantum discord remembers*, Contributing Speaker, Annual Quantum Symposium, NC State University, May 2025.
- *Quantum advantage in trading: A game-theoretic approach*, Contributing Speaker, Quantum Applications in Economics and Finance, Penn Initiative for the Study of Markets, University of Pennsylvania, Apr 2025.
- *Is there a world market for five quantum computers, or will they be as common as flying cars?*, Invited Speaker and Panelist, National Academy of Sciences, 9th Arab–American Frontiers Symposium, Doha, Oct 2023.
- *Nash equilibrium as a quadratic optimization problem for quantum annealers*, MOP/GP, Dec 2021.
- *Information geometries and fault-tolerant qubits*, IEEE Quantum Week, 2020.

EDITORIAL AND PROFESSIONAL SERVICE

- **Guest Editor**, Special Issue on *Quantum Innovation and Technology Management, Technology Analysis & Strategic Management*, 2021.
- **Associate Editor**, *Quantum Information Processing*, 2020–2021.
- **Organizer/Program Committee**, IEEE Quantum Week (2020–2021); QTOP'19; SIAM Minisymposia (2020).

OUTREACH AND ENGAGEMENT

- **Founder and author**, [QuantumSheikh.org](https://quantumsheikh.org) — Blog sharing accessible insights on quantum information, game theory, their interface, and applications in finance
- **Media features**: *PHYS.ORG*; *WIRED Middle East*; *Digitale Welt Magazine*; *Deep Tech Dive #2*.

PROFESSIONAL AFFILIATIONS

- North Carolina Coalition for Global Competitiveness, Member (2023–present).
- Technology Adviser, Quantum Computing Inc., 2020–2021.

Selected academic CV — full version available upon request.