

# FAISAL SHAH KHAN, Ph.D.

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## SUMMARY

I am a mathematician and quantum information theorist with over 15 years of experience in quantum computing and quantum game theory, applying these fields to solve real-world challenges. My recent work has focused on first-generation quantum processors—mapping optimization problems, building a quantum trading platform, and modeling errors in quantum networks. I enjoy bridging theory and practice, turning ideas into testable protocols, and collaborating closely with software engineers as well as hardware and experimental physics teams..

## EXPERIENCE

Research Fellow (Quantum Game Theory & Algorithms)

Rethinc. Labs, UNC Kenan-Flagler Business School | Chapel Hill, NC | Apr 2024 – Present

- Developing game-theoretic frameworks for quantum algorithms and error-mitigation strategies, including a novel use of quantum discord as a memory resource in extensive-form games (arXiv:2505.08917).  
Leading research on a quantum trading platform concept for future quantum networks supporting entanglement distribution between nodes, with the long-term goal of inferring quantum signals from public market data. Developed associated simulation frameworks using Qiskit.

Adjunct Faculty (Finance, Data Science, & AI)

SKEMA Business School USA | Raleigh, NC | 2021 – Present

- Teach graduate-level courses on business analytics and emerging technologies.
- Advise student projects on applying AI advanced analytics to business use cases.

Senior Project Consultant (Quantum Optimization)

DP World | Dubai, UAE (Remote) | Aug 2021 – Oct 2022

- Developed a proof-of-concept optimization system using D-Wave quantum annealers to improve container placement and movements in container yards, minimizing unproductive moves during deliveries.
- Supervised interns in formulating the problem as a quadratic assignment problem and implementing it using the Ocean SDK.

Faculty & Principal Investigator (Mathematics and Quantum Information)

Khalifa University | Abu Dhabi, UAE | 2010 – 2020

- Taught undergraduate and graduate mathematics and engineering courses and supervised student research and capstone projects in quantum computing.

- Led funded research programs in quantum information theory and secure communication protocols.
- Deployed *Kamiyya*, a quantum random number generator platform in secure networks.

## SELECTED PROJECTS

- Epidemiological Solutions with Quantum Annealing and Quantum Machine Learning: Led a team using quantum annealers and Quantum Support Vector Machines (QSVM) to design optimal pandemic lockdown schedules, reducing deaths and maximizing hospital capacity while outperforming classical approaches.
- Calculating Nash Equilibria on Quantum Annealers: Developed a QUBO-based method to compute all pure strategy Nash equilibria in two-player non-cooperative games using D-Wave quantum annealers, supervising an intern team and achieving a 7–10× time-to-solution speed-up over classical approaches.
- See Rethinc Labs (Experience) for projects on quantum discord and a quantum trading platform for entanglement-distributed quantum networks.

## PROFESSIONAL & ADVISORY ROLES

- Member, NC Coalition for Global Competitiveness (2023–Present)
- Technology Advisor, Quantum Computing Inc (QCI) (2019–2022)

## TALKS & PRESENTATIONS

- Speaker, Penn Initiative for the Study of Markets – University of Pennsylvania (2025)
- Panelist, *Why We Need to Know the Future of Quantum Computing* – NC Tech & Lenovo (2024)
- Guest Speaker, Quantum Fall Fest – UNC Chapel Hill (2024)
- Invited Speaker, 9th Arab-American Frontiers Symposium – U.S. National Academy of Sciences, Qatar (2023)

## EDUCATION

Ph.D., Mathematical Sciences – Portland State University (2009)

M.S., Mathematics – Portland State University (2003)

B.S., Mathematics – Santa Clara University (1997)

## SELECTED PUBLICATIONS

- Khan, F.S. et al. Quantum Advantage in Trading: A Game-Theoretic Approach, *Quantum Economics and Finance*, Sage Journals (April 2025). DOI: <https://doi.org/10.1177/29767032251333418>
- Khan, F.S., et al. Calculating Nash Equilibrium on Quantum Annealers, *Annals of Operations Research*, Springer Nature (January 2024). DOI: <https://doi.org/10.1007/s10479-023-05700-z>
- Zaman, S., Khan, F.S., et al. Hybrid-Quantum Approach for the Optimal Lockdown to Stop the SARS-CoV-2 Community Spread Subject to Maximizing National Economy Globally, *Quantum Communication, The Institution of Engineering and Technology* (September 2023). DOI: <https://doi.org/10.1049/qtc2.12068>