Faisal Shah Khan

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Citizenship: USA

Education

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

Recent Employment History

- Assistant Professor of Mathematics, Khalifa University, 2010 - present.
- Adjunct Assistant Professor of Mathematics, University of Portland, 2007 - 2009.
- Mathematics Lecturer, Portland State University, 2005 - 2009.

Research Interests

- Optimal quantum information processing, in particular, quantum adiabatic computation.
- Connections between space-time and quantum information processing in a category theoretic setting.

Research Grants

- 2014 – 2015, Initiation grant from the Swedish Foundation for International Cooperation in Research and Higher Education. Project title: *Gaming the quantum for constrained optimization of quantum informational processes.* Role: Senior Researcher.

- 2013 – 2015, Level 2 internal grant from Khalifa University. Project title: *Population dynamics, sustainable economic growth, energy and the environment - mathematical models and optimal policies.* Role: Researcher.

Publications

Peer-reviewed Journals.

- *Dominant strategies in two qubit quantum computations*, Quantum Information Processing, volume 14, issue , 2015.

- *Mini-maximizing two qubit quantum computations*, with Simon J.D. Phoenix. Quantum Information Processing, volume 12, issue 12, 2013.

- *The role of correlation in quantum and classical games*, with Simon J.D. Phoenix. Fluctuation and Noise Letters, volume 12, issue 3, 2013.

- *Gaming the quantum*, with Simon J.D. Phoenix. Quantum Information & Computation, volume 13, number 3 & 4, 2013.

- *Properly quantized history-dependent Parrondo games, Markov processes, and multiplexing circuits*, with Steven Bleiler. Physics Letters A, volume 375, 2011.

- *Octonionization of three player, two strategy maximally entangled quantum games*, with Aden Ahmed and Steven Bleiler. International Journal of Quantum Information, volume 8, issue 3, 2010.

- *Synthesis of hybrid and d-valued quantum logic circuits by decomposition*, with Marek Perkowski. Theoretical Computer Science, volume 367, issue 3, 2006.

Selected Conferences & Workshops.

- 7^{th} Winter School on Practical Quantum Communications, Les Diablerets, Switzerland, 2105.

- *Nash equilibrium in quantum superpositions*, with Simon J.D. Phoenix. Quantum Information and Computation IX, Proceedings of SPIE Defense, Security + Sensing, Orlando, Florida, 2011.

- *Synthesis of ternary quantum logic circuits by decomposition*, with Marek Perkowski. Proceedings of the Seventh International Symposium on Representations and Methodology of Future Computing Technologies, Tokyo, 2005.

Other Publications & Pre-prints.

- *Quantum gaming, a very naïve introduction*, article by invitation for IT security magazine *Hackin9*. Web link: `http://hakin9.org/hakin9-extra-72012/?a_aid=michalwisniewski&a_bid=8f6377e8`, July, 2012.

- *Geometry of Nash equilibrium in quantum hawk-dove games*, Journal of Systemics, Cybernetics and Informatics, volume 9, number 4, 2011.

- *Playing games with quantum mechanics*, with Simon J.D. Phoenix, available at: `http://arxiv.org/abs/1202.4708`.

- *An alternative quantization protocol for the history dependent Parrondo game*, available at: `http://arxiv.org/abs/0806.1544`.

Talks and Presentations

- Talk on emerging quantum technologies such as quantum computers and quantum encryption schemes at Khalifa University's *Quantum Event*. Title: *Rise of the quantum machines*

- Invited talk on quantum technologies at New York University, Abu Dhabi, December 4^{th}, 2014. Title: *The quantum age cometh.*

- Poster presentation at the Aspen Winter Conference on Advances in Quantum Algorithms and Computation, Aspen Center for Physics, Aspen, Colorado, USA 2014. Title: *Gaming quantum machine learning.*

- Poster presentation at New Directions in Quantum Control Landscape conference, Kavli Institute for Theoretical Physics, University of Santa Barbara, USA 2013. Title: *Gaming the quantum for control.*

- Contributed talk at the special session titled Mathematical Theory of Control of Quantum Systems at the joint meeting of American Mathematics Society and Mathematical Association of America, Boston, USA 2012. Title: *Quantum circuits at Nash equilibrium.*

- Invited talk, Department of Physics, Sharif University, Iran 2011. Title: *Playing games with quantum mechanics.*

- Invited talk at the School of Electrical and Electronic Engineering, University of Adelaide, Australia 2011. Title: *Quantizing games and gaming the quantum.*

- Poster presentation at Simons Conference on New Trends in Quantum Computation, Simons Center for Geometry and Physics, Stony Brook University, USA 2010. Title: *Synthesizing quantized finite games.*

- Contributed talk, International Iran Conference on Quantum Information, Kish Island, Iran 2010. Title: *A game theoretic approach to quantizing Markov processes.*

- Contributed talk at the 4^{th} International Symposium on Quantum Optics at the Center for Quantum Physics, Islamabad, Pakistan 2009. Title: *Quantized games.*

- Keynote talk at the 10^{th} International Pure Mathematics Conference, Islamabad, Pakistan 2009. Title: *Quantum Markov processes.*

Service to the University and Profession

- Organized an informative event at Khalifa University for the university community as well as industrial and governmental invitees on research and innovation in the field of quantum computation and information security. Presentation by Swiss quantum technology company Idquantique in making information secure against quantum computer attacks.

- Member of the steering committee for the development of the Undergraduate Mathematics degree program at Khalifa University.

- Member of committee for hiring of Mathematics faculty at Khalifa University.

- Advising undergraduate students at Khalifa University.

- Review Editor for the journal Frontiers in ICT - Quantum Computing.

- Member of IEEE Computational Intelligence Society's Task Force on Quantum Computing.

- Member of the program committee for:
  - 2^{nd} International Conference on Robotics, Biomimetics, Intelligent Computational Systems (Robionetics 2014).

  - International Workshop on Bio-Inspired Computing (BioCom13).
  - Gulf cooperation council IEEE conference and exhibition for sustainable and ubiquitous technology, 2011.
- Reviewed for:
  - Rocky Mountain Journal of Mathematics.
  - Quantum Information & Computation (journal).
  - Quantum Information Processing (journal)
  - Frontiers Frontiers in Physics, section Interdisciplinary Physics
  - International Journal of Modern Physics B.
  - IEEE Symposium Series on Computational Intelligence, 2013.
  - IEEE Congress on Evolutionary Computation, 2012, 2013, 2014.
  - The 13$^{\text{th}}$IEEE International Conference on Nanotechnology, 2013.
  - The 11$^{\text{th}}$ IEEE International Conference on Nano-technology, 2011.

Professional Affiliations

- Member of the Information Security Research Group at Khalifa University.
- American Mathematical Society (non-active).
- IEEE Information Society.
- IEEE Communications Society.
- IEEE Life Sciences Community.