

Salman Beigi

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Institute for Research in Fundamental Sciences (IPM)
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Education

- **Massachusetts Institute of Technology (MIT)**
Ph.D, Mathematics, (2005-2009)
Supervisor: Prof. Peter W. Shor
Thesis: *Quantum Proof Systems and Entanglement Theory*
- **Sharif University of Technology (SUT)**
M.Sc student in Mathematics department (2004-2005, not completed, I left there for MIT)
Tehran, Iran
- **Sharif University of Technology (SUT)**
B.Sc, Mathematics (2000-2004)
Tehran, Iran

Postdoctoral Appointments

- Institute for Quantum Information, **California Institute of Technology (Caltech)**, June 2009 - Dec 2010

Long-Term Visits

- Department of Information Engineering, The Chinese University of Hong Kong (CUHK), June - December 2015

Research Interests

Quantum computation and quantum information theory

Awards

- **Gold Medal**, 41st International Mathematical Olympiad (IMO 2000), Taejon, South Korea
IMO is a competition among high school students from more than 80 countries around the world: <http://www.imo-official.org/>
- **First Prize**, 8th International Mathematics Competition for University Students (IMC 2001), Prague, Czech
Each year there are more than 60 universities participating in IMC:
<http://www.imc-math.org/>
- **First Prize**, 9th International Mathematics Competition for University Students (IMC 2002), Warsaw, Poland
- **First Prize**, 11th International Mathematics Competition for University Students (IMC 2004), Skopje, Macedonia
- **Four Gold Medals** in national mathematics competitions for high school and university students.
1999-2004, Tehran, Iran

Publications

- S. Beigi, N. Datta, and F. Leditzky, Decoding quantum information via the Petz recovery map, *Journal of Mathematical Physics* **57** 082203 (2016).
- S. Beigi, O. Etesami, and A. Gohari, The Value of Help Bits in Randomized and Average-Case Complexity, *Computational Complexity*, 1-27 (2016).
- S. Beigi and C. King, Hypercontractivity and the logarithmic Sobolev inequality for the completely bounded norm, *Journal of Mathematical Physics* **57**, 015206 (2016).
- S. Beigi and A. Gohari, Monotone Measures for Non-local Correlations, *IEEE Transactions on Information Theory* **9**, 5185-5208 (2015).
- S. Beigi and A. Gohari, Quantum Achievability Proof via Collision Relative Entropy, *IEEE Transactions on Information Theory* **60**, 7980-7986 (2014).
- P. Delgosha and S. Beigi, Impossibility of Local State Transformation via Hypercontractivity, *Communications in Mathematical Physics* **332**, 449-476 (2014).
- S. Beigi and A. Gohari, On Dimension Bounds for Auxiliary Quantum Systems, *IEEE Transactions on Information Theory* **60**, 368-387 (2014).
- S. Beigi, Sandwiched Rényi Divergence Satisfies Data Processing Inequality, *Journal of Mathematical Physics* **54**, 122202 (2013).
- S. Beigi, A New Quantum Data Processing Inequality, *Journal of Mathematical Physics* **54**, 082202 (2013).
- S. Beigi, Classification of the Phases of 1D Spin Chains with Commuting Hamiltonians, *Journal of Physics A: Mathematical and Theoretical* **45**, 025306 (2012).
- S. Beigi, and R. Koenig, Simplified Instantaneous Non-local Quantum Computation with Applications to Position-Based Cryptography, *New Journal of Physics* **13**, 093036 (2011).
- S. Beigi, P. W. Shor, and D. Whalen, The Quantum Double Model with Boundary: Condensations and Symmetries, *Communications in Mathematical Physics* **306**, 663-694 (2011).
- S. Beigi, P. W. Shor, and J. Watrous, Quantum Interactive Proofs with Short Messages, *Theory of Computing* **7**, 101-117 (2011).
- S. Beigi, I. Chuang, M. Grassl, P. W. Shor, and B. Zeng, Graph Concatenation for Quantum Codes, *Journal of Mathematical Physics* **52**, 022201 (2011).
- S. Beigi, Entanglement-Assisted Zero-Error Capacity is Upper Bounded by the Lovász ϑ Function, *Physical Review A* **82**, 010303 (2010).
- S. Beigi, A Lower Bound on the Value of Entangled Binary Games, *Quantum Information & Computation* **10**, 0911-0924 (2010).
- H. Barnum, S. Beigi, S. Boixo, M. B. Elliott, and S. Wehner, Local Quantum Measurement and No-Signaling Imply Quantum Correlations, *Physical Review Letters* **104**, 140401 (2010).
- S. Beigi and P. W. Shor, Approximating the Set of Separable States Using the Positive Partial Transpose Test, *Journal of Mathematical Physics* **51**, 042202 (2010).
- S. Beigi, NP vs $\text{QMA}_{\log}(2)$, *Quantum Information & Computation* **10**, 141-151 (2010).
- S. Beigi and P. W. Shor, \mathcal{C}_3 , Semi-Clifford and Generalized Semi-Clifford Operations, *Quantum Information & Computation* **10**, 41-59 (2010).
- S. Aaronson, S. Beigi, A. Drucker, B. Fefferman, and P. W. Shor, The Power of Unentanglement, *Theory of Computing* **5**, 1-42 (2009).

Conference Proceedings

- S. Beigi, S. Liu, C. Nair, and M. Yazdanpanah, Some results on the scalar Gaussian interference channel, 2016 IEEE International Symposium on Information Theory (ISIT), 2199-2203.
- S. Beigi and C. Nair, Equivalent characterization of reverse Brascamp-Lieb type inequalities using information measures, 2016 IEEE International Symposium on Information Theory (ISIT), 1038-1042.
- S. Beigi and A. Gohari, On the duality of additivity and tensorization, 2015 IEEE International Symposium on Information Theory (ISIT), 2381-2385.
- S. Beigi, Maximal entanglement - A new measure of entanglement, Communication and Information Theory (IWCIT), 2014 Iran Workshop on, 106.
- S. Beigi, J. Chen, M. Grassl, Z. Ji, Q. Wang, and B. Zeng, Symmetries of Code-word Stabilized Quantum Codes, 8th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC 2013), LIPIcs 22, 192–206 (2013).
- S. Beigi, A. Gohari, On dimension bounds for quantum systems, Communication and Information Theory (IWCIT), 2013 Iran Workshop on, 1-6.
- S. Aaronson, S. Beigi, A. Drucker, B. Fefferman, and P. W. Shor, The Power of Unentanglement, Computational Complexity 2008 (CCC '08), 23rd Annual IEEE Conference on, 223-236.

Preprints

- S. Beigi, On the Optimality of Time Division for Broadcast Channels, arXiv:1605.08874 (2016).
- S. Beigi, O. Etesami, and A. Gohari, Deterministic Randomness Extraction from Generalized and Distributed Santha-Vazirani Sources, arXiv:1412.6641 (2014)
- F. Haddadpour, M. H. Yassaee, S. Beigi, A. Gohari and M. R. Aref, Simulation of a Channel with Another Channel, arXiv:1305.5901 (2013).
- S. Beigi and A. Gohari, Information Causality is a Special point in the Dual of the Gray-Wyner Region, arXiv:1111.3151 (2011).
- S. Beigi and P. W. Shor, On the Complexity of Computing Zero-Error and Holevo Capacity of Quantum Channels, arXiv:0709.2090 (2007).
- M. Bahramgiri and S. Beigi, Enumerating the Classes of Local Equivalency in Graphs, arXiv:math/0702267 (2007).
- M. Bahramgiri and S. Beigi, An Efficient Algorithm to Recognize Locally Equivalent Graphs in Non-Binary Case, arXiv:cs/0702057 (2007).
- M. Bahramgiri and S. Beigi, Graph States Under the Action of Local Clifford Group in Non-Binary Case, arXiv:quant-ph/0610267 (2006).

Selected talks

- Hypercontractivity and logarithmic Sobolev inequalities, Combinatorics Seminar, IPM, Tehran, Iran (April, 2016).
- Hypercontractivity and log Sobolev inequalities for completely bounded norms, NIMS, Daejeon, Korea (February 18, 2016).
- On the Duality of Additivity and Tensorization, ISIT 2015, Hong Kong (June 19, 2015).
- Measuring quantum correlation via completely bounded norms, Banff Centre, Canada (February 25, 2015).
- A Monotone Measure for Non-local Correlations, QIP 2015, Sydney, Australia (January 12, 2015).

- A Monotone Measure for Non-local Correlations, Combinatorics Seminar, IPM, Tehran, Iran (November 12, 2014).
- Quantum Achievability Proof via Collision Relative Entropy, IICQI 2014, Isfahan University of Technology, Isfahan, Iran (September 8, 2014).
- Quantum Achievability Proof via Collision Relative Entropy, Beyond I.I.d in Information Theory Conference 2014, Centre for Quantum Technologies (CQT), National University of Singapore, Singapore (May 19, 2014).
- Maximal Entanglement - A New Measure of Entanglement, Iran Workshop on Communication and Information Theory IWCIT 2014, Sharif University of Technology, Tehran, Iran (May 7, 2014).
- A Mathematical Treatment of Quantum Mechanics, Mathematics Colloquium, Shahid Beheshti University, Tehran, Iran (April 27, 2014).
- A Mathematical Treatment of Quantum Mechanics, Sharif University of Technology, Tehran, Iran (March 12, 2014).
- Classification of Phases of Non-interacting Fermions via K-theory, Hard Talk seminar, IPM, Tehran, Iran (January 2014).
- Local Transformation of Bipartite Quantum States, Mathematics Colloquium, Sharif University of Technology, Tehran, Iran (November 17, 2013)
- Non-commutative Probability Theory, Mathematics Colloquium, IPM, Tehran, Iran (August 2013).
- Information Theoretic Benefit of Entanglement in Classical Communication Settings, Perimeter Institute, Waterloo, Canada (May 2013).
- The Combinatorics of (Non-)Contextuality and Non-locality, Combinatorics Seminar, IPM, Tehran, Iran (February 2013).
- The quantum double model as a topologically ordered phase, Sharif University of Technology, Frontiers in Mathematical Sciences (A conference in honor of Siavash Shahshahani), Tehran, Iran (December 2012).
- Introduction to Quantum Computation, IPM Summer School on Theoretical Computer Science, Tehran, Iran (July 2012).
- Information Theoretic Benefit of Entanglement in Classical Communication Settings, Centre for Quantum Computation and Intelligent Systems, University of Technology Sydney, Sydney, Australia (September 2012).
- The Quantum Double Model with Boundary: Condensations and Symmetries, Condensed Matter Seminar, School of Physics, IPM, Tehran, Iran (January 2012).
- Information Causality is a Special Point in the Dual of the Gray-Wyner Region, Quantum Information Processing (QIP 2012), Centre de recherches mathématiques (CRM), Montreal, Canada (December 2011).
- Simplified instantaneous non-local quantum computation with applications to position-based cryptography, Quantum Information Processing (QIP 2012), Centre de recherches mathématiques (CRM), Montreal, Canada (December 2011).
- The Quantum Double Model with Boundary: Condensations and Symmetries, IBM T. J. Watson Research Center, Yorktown Heights, NY (August 2011).
- An Efficient Algorithm to Recognize Locally Equivalent Graphs, Workshop on Graphs and Algorithms, IPM, Tehran, Iran (June 2011).
- Entanglement-Assisted Zero-Error Capacity is Upper Bounded by the Lovász ϑ Function, Combinatorics Seminar, IPM, Tehran, Iran (May 2011).

- Simplified instantaneous non-local computation with applications to position-based cryptography, Quantum Information Science group, Department of Physics, Sharif University of Technology, Tehran, Iran (May 2011).
- A Lower Bound on the Value of Entangled Binary Games, Quantum computation group, University of California, Berkeley, CA (November 2010).
- Two-Message Quantum Interactive Proofs with Short Messages, CS Theory Seminar, Caltech, Pasadena, CA (July 2009).
- An Efficient Algorithm to Recognize Locally Equivalent Graphs, Combinatorics Seminar, MIT, Boston, MA (February 27, 2009).
- Quantum Multiple-Merlin-Arthur Games and Separability Problem, IQI, Caltech, Pasadena, CA (January 28, 2009).
- NP vs $\text{QMA}_{\log}(2)$, CS Theory Seminar, Caltech, Pasadena (January 27, 2009).
- Quantum Multiple-Merlin Arthur Games, IBM T. J. Watson Research Center, Yorktown Heights, NY (December 2, 2008).

Teaching Experiences

- Linear programming and semidefinite programming in combinatorics and computer sciences, A short course, IPM, Fall 2014
- Quantum information theory, EE department of Sharif University of Technology, Fall 2013
- Complexity theory, IPM, Spring 2013
- Quantum information theory, EE department of Sharif University of Technology, Fall 2012
- Theory of quantum computation, Math department of Sharif University of Technology, Spring 2012

Professional Services

1. Member of the Editorial Advisory Board of Journal of Mathematical Physics
2. Program Committee co-chair of the 10th Conference on the Theory of Quantum Computation, Communication and Cryptograph (TQC 2015, Brussels, Belgium)
3. Program Committee member of
 - Quantum Information Processing 2017 (QIP 2017, Seattle, WA)
 - 16th Asian Quantum Information Science Conference (AQIS 2016, Taipei, Taiwan)
 - The 1st conference on Topics in Theoretical Computer Science (TTCS 2015, Tehran, Iran)
 - The 3rd Iran Workshop on Communication and Information Theory (IWCIT 2015, Tehran, Iran)
 - The 2nd Iran Workshop on Communication and Information Theory (IWCIT 2014, Tehran, Iran)
 - The 8th Conference on the Theory of Quantum Computation, Communication and Cryptograph (TQC 2013, Guelph, Canada)
 - Quantum Information Processing 2013 (QIP 2013, Beijing, China)
4. Organizing Committee of
 - IPM Combinatorics and Computing Conference 2017 (IPMCCC 2017, Tehran, Iran)

- IPM Combinatorics and Computing Conference 2015 (IPMCCC 2015, Tehran, Iran)

5. Reviewer of several high qualified journals including

- Communications in Mathematical Physics
- Journal of Mathematical Physics (selected as an “outstanding referee” in 2013)
- Theory of Computing
- Journal of the ACM
- IEEE Transactions on Information Theory
- SIAM Journal on Computing
- Journal of Combinatorial Theory, Series B
- New Journal of Physics
- Chicago Journal of Theoretical Computer Science
- Quantum Information and Computation
- IEEE Transactions on Computers
- Journal of Physics A: Mathematical and Theoretical
- Proceedings of the Royal Society A