

# Curriculum Vitae

## Address

Dr. Hartmut Klauck  
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## Short CV

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1995	Diplom (Master) in Computer Science, University of Paderborn
1995-2000	Graduate Student at the University of Frankfurt (Supervisor: Prof.Dr. Georg Schnitger)
2000	PhD received from the University of Frankfurt “summa cum laude”
2000-2002	Postdoctoral researcher at CWI in Amsterdam
2002-2003	Member (Postdoc) Institute for Advanced Study, Princeton
2003-2004	Postdoc at Institute for Quantum Information Science, University of Calgary
2004-2008	”Junior” Research Group in Quantum Computing at University of Frankfurt
2009-2010	Visiting Senior Research Fellow CQT Singapore
2010-2020	Asst. Prof. in Division of Mathematical Sciences, Nanyang Tech. University and Principal Investigator, CQT
2020-	Principal Investigator, CQT and Res. Assoc. Prof. National University of Singapore

## Dissertation

“Preis für den Naturwissenschaftlichen Nachwuchs 2001” of the Johann Wolfgang Goethe Universität Frankfurt received for the dissertation “Über beschränkte Interaktion in der Kommunikationskomplexität”.

## Publications:

### a.) Refereed Journal Publications

- [1] R. Jain, H. Klauck, S. Kundu, T. Lee, M. Santha, S. Sanyal, J. Vihrov. Quadratically Tight Relations for Randomized Query Complexity. *Theory Comput. Syst*, 64(1):101-119 (2020).
- [2] R. Jain, H. Klauck, M. Santha: Optimal direct sum results for deterministic and randomized decision tree complexity. *Information Processing Letters*, 110(20): 893-897 (2010).
- [3] H. Klauck, A. Nayak, A. Ta-Shma, D. Zuckerman: Interaction in Quantum Communication. *IEEE Transactions on Information Theory*, 53(6): 1970-1982 (2007).
- [4] H. Klauck: One-Way Communication Complexity and the Nečiporuk Lower Bound on Formula Size. *SIAM Journal on Computing*, 37(2): 552-583 (2007).
- [5] H. Klauck: Lower Bounds for Quantum Communication Complexity. *SIAM Journal on Computing*, 37(1): 20-46 (2007).
- [6] H. Buhrman, H. Klauck, N.K. Vereshchagin, P.M.B. Vitanyi: Individual communication complexity. *Journal of Computer and System Sciences*, 73(6): 973-985 (2007).
- [7] H. Klauck, R. Spalek, R. de Wolf: Quantum and Classical Strong Direct Product Theorems and Optimal Time-Space Tradeoffs. *SIAM Journal on Computing* 36(5): 1472-1493 (2007).
- [8] H. Klauck: Quantum and Approximate Privacy. *Theory of Computing Systems, special issue for STACS 2002*, 37(1): 221-246 (2004).
- [9] J. Hromkovic, S. Seibert, J. Karhumäki, H. Klauck, G. Schnitger: Communication Complexity Method for Measuring Nondeterminism in Finite Automata. *Information and Computation*, 172(2): 202-217 (2002).

### b.) Refereed Conference Publications

- [10] H. Klauck, D Lim. The Power of One Clean Qubit in Communication Complexity. *46th Int. Symp. on Mathematical Foundations of Computer Science (MFCS)*, pp. 69:1-69:23, 2021.
- [11] R. Jain, H. Klauck, S. Kundu, T. Lee, M. Santha, S. Sanyal, J. Vihros. Quadratically Tight Relations for Randomized Query Complexity. *13th International Computer Science Symposium in Russia (CSR)*, 2018.
- [12] H. Klauck. On the Complexity of Quantum Disjointness. *42nd Int. Symp. on Mathematical Foundations of Computer Science (MFCS)*, pp. 15.1-15.13, 2017.
- [13] R. Bottesch, D. Gavinsky, H. Klauck. Equality, Revisited. *40th Int. Symp. on Mathematical Foundations of Computer Science (MFCS)*, vol. 2, pp. 127–138, 2015.
- [14] R. Bottesch, D. Gavinsky, H. Klauck. Correlation in Hard Distributions in Communication Complexity. *Approximation, Randomization, and Combinatorial Optimization, APPROX/RANDOM*, pp. 544-572, 2015.

- [15] H. Klauck, D. Nanongkai, G. Pandurangan, P. Robinson: Distributed Computation of Large-scale Graph Problems. *26th ACM-SIAM Symp. on Discrete Algorithms (SODA)*, pp. 391–410, 2015.
- [16] H. Klauck, S. Podder: New Results about the Garden-Hose Model. *34th International Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS)*, pp. 481–492, 2014.
- [17] H. Klauck, S. Podder: Two Results about Quantum Messages. *39th Int. Symp. on Mathematical Foundations of Computer Science (MFCS)*, vol. 2, pp. 445–456, 2014.
- [18] H. Klauck, V. Prakash: An Improved Interactive Streaming Algorithm for the Distinct Elements Problem. *Automata, Languages, and Programming - 41st International Colloquium (ICALP)*, vol. 1, pp. 919–930, 2014.
- [19] M. Elkin, H. Klauck, D. Nanongkai, G. Pandurangan: Can quantum communication speed up distributed computation? *ACM Symposium on Principles of Distributed Computing (PODC)*, pp. 166–175, 2014.
- [20] H. Klauck, V. Prakash. Streaming Computations with a Loquacious Prover. *Innovations in Theoretical Computer Science*, pp. 305-320, 2013.
- [21] H. Klauck, R. de Wolf. Fooling One-sided Quantum Protocols. *30th Symposium on Theoretical Aspect of Computer Science*, pp. 424-433, 2013.
- [22] G. Ivanyos, H. Klauck, T. Lee, M. Santha, R. de Wolf. New Bounds on the classical and quantum communication complexity of some graph properties. *Foundations of Software Technology and Theoretical Computer Science*, pp. 148-159, 2012.
- [23] H. Klauck: On Arthur Merlin Games in Communication Complexity. *IEEE Conference on Computational Complexity CCC*, pp. 189-199, 2011.
- [24] R. Jain, H. Klauck, S. Zhang: Depth-Independent Lower Bounds on the Communication Complexity of Read-Once Boolean Formulas. *Computing and Combinatorics, Annual International Conference, COCOON*, pp. 54–59, 2010.
- [25] R. Jain, H. Klauck: The Partition Bound for Classical Communication Complexity and Query Complexity. *IEEE Conference on Comp. Complexity CCC*, pp. 247–258, 2010.
- [26] H. Klauck: A strong direct product theorem for disjointness. *ACM Symposium on Theory of Computing*, pp. 77–86, 2010.
- [27] R. Jain, H. Klauck. New Results in the Simultaneous Message Passing Model via Information Theoretic Methods. *IEEE Conference on Computational Complexity CCC*, pp. 369–378, 2009.
- [28] R. Jain, H. Klauck, A. Nayak. Direct Product Theorems for Classical Communication Complexity via Subdistribution Bounds. *ACM Symposium on Theory of Computing*, pp. 599–608, 2008.
- [29] H. Klauck: Quantum and Classical Communication-Space Tradeoffs from Rectangle Bounds. *Conference on Foundations of Software Technology and Theoretical Computer Science*, pp. 384–395, 2004.
- [30] H. Klauck, R. Spalek, R. de Wolf: Quantum and Classical Strong Direct Product Theorems and Optimal Time-Space Tradeoffs. *IEEE Symposium on Foundations of Computer Science*, pp. 12–21, 2004.

- [31] H. Buhrman, H. Klauck, N.K. Vereshchagin, P.M.B. Vitanyi: Individual Communication Complexity. *Symp. on Theoretical Aspects of Computer Science*, pp. 19–30, 2004.
- [32] H. Klauck. Rectangle Size Bounds and Threshold Covers in Communication Complexity. *IEEE Conference on Computational Complexity CCC*, pp. 118–134, 2003.
- [33] H. Klauck. Quantum Time-Space Tradeoffs for Sorting. *ACM Symposium on Theory of Computing*, pp. 69–76, 2003.
- [34] H. Klauck. On quantum and approximate privacy. *Symp. on Theoretical Aspects of Computer Science*, pp. 335–346, 2002.
- [35] H. Klauck. Lower bounds for quantum communication complexity. *IEEE Symposium on Foundations of Computer Science*, pp. 288–297, 2001.
- [36] H. Klauck, A. Nayak, A. Ta-Shma, D. Zuckerman. Interaction in Quantum Communication and the Complexity of Set Disjointness. *33rd ACM Symposium on Theory of Computing*, pp. 124–133, 2001.
- [37] J. Hromkovič, J. Karhumäki, H. Klauck, G. Schnitger, S. Seibert. Measures of Nondeterminism in Finite Automata. *International Colloquium on Automata, Languages, and Programming*, pp. 199–210, 2000.
- [38] H. Klauck. On Quantum and Probabilistic Communication: Las Vegas and One-Way Protocols. *ACM Symposium on Theory of Computing*, pp. 644–651, 2000.
- [39] H. Klauck. Lower bounds for computation with limited nondeterminism. *IEEE Conference on Computational Complexity CCC*, pp. 141–153, 1998.
- [40] H. Klauck. On the Size of Probabilistic Formulae. *International Symposium on Algorithms and Computation*, pp. 243–252, 1997.
- [41] H. Klauck. On the Hardness of Global and Local Approximation. *Scandinavian Workshop on Algorithm Theory*, pp. 88–99, 1996.

**c.) Invited Papers**

- [42] H. Klauck. Quantum Communication Complexity. *Workshop on Boolean Functions and Applications at 27th ICALP*, pp. 241–252, 2000.

**d.) Under Submission**

- [43] H. Klauck, D. Lim. The aBc Problem and Equator Sampling Rényi Divergences.

**e.) Other papers**

- [44] H. Klauck, T. Lee, D.O. Theis, R.R. Thomas. Limitations of convex programming: lower bounds on extended formulations and factorization ranks (Dagstuhl Seminar 15082). *Dagstuhl Reports*, 5(2): 109-127, 2015.
- [45] L.B. Beasley, H. Klauck, T. Lee, D.O. Theis. Communication Complexity, Linear Optimization, and lower bounds for the nonnegative rank of matrices (Dagstuhl Seminar 13082). *Dagstuhl Reports*, 3(2): 127-143, 2013.

- [46] T. Brun, H. Klauck, A. Nayak, M. Rötteler, Ch. Zalka. Comment on "Probabilistic Quantum Memories". *Physical Review Letters*, vol. 91(209801), 2003.
- [47] H. Klauck. Algorithms for Parity Games (Survey). *Automata, Logics, and Infinite Games*, Springer LNCS 2500, pp. 107–129, 2002.
- [48] H. Klauck. Über beschränkte Interaktion in der Kommunikationskomplexität. Dissertation, Frankfurt 2000.
- [49] H. Klauck. On the Complexity of Approximation, Local Search, and Local Approximation. Master's Thesis, Paderborn 1995.

## Citations Report

Google Scholar lists 1512 citations, h-index 23, i10-index 32.

## Professional Service

Program Committee 36th Int. Symposium on Theoretical Aspects of Computer Science (STACS) 2019.

Local Organization Committee Chair, AQIS 2017.

Organization of the Program "Semidefinite and Matrix Methods for Optimization and Communication" at Institute for Mathematical Sciences, Singapore, January 18 to February 28, 2016.

Member of A\*STAR/SERC Futurescape 2025 Panel on Data Driven Research and Future Computing Paradigms, Singapore.

Organization of Dagstuhl Seminar 15082 "Limitations of convex programming: lower bounds on extended formulations and factorization ranks", February 15 to 20, 2015.

Local Organization Committee of 9th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC), 2014, May 2014.

Organization of Dagstuhl Seminar 13082 "Communication Complexity, Linear Optimization, and lower bounds for the nonnegative rank of matrices", February 2013.

Program committee of the 27th IEEE Conference on Computational Complexity 2012.

Local organization committee of QIP 2011.

Program committee of 25th Int. Symp. on Theoretical Aspects of Comp. Science (STACS)2008.

## Teaching Experience

At the University of Frankfurt:

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Winter 2004	Quantum Computing, 2 hours per week +tutorial
Summer 2005	Black Box Algorithms, 4 hours +tutorial
Winter 2005	Quantum Computing, 4 hours +tutorial
Summer 2006	Efficient Algorithms, 4 hours +tutorial
Winter 2006	Proof Systems, 2 hours
Summer 2007	Information and Communication, 4 hours +tutorial
Winter 2007	Parallel and Distributed Algorithms, 4 hours +tutorial

At Nanyang Technological University:

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Fall 2010	MTH 110 (Introduction to Scientific Programming)
Fall 2011	MH 1400 (Introduction to Scientific Programming)
Spring 2012	MAS 725 (Quantum Computing)
Fall 2012	MH 1200 (Linear Algebra I)
Fall 2013	MAS 714 (Algorithms and Theory of Computing, with Edith Elkind)
Fall 2014	MAS 714 (Algorithms and Theory of Computing)
Fall 2015	MH 4320 (Computational Economics)
Fall 2016	MH 4320 (Computational Economics)
Spring 2017	MH 1301 (Discrete Mathematics)
Fall 2017	MH 4320 (Computational Economics)
Spring 2018	MH 1301 (Discrete Mathematics)
Fall 2018	MH4320 (Computational Economics)
Fall 2019	MAS 714 (Algorithms and Theory of Computing)

## Graduate Students:

Debbie Lim Huey Chih (CQT PhD program): since August 2018.

Supartha Podder (CQT PhD program): graduated September 2016. Thesis: Exploring Different Models of Query Complexity and Communication Complexity.

Ralph Bottesch (NTU PhD program): graduated January 2016. Thesis: Contributions to the Study of Probabilistic Communication Complexity Classes.

Ved Prakash (CQT PhD program): graduated 2015. Thesis: Efficient Delegation Algorithms for Outsourcing Computations On Massive Data Streams.

## **Undergraduate Students:**

Debbie Lim Huey Chih: Final Year Project 2017-2018.

## **Grant Information**

co-PI (one of 13) on the Tier 3 (type A) Grant "Random numbers from quantum processes", MOE2012-T3-1-009, 2013-2018.

co-PI (one of 10) of the NRF grant "Computer science approaches to quantum computing for finance", NRF2021-QEP-01-P05, starting April 2022.