

Pradeep Sarvepalli

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Atlanta, GA 30332-400 Web: <http://ww2.chemistry.gatech.edu/pradeep/>
- Research Interests** Coding theory, quantum cryptography, quantum algorithms, matroids, graph theory, number theory, digital signal processing, circuit design.
- Citizenship** India.
- Education**
- Texas A&M University, College Station, USA**
Ph. D., Computer Science, Aug 2008
– Thesis : “[Quantum stabilizer codes and beyond](#)” .
– Advisor: Dr. Andreas Klappenecker
- Texas A&M University, College Station, USA**
M. S., Electrical Engineering, Aug 2003
– Thesis : “[Non data aided timing recovery for linear and nonlinear modulations](#)”
– Advisor: Dr. Erchin Serpedin
- Indian Institute of Technology, Madras, India**
B. Tech., Electrical Engineering, Jul 1997
– Thesis : “A translinear principle based BICMOS transistor”
– Advisor: Dr. K. Radhakrishna Rao
- Research**
- Postdoctoral Fellow, Georgia Institute of Technology, Atlanta** Dec 2011 –
Supervisor: Dr. Ken Brown
 - Currently extending a formalism based on graph states for quantum secret sharing.
- Postdoctoral Fellow, University of British Columbia, Vancouver** Jan 2009 – Aug 2011
Supervisor: Dr. Robert Raussendorf
 - Developed an efficient decoding algorithm for topological color codes.
 - Established for the first time a connection between quantum codes, matroids and quantum secret sharing schemes.
 - Developed an efficient quantum algorithm for one dimensional infrastructures.
- Research Assistant, Texas A&M University** Sep 2003 – Aug 2008
 - Studied various aspects of quantum computing, with primary focus on quantum error correction. These investigations are part of my Ph.D. research.
- Research Assistant, Texas A&M University** Sep 2002 – Dec 2002
 - Investigated nondata aided timing recovery schemes, with prefiltering at lower sampling rates; these studies formed the basis of my Masters thesis.
- Industry**
- Summer Intern, NEC Laboratories America Inc., Princeton, NJ** Jul 2007 – Aug 2007
Supervisor: Dr. Martin Rötteler
 - Studied the use of quantum codes for asymmetric channels. The results have been submitted as a technical report to NEC Labs and have been published in Proc. Roy. Soc. A, 2009.
- IC Design Engineer, Texas Instruments India, Bangalore** Jul 1997 – Jul 2001
 - Job description: Design of analog and mixed signal circuits. Designed various analog and digital circuits; among them are analog filters for ADSL codecs, finite impulse response (FIR) filters for sigma delta converters, infinite impulse response (IIR) digital filters, pipelined ADCs for DSL applications. I was also involved in testing and debugging the performance of codecs.
 - ◊ Delay Locked Loop (DLL): I worked on a DLL which involved the generation of four phases of a 141.312MHz clock from a reference clock of 35.328MHz. It was based

on a DLL that was designed to work as a clock multiplier. The design also involved close working with the systems engineer in generating the specifications for the block and developing the overall timing recovery.

- ◇ Programmable IIR filters: The filters were designed as a cascade of two second order biquadratic filters with programmable coefficients. The design involved optimization for filter coefficients and data widths, limit cycle presence, overflow detection.
- ◇ Decimation filters for sigma delta ADCs: It involved the design of programmable sinc, halfband filters. It also involved the design of a multi-band FIR filter for optimal performance. The design took into account the effect of data and coefficient quantization, overflow detection and area optimization.
- ◇ Pipelined ADCs: I worked on a dual channel 14 bit 4.416MHz pipelined ADC for DSL applications. It incorporated statistical design to avoid over design. It involved special design considerations for reducing the crosstalk between the two channels through the capacitor hysteresis. I have also worked on the design of a 13.332 MHz 13-bit pipelined ADC for an Etherloop Codec.
- ◇ Analog Filters: I designed a 5th order high pass filter which was a cascade of 2nd order Chebyshev and 3rd order elliptic filter. The design also involved trimming the filter for process variation and sensitivity analysis.
- ◇ Testing: I have also been involved in testing of codecs used in DSL modems. In specific the work involved characterizing and debugging the performance of the ADCs, DACs, voltage references, PGAs, analog and digital filters which are commonly part of codecs.

Teaching

Teaching Assistant, ECE Department, Texas A&M University Jan 2003 – May 2003

- TA for an undergraduate course on Electric Circuits. The job responsibilities included teaching for the labs, setting exams involving theory and experiments.

Publications

Journal (12)

27. P. Sarvepalli and R. Raussendorf. [Efficient Decoding of Topological Color Codes](#). Accepted Phys. Rev. A.
26. P. Sarvepalli. [Entropic inequalities for a class of quantum secret sharing schemes](#). Phys. Rev. A. 83, 042303, 2011.
25. P. Sarvepalli. [Bounds on the information rate of quantum secret sharing schemes](#). Phys. Rev. A. 83, 042324, 2011.
24. P. Sarvepalli and R. Raussendorf. [Local equivalence, surface code states and matroids](#). Phys. Rev. A 82, 022304, 2010.
23. P. Sarvepalli and R. Raussendorf. [Matroids and quantum secret sharing schemes](#). Phys. Rev. A 81, 052333, 2010.
22. P. K. Sarvepalli and A. Klappenecker. [Degenerate quantum codes and the quantum Hamming bound](#). Phys. Rev. A 81, 032318, 2010.
21. P.K. Sarvepalli and A. Klappenecker. [Encoding subsystem codes](#) *International Journal on Advances in Security*, vol 2, no. 2 and 3, pages 142-155, 2009.
20. P. K. Sarvepalli and A. Klappenecker. [Sharing classical secrets with Calderbank-Shor-Steane codes](#). Phys. Rev. A 80, 022321, 2009.
19. P. K. Sarvepalli, A. Klappenecker, and M. Rötteler. [Asymmetric Quantum Codes: Constructions, Bounds, and Performance](#). Proc. Roy. Soc. A, May 2009 vol. 465 no. 2105 1645-1672
18. A. Klappenecker and P. K. Sarvepalli. [Clifford code constructions of operator quantum error correcting codes](#). IEEE Trans. Inform. Theory, 54(12):5760–5765, 2008.
17. A. Klappenecker and P. K. Sarvepalli. [On subsystem codes beating the quantum Hamming or Singleton bound](#). Proc. Roy. Soc. A, 463, 2887–2905, 2007.
16. S. A. Aly, A. Klappenecker, and P. K. Sarvepalli. [On quantum and classical BCH codes](#). IEEE Trans. Inform. Theory, 53(3):1183–1188, 2007.

15. A. Ketkar, A. Klappenecker, S. Kumar, and P. K. Sarvepalli. [Nonbinary stabilizer codes over finite fields](#). *IEEE Trans. Inform. Theory*, 52(11):4892–4914, 2006.

Conference (14)

14. P. Sarvepalli, and R. Raussendorf. Local equivalence of surface code states. 16 pages, In Proceedings of The 5th Conference on the Theory of Quantum Computation, Communication and Cryptography, 2010. Apr 13-15, University of Leeds, UK.
13. P. Sarvepalli. Topological color codes over higher alphabet. [\(Invited\)](#) IEEE Information theory workshop 2010, Dublin, Ireland.
12. P. K. Sarvepalli, M. Rötteler, and A. Klappenecker. Decoding Algorithm for a Generalized Shor Codes and A class of Subsystem Codes. *Proc. Intl. Symposium on Information Theory*, Toronto, Canada, 2009.
11. P. K. Sarvepalli and A. Klappenecker. Encoding subsystem codes with and without noisy gauge qubits. [\(Best Paper Award\)](#) In Proc. ICQNM 2009, *The Third International Conference on Quantum, Nano and Micro Technologies*, February 1-6, 2009 Cancun, Mexico.
10. P. K. Sarvepalli, M. Rötteler, and A. Klappenecker. Asymmetric quantum LDPC codes. *Proc. Intl. Symposium on Information Theory*, Toronto, Canada, 2008.
9. S. A. Aly, A. Klappenecker, and P. K. Sarvepalli. Duadic group algebra codes. In *Intl. Symposium on Information Theory*, Nice, France, 2007.
8. S. A. Aly, A. Klappenecker, and P. K. Sarvepalli. Quantum convolutional codes from generalized Reed-Solomon codes. In *Intl. Symposium on Information Theory*, Nice, France, 2007.
7. S. A. Aly, M. Grassl, A. Klappenecker, M. Roetteler, and P. K. Sarvepalli. Quantum convolutional BCH codes In *Proc. 10th Canadian Workshop on Information Theory*, Edmonton, Canada, 2007.
6. S. A. Aly, A. Klappenecker, and P. K. Sarvepalli. Subsystem codes. [\(Invited\)](#) In *Forty-Fourth Annual Allerton Conference on Communication, Control, and Computing*, Illinois, USA, 2006.
5. S. A. Aly, A. Klappenecker, and P. K. Sarvepalli. Primitive BCH codes over finite fields. In *Intl. Symposium on Information Theory*, Seattle, USA, 2006.
4. S. A. Aly, A. Klappenecker, and P. K. Sarvepalli. Remarkable degenerate quantum stabilizer codes derived from duadic codes. In *Intl. Symposium on Information Theory*, Seattle, USA, 2006.
3. P. K. Sarvepalli and A. Klappenecker. Nonbinary quantum codes from hermitian curves. In M. Fossorier et al., (eds), *Applied Algebra, Algebraic Algorithms and Error-Correcting Codes: 16th International Symposium, AAECC-16*, Las Vegas, NV, USA, February 20-24, 2006.
2. A. Klappenecker and P. K. Sarvepalli. Nonbinary quantum Reed-Muller codes. In *Proc. 2005 IEEE Intl. Symposium on Information Theory*, Adelaide, Australia, pages 1023-1027, 2005.
1. Pradeep Kiran and K. Radhakrishna Rao. A novel BIMOS translinear principle based transconductor. *IEEE International Conference on VLSI*, Madras, India, 1998.

Book Chapters

1. P. K. Sarvepalli, S. A. Aly, and A. Klappenecker. Nonbinary stabilizer codes. In (eds) G. Chen, L. Kauffman and S. Lomonaco, Jr., *Mathematics of quantum computation and quantum technology*, Taylor and Francis, 2007.

Preprints

5. R. Raussendorf, P. Sarvepalli, T.-C. Wei, and P. Haghnegahdar. [Measurement-based quantum computation—a quantum-mechanical toy model for spacetime?](#), arXiv:1108.5774, 2011.
4. P. Sarvepalli and P. Wocjan. [Quantum algorithms for one-dimensional infrastructures](#), arXiv:1106.6347, 2011.
3. P. Sarvepalli. [Quantum codes and symplectic matroids](#), arXiv:1104.1171, 2011.
2. A. Klappenecker and P. K. Sarvepalli. [Encoding subsystem codes](#). arXiv:0806.4954, 2008.
1. P. Sarvepalli and A. Klappenecker. [Asymptotics of the quantum Hamming bound for subsystem codes](#). arXiv:0710.4271, 2007.

Presentations

- Quantum codes and symplectic matroids. [\(Invited\)](#) The 3rd biennial Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM), May 31–June 3, 2011, University of Victoria in Victoria, BC, Canada.
- Quantum codes, symplectic matroids and secret sharing schemes. Seminar on quantum topology and quantum computing, Ohio State University, Columbus, USA, May 25, 2011.
- Matroids in quantum information processing. Université of Sherbrooke, Canada, April 12, 2011.
- Topological color codes over prime power alphabet. Discrete Math Seminar, Simon Fraser University, Vancouver, Canada, Dec 7, 2010.
- Quantum secret sharing schemes: Constructions and bounds. Centre for Quantum Technologies, National University of Singapore, Singapore, Nov 11, 2010.
- Topological color codes over higher alphabet. [\(Invited\)](#) IEEE Information Theory Workshop, Dublin, Ireland, Aug 30–Sep 3, 2010.
- Local equivalence of surface code states. Theory of Quantum Computation, Communication and Cryptography, University of Leeds, UK, April 13–15 2010.
- Quantum secret sharing, Matroids and stabilizer codes. [\(Invited\)](#) Canadian Mathematical Society Summer Meeting, New Brunswick, 2010.
- Matroids in quantum computing and quantum cryptography. [\(Invited\)](#) Applications of Matroid Theory and Combinatorial Optimization to Coding Theory, Banff International Research Station, Banff, Aug 2–7, 2009.
- Quantum secret sharing with CSS codes. Quantum Information Seminar, Department of Physics and Astronomy, University of British Columbia, Vancouver, Apr 29, 2009
- Sharing classical secrets with CSS codes. *Center for Advanced Studies Seminars*, University of New Mexico, Albuquerque, Nov 6, 2008.
- Asymmetric quantum LDPC codes. In *IEEE Intl. Symposium on Information Theory*, Toronto, Canada, Jul 6–11, 2008.
- Two approaches to sparse graph quantum codes. *Quantum information and graph theory: Emerging connections*, Perimeter Institute for Theoretical Physics, Waterloo, Apr 28 – May 2, 2008.
- Remarkable degenerate quantum stabilizer codes derived from duadic codes. In *IEEE Intl. Symposium on Information Theory*, Seattle, USA, 2006.
- Nonbinary quantum codes from Hermitian curves. In *Applied Algebra, Algebraic Algorithms and Error-Correcting Codes: 16th Intl. Symposium, AAECC-16*, Las Vegas, NV, USA, February 20–24, 2006.
- Nonbinary quantum Reed-Muller codes. In *IEEE Intl. Symposium on Information Theory*, Adelaide, Australia, 2005.

Patents

F. A. Mujica, U. Dasgupta, S. K. Oswal, M. Ali, P. Sarvepalli, P. Easwaran, D. N. Basu. [“Digital timing recovery method for communication receivers,”](#) United States Patent 6983032.

Relevant Coursework	<p>Ph.D.: Analysis of algorithms, Randomized algorithms, Distributed algorithms and systems, Theory of numbers, Algebra I/II, Elliptic curves and modular forms, Algebraic number theory, Operating systems and applications, Computational linear algebra, Advanced topics in channel coding.</p> <p>M.S.: Data converters, Statistical communication theory, Estimation and detection theory, Modulation theory, Discrete time systems, Information theory, Channel coding for communication systems, Algorithmic aspects of quantum computation.</p>
Awards and Honors	<ul style="list-style-type: none"> — Best paper award (2009 ICQNM, <i>The Third International Conference on Quantum, Nano and Micro Technologies</i>). — Placed 74th All India in the GATE conducted in 1997 with 98.74 percentile. — Secured 264th Rank in IIT-JEE 1993 out of nearly 100 000 candidates all over India. — Placed in the top 1% of the state of Andhra Pradesh in the National Standard Examination in Physics, 1992 conducted by the Indian Association of Physics Teachers. — Recipient of the A.P. State Merit scholarship (given to three students per year overall the state) in the year 1987. — Received certificate of merit in the National Science Talent Search Exam, 1992.
Service	
Reviewer	IEEE Trans. Information Theory, Physical Review Letters, Physical Review A., International Symposium on Information Theory, Journal of Mathematical Physics.
Co-organizer	<p>10th Canadian Summer School on Quantum Information, University of British Columbia, Vancouver, Canada, Jul 17–30, 2010.</p> <p>Research Workshop on Quantum Algorithms, Computational Models, and Foundations of Quantum Mechanics, University of British Columbia, Vancouver, Canada, Jul 23–25, 2010.</p>
References	Available on request.