

## Arun Prasath Mani

### Present Address (until August 2010)

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### Permanent Address

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### Research Interests

Combinatorics and combinatorial algorithms, approximate evaluations of graph and matroid polynomials, and more broadly, topics on the intersection between discrete mathematics and computer science.

### Education

PhD Computer Science, Monash University, Australia, 2010 (Graduated May 2010)

- Thesis: *Correlation inequalities for Tutte polynomials* (URL: [http://www.arunweb.net/pub/phd\\_thesis.pdf](http://www.arunweb.net/pub/phd_thesis.pdf))
- Supervisor: Assoc. Prof. Graham E. Farr

MSc Mathematics and Foundations of Computer Science, University of Oxford, UK, 2004

MS Computer Science, Michigan State University, USA, 2000 (GPA: 3.95/4.0)

BE Computer Science and Engineering, Anna University, India, 1998 (Graduated First Class with Distinction)

### Employment History

Specialist (Software), Strand Life Sciences, India, 2004–2005

- Senior software developer of Avadis (Version 4.0), a microarray data analysis and visualization framework in Java

Member of Technical Staff I, Bell Labs, Lucent Technologies, USA, 2000–2003

- Programmer for Lucent Standard Components C++ libraries, a collection of general purpose libraries used widely within Lucent

Sessional Tutor, Clayton School of Information Technology, Monash University

- FIT2014 Theory of computation (Jul 2008 – Nov 2008), FIT2004 Algorithms and data structures (Feb 2008 – Jun 2008, Feb 2007 – Jun 2007): Led one-hour problem solving sessions
- FIT2044 Advanced programming project (Jul 2007 – Nov 2007): Supervised a second-year student programming project on context aware data compression

Tutor, Mathematical Institute, University of Oxford

- Logic and computability (Jan 2004 – Apr 2004): Assisted with one-hour problem solving sessions

Research Assistant, Department of Computer Science and Engineering, Michigan State University

- Project: Error correction for collaborative computing protocols in wireless local area networks (May 1999 – Jul 2000)
- This work led to two publications (listed below)

Teaching Assistant, Department of Computer Science and Engineering, Michigan State University

- Introduction to computing (Aug 1998 – May 1999): Conducted three-hour laboratory sessions

## Publications

PhD related:

- Some inequalities for Whitney-Tutte polynomials. *Combinatorics, Probability and Computing*, volume 19, number 3, pages 425–439, 2010. doi: 10.1017/S0963548309990617.  
(A paper introducing a family of correlation inequalities for the matroid Tutte polynomial that can be potentially used to approximate its evaluation at points in the region  $x, y \geq 1$ . Also introduces the notion of *rank domination* in matroids.)
- On some Tutte polynomial sequences in the square lattice. Submitted. Manuscript URL: [http://www.arunswb.net/pub/lattices\\_sub.pdf](http://www.arunswb.net/pub/lattices_sub.pdf).  
(The correlation inequalities from the paper above are used to provide non-trivial one-sided bounds for the asymptotic growth of the Tutte polynomial of a square lattice as the dimensions of the lattice tend to infinity. We improve upon the current best upper bound for a limit describing this growth at the point where the Tutte polynomial counts the number of forests of a graph. This work also includes results applicable to the ferromagnetic versions of the Ising and Potts model partition functions of statistical physics.)
- An extension to matroid rank submodularity and the  $Z$ -Rayleigh property. Submitted. Manuscript URL: [http://www.arunswb.net/pub/zrayleigh\\_sub.pdf](http://www.arunswb.net/pub/zrayleigh_sub.pdf).  
(The idea of rank dominations in matroids is developed further to introduce a theory of *R-submodularity* in matroids, a definition that extends matroid rank submodularity. This is then applied to establish strong negative correlation properties of the multivariate Tutte polynomial of the Fano and non-Fano matroids. Unlike previous such proofs provided in the literature for some weaker correlation properties, we do not rely on computer algebra systems.)

Before PhD:

- (with P.K. McKinley and C. Tang). A study of adaptive forward error correction for wireless collaborative computing. *IEEE Transactions on Parallel and Distributed Systems*, 13(9):936–947, 2002.
- (with P.K. McKinley). An experimental study of adaptive forward error correction for wireless collaborative computing. In *Proceedings of the IEEE Symposium on Applications and the Internet (SAINT)*, San Diego, USA, 2001, pages 157–166.

## Conference Talks

- On matroids and partial sums of binomial coefficients. *22nd British Combinatorial Conference (BCC)*, St Andrews, UK, July 2009.
- Extended submodularity and Tutte polynomial inequalities for graphs. *Techniques and Problems in Graph Theory*, Bristol, UK, July 2009.
- A correlation inequality for Whitney-Tutte polynomials. *Fourth International Conference on Combinatorial Mathematics and Combinatorial Computing (4ICC)*, Auckland, New Zealand, December 2008.
- Rank dominations in matroids. *Seventh Australia-New Zealand Mathematics Convention (7ANZMC)*, Christchurch, New Zealand, December 2008.

## Invited Seminars

- A combinatorial approach to Tutte polynomial inequalities. *Discrete Structures and Algorithms Seminar*, University of Melbourne, September 2009.

## Informal Research Talks

- About 15 talks (2006 – 2009) at the *Discrete Mathematics Research Group* meetings at Monash University.
- Two talks (Aug 2008, May 2009) at the *Postgraduate Student Lunchtime Seminar* series at the Clayton School of Information Technology, Monash University.

## References

- Assoc. Prof. Graham E. Farr, DPhil (Oxford, 1986)  
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Phone: +61-3-9905 5201  
Email: graham.farr@infotech.monash.edu.au  
(A/Prof. Farr is my PhD supervisor. His research interests include graph theory, matroid theory, algorithms and computational complexity, and he has published over 30 refereed papers on these topics, mainly in international journals. He is a co-convenor of the Discrete Mathematics Research Group, Monash University, since 2006. He is also currently Director, Higher Degrees by Research, Clayton School of Information Technology, and previously Head of School, Caulfield School of Information Technology, Monash University, 2005–2008.)
- Dr. Steven Noble, DPhil (Oxford, 1997)  
Department of Mathematical Sciences, Brunel University  
Kingston Lane, Uxbridge UB8 3PH, UK  
Phone: +44-1895-265619  
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(Dr. Noble is an expert on the computational complexity of graph polynomials, frequency assignment and scale-free networks, and he has published about 15 refereed papers in international journals on these topics. His enthusiasm and insightful comments on topics of my research, in particular, on matroid  $R$ -submodularity, were also very helpful during my PhD.)
- Dr. Ian Wanless, PhD (Australian National University, 1997)  
School of Mathematical Sciences, Monash University  
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(Dr. Wanless is a Queen Elizabeth II Fellow and a Monash Fellow at the School of Mathematical Sciences, Monash University. His research interests include latin squares, combinatorial enumeration and random graphs, and he has authored over 50 refereed publications in international journals on these topics. He is a co-convenor of the Discrete Mathematics Research Group, Monash University, since 2006. He was awarded the Kirkman Medal (2002) and the Hall Medal (2008) of the Institute of Combinatorics and Applications (ICA), and the Australian Mathematical Society Medal (2009) for his research. His other honors include a Young Tall Poppy Science Award - Victoria (2008) and a Monash University Faculty of Science Early Career Research Award (2008). He is also a managing editor of the Electronic Journal of Combinatorics, and a former President of the Combinatorial Mathematics Society of Australasia (CMSA).)

- Prof. (Emeritus) Dominic Welsh, DPhil (Oxford)  
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Oxford OX1 3LB, UK  
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(Prof. Welsh was my academic advisor during my Masters at the University of Oxford. He has a distinguished research record in combinatorics, computational complexity and probability theory. He has authored at least six books on these topics including the highly influential *Complexity: Knots, Colouring and Counting* and the first standard reference on *Matroid Theory*, and served on the editorial board of many prestigious journals including the *Journal of Combinatorial Theory, Series B*, *Discrete Mathematics* and *Combinatorics, Probability and Computing*. He has supervised over 35 doctoral students, and served as the Chairman of the Board of Faculty of Mathematics at the University of Oxford, Sub-Warden of Merton College, Oxford, and Chairman of the British Combinatorial Committee.)