

# DA WANG

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<https://adgnaw.github.io/>

EDUCATION	<b>MIT, Electrical Engineering &amp; Computer Science</b>	Ph.D	<b>2010–2014</b>
	<i>Advisor:</i> Gregory W. Wornell		GPA: 5.0/5.0
	<i>Major:</i> Electrical Engineering, <i>Minor:</i> Finance		
	<b>MIT, Electrical Engineering &amp; Computer Science</b>	Master of Science	<b>2010</b>
	<i>Advisor:</i> Gregory W. Wornell		GPA: 5.0/5.0
	<b>University of Toronto, Electrical Engineering</b>	Bachelor of Applied Science	<b>2008</b>
	<i>Major:</i> Electrical Engineering, <i>Minor:</i> Mathematics		GPA: 3.95/4

RESEARCH EXPERIENCES	<b>Signals, Information &amp; Algorithms Lab, Research Laboratory of Electronics (RLE), MIT</b>		
	<i>Advisor:</i> Prof. G. W. Wornell		
	<i>Efficient task replication in large-scale parallel computation</i>		
	<ul style="list-style-type: none"><li>Analyzed the impact of task replication on latency and computing cost via extreme value theory and order statistics.</li><li>Proposed algorithms for optimal task replication.</li><li>Showed that a proper amount of replication could reduce latency and computing cost simultaneously.</li></ul>		
	<i>Compression in the Space of Permutations</i>		
	<ul style="list-style-type: none"><li>Characterized the rate-distortion function for lossy compression of permutations under a variety of common metrics.</li><li>Analyze the lossless compression of permutations from the Mallows model.</li><li>Drew implicating to ranking data storage and approximate sorting algorithms.</li></ul>		
	<i>Flash ADC design with noisy comparators</i>		
	<ul style="list-style-type: none"><li>Formulated the problem as scalar quantization with noisy partition points.</li><li>Characterized quantization error using high resolution analysis.</li><li>Derived optimal partition point densities for Gaussian and Uniform input distributions with significant resolution gain over existing designs.</li></ul>		
	<i>Fundamental limits of joint source-channel coding</i>		
	<ul style="list-style-type: none"><li>Investigated behavior of joint source-channel coding at finite block-length and characterized the <i>joint source-channel dispersion</i>.</li><li>Demonstrated the advantage of joint source-channel coding over any separation-based scheme at finite block length.</li><li>Proved the exponentially strong converse for joint source-channel coding.</li><li>Evaluated the dispersion of unequal error protection channel coding as a side result.</li></ul>		
	<i>Asynchronous communication with application to sparse communication</i>		
	<ul style="list-style-type: none"><li>Investigated the fundamental performance limits of frame synchronization in the presence of noise.</li><li>Proposed an slotted asynchronous channel model and identified the inefficiency in existing training-based schemes, where synchronization is separated from data transmission.</li><li>Proposed a joint synchronization-communication scheme that leads to significant performance gain in the high communication rate regime in terms of error exponents.</li><li>Discovered alternative converse proofs for single-message unequal error protection as a side result.</li></ul>		

## **Electrical & Computer Engineering, University of Toronto**

*Multicast capacity of network coding in broadcast-mode*

- Mentor: Prof. F. R. Kschischang
- Proposed an efficient protocol to counter the pollution attack in network coding.

*Webpage prefetching in wireless heterogeneous networks*

- Mentor: Prof. B. Liang
- Proposed the optimal strategy for web prefetching in heterogeneous wireless networks.

WORK  
EXPERIENCES

**Two Sigma Investments**  
*Research Analyst*

New York, NY  
Aug. 2014–present

- Conducted behavioral finance research based on unstructured data.
- Designed scheduling algorithms to reduce latency in distributed parallel computing.
- Architected systems for unstructured data storage, retrieval, and processing.

**Two Sigma Investments**  
*Quantitative Research Intern*

New York, NY  
Jun. 2013–Aug. 2013

- Conducted quantitative behavioral research for equity markets.

**OANDA Corp.**  
*Quantitative Analyst Intern*

Toronto, ON  
Jun. 2012–Aug. 2012

- Researched high frequency currency data at OANDA, a global forex market marker.
- Developed prediction algorithms to reduce the transaction cost of currency rejections.
- Investigated dynamic exposure hedging strategies for currency risk management.

**Swipely Inc.**  
*Intern Engineer*

Providence, RI  
Jun. 2011–Aug. 2011

- Developed a statistical inference algorithm to identify merchants from highly noisy and heterogeneous credit/debit card transaction records, with significant accuracy improvement over the existing system for a large number of banks.

**Bain Capital Absolute Return Capital (ARC)**  
*Intern Analyst*

Boston, MA  
Jun. 2010–Aug. 2010

- Developed software for *large scale option data management* and *option pricing analysis*.

**Mitsubishi Electric Research Lab (MERL)**  
*Intern Researcher*

Cambridge, MA  
Jun. 2009–Aug. 2009

- Researched and implemented in Python a constraint satisfaction algorithm named “divide and concur”, and applied it to *infer 3D human motion from 2D video segments*.

**Altera Corporation: Toronto Technology Center**  
*Intern Engineer*

Toronto, ON, Canada  
May 2006–May 2007

- FPGA CAD development in C++ and FPGA-based embedded system development.

THESES

1. **D. Wang**, “Computing with Unreliable Resources: Design, Analysis and Algorithms”, Ph.D. thesis, Department of Electrical Engineering and Computer Science, MIT, May 2014
2. **D. Wang**, “Distinguishing Codes from Noise: Fundamental Limits and Applications to Sparse Communication” S.M. thesis, Department of Electrical Engineering and Computer Science, MIT, May 2010

## PUBLICATIONS

1. **D. Wang**, A. Mazumdar, and G. W. Wornell, "Compression in the Space of Permutations," *IEEE Transactions on Information Theory*, vol 61, issue 12, pp. 6417-6431, December 2015.
2. **D. Wang**, G. Joshi, G. W. Wornell, "Using Straggler Replication to Reduce Latency in Large-scale Parallel Computing," *ACM Sigmetrics Distributed Cloud Computing Workshop (DCC 2015)*, Portland, OR, 2015
3. **D. Wang**, Y. Polyanskiy, G. W. Wornell, "Scalar Quantization with Noisy Partitions and its Application to Flash ADC Design," *Proc. IEEE International Symposium of Information Theory*, Honolulu, HI, 2014
4. **D. Wang**, A. Mazumdar, and G. W. Wornell, "Lossy compression of permutations," *Proc. IEEE International Symposium of Information Theory*, Honolulu, HI, 2014
5. H. Zhou, **D. Wang**, and G. W. Wornell, "A Simple Class of Efficient Compression Schemes Supporting Local Access and Editing," *Proc. IEEE International Symposium of Information Theory*, Honolulu, HI, 2014
6. **D. Wang**, G. Joshi, and G. W. Wornell, "Efficient Job Replication for Fast Response Times in Parallel Computation," *ACM Sigmetrics*, Austin, TX, 2014
7. **D. Wang**, A. Mazumdar, and G. W. Wornell, "A rate-distortion theory for permutation spaces," *Proc. IEEE International Symposium of Information Theory*, Istanbul, Turkey, 2013
8. **D. Wang**, V. Chandar, S.-Y. Chung and G. W. Wornell, "On Reliability Functions for Single-Message Unequal Error Protection," *Proc. IEEE International Symposium of Information Theory*, Cambridge, MA, 2012
9. **D. Wang**, A. Ingber, Y. Kochman, "A Strong Converse for Joint Source-Channel Coding," *Proc. IEEE International Symposium of Information Theory*, Cambridge, MA, 2012
10. A. Ingber, **D. Wang**, Y. Kochman, "Dispersion Theorems via Second Order Analysis of Functions of Distributions," *Proc. 46th Annual Conference on Information Sciences and Systems (CISS)*, Princeton, NJ, 2012
11. **D. Wang**, A. Ingber, Y. Kochman, "The Dispersion of Joint Source-Channel Coding," *Proc. 49th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, September 2011.
12. **D. Wang**, V. Chandar, S.-Y. Chung and G. W. Wornell, "Error Exponents in Asynchronous Communication," *Proc. IEEE International Symposium on Information Theory*, St. Petersburg, Russia, August 2011
13. **D. Wang**, D. Silva and F. R. Kschischang, "Robust Network Coding in the Presence of Untrusted Nodes," *IEEE Transactions on Information Theory*, vol 56, issue 9, pp. 4532-4538, September 2010.
14. B. Liang, S. Drew, and **D. Wang**, "Performance of Multiuser Network-aware Prefetching in Heterogeneous Wireless Systems," *ACM/Springer Wireless Networks*, vol 15, no. 1, pp. 99-110, January 2009.
15. **D. Wang**, D. Silva, F. R. Kschischang, "Constricting the Adversary: A Broadcast Transformation for Network Coding," *Proc. 45th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, September 2007.

## REPORTS

1. G. Joshi, JB. Rhim, J. Sun, **D. Wang**, "Fountain Codes," *Report for Principles of Digital Communication II*, MIT, December 2010.

TALKS AND PRESENTATIONS	<ol style="list-style-type: none"> <li>1. “Rank compression” (invited), <i>48th Annual Conference on Information Sciences and Systems (CISS)</i>, Princeton, NJ, March 2014</li> <li>2. “Flash ADC design with noisy comparators”, <i>RLE Immersion—Information Science and Systems</i>, MIT, Cambridge, MA, March 2014</li> <li>3. “Distinguishing Codes from Noise”, <i>2010 North American School of Information Theory</i>, University of Southern California, Los Angeles, CA, August 2010</li> <li>4. “Coding and Analysis for Sparse Communication”, <i>EECS Masterworks</i>, MIT, Cambridge, MA, April 2010</li> <li>5. “Constricting the Adversary: A Broadcast Transformation for Network Coding”, <i>Network Coding Day</i>, University of Toronto, Toronto, ON, Canada, November 2007</li> </ol>
PROFESSIONAL SERVICES	<ul style="list-style-type: none"> <li>• Reviewer for <i>IEEE Transaction on Information Theory</i></li> <li>• Reviewer for <i>IEEE Transaction on Communications</i></li> <li>• Reviewer for <i>IEEE Communications Letters</i></li> <li>• Reviewer for <i>SAIEE Africa Research Journal</i></li> <li>• Reviewer for IEEE International Symposium on Network Coding (NetCod)</li> <li>• Reviewer for IEEE International Symposium on Information Theory (ISIT)</li> <li>• Reviewer for IEEE Wireless Communication and Networking Conference (WCNC)</li> <li>• Reviewer for IEEE Global Communication Conference (GLOBALCOM)</li> <li>• Reviewer for IEEE International Conference on Communications (ICC)</li> </ul>
TEACHING EXPERIENCE	<p><b>6.437 Inference and Information</b> <span style="float: right;">EECS, MIT</span></p> <p><i>Teaching Assistant</i> <span style="float: right;">Spring 2011</span></p> <ul style="list-style-type: none"> <li>• <b>Instructors:</b> Prof. P. Golland, Prof. G. W. Wornell</li> <li>• Led recitations, wrote problem sets and exams, and held office hours for the graduate-level statistical inference course.</li> </ul>
COURSES	Advanced Stochastic Processes (S12), Optimization Methods (F11), Cloud Computing Seminar (S11), Coding Theory (F10), Principles of Wireless Communication (F09), Convex Optimization (Listener, F09), Information Theory (S09), Inference and Information (S09), Algorithms for Estimation and Inference (F08), Digital Communication I (F08).
AWARDS AND HONORS	<ul style="list-style-type: none"> <li>• <b>Wellington and Irene Loh Fund Graduate Fellowship</b>, MIT <span style="float: right;">2013</span></li> <li>• <b>Claude E. Shannon Research Assistantship</b>, MIT <span style="float: right;">2011</span></li> <li>• <b>NSERC Postgraduate Scholarship (Master &amp; Doctoral level)</b>, Natural Sciences and Engineering Research Council of Canada <span style="float: right;">2009 &amp; 2010</span></li> <li>• <b>Hewlett Packard Fellowship</b>, MIT <span style="float: right;">2009</span></li> <li>• <b>Irwin M. Jacobs and Joan K. Jacobs Presidential Fellowship</b>, MIT <span style="float: right;">2008</span></li> <li>• <b>William L. Everitt Student Award of Excellence</b>, International Engineering Consortium <span style="float: right;">2008</span></li> <li>• <b>J.E. Reid Memorial Prize</b>, University of Toronto <span style="float: right;">2008</span></li> </ul>

- **NSERC Undergraduate Summer Research Award**, University of Toronto 2005 & 2007
- **CSUA Broadcast Technology Scholarship**, Canadian Satellite Users Association (CSUA) (now Canadian Broadcast Distribution Association (CBDA)) 2007
- **CPAC TD Meloche Monnex Scholarship**, Chinese Professionals Association of Canada (CPAC) 2007
- **The Adel S. Sedra Outstanding Student Awards**, Department of Electrical and Computer Engineering, University of Toronto 2006
- **IEEE Canada-Toronto Section Scholarship**, IEEE Canada, Toronto Section 2006
- **Andrew Alexander Kinghorn Scholarship**, Applied Science and Engineering Faculty, University of Toronto 2006
- **Nortel Institute Undergraduate Scholarship**, University of Toronto 2006

#### AFFILIATIONS & ACTIVITIES

- EECS representative, MIT *Graduate Student Council (GSC)* Fall 2012–Spring 2012
- Co-organizer, *RLE Information & Signals Seminar Series (ISSS)* Spring 2010–Fall 2011
- VP Academic, EECS Graduate Student Association (GSA), MIT 2010
  - Led a five-member team to organize academic and career events for EECS graduate students.
- Student organizer, *6.454 Graduate Seminar in Area I*, MIT Fall 2009

#### LANGUAGES

Fluent in English, Mandarin and Cantonese.