

DA WANG

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

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

RESEARCH
EXPERIENCES **Signals, Information & Algorithms Lab, Research Laboratory of Electronics (RLE), MIT**
Advisor: Prof. G. W. Wornell

Efficient task replication in large-scale parallel computation

- Analyzed the impact of task replication on latency and computing cost via extreme value theory and order statistics.
- Proposed algorithms for optimal task replication.
- Showed that a proper amount of replication could reduce latency and computing cost simultaneously.

Compression in the Space of Permutations

- Characterized the rate-distortion function for lossy compression of permutations under a variety of common metrics.
- Analyze the lossless compression of permutations from the Mallows model.
- Drew implicating to ranking data storage and approximate sorting algorithms.

Fundamental limits of joint source-channel coding

- Investigated behavior of joint source-channel coding at finite block-length and characterized the *joint source-channel dispersion*.
- Demonstrated the advantage of joint source-channel coding over any separation-based scheme at finite block length.
- Proved the exponentially strong converse for joint source-channel coding.
- Evaluated the dispersion of unequal error protection channel coding as a side result.

Asynchronous communication with application to sparse communication

- Investigated the fundamental performance limits of frame synchronization in the presence of noise.
- Proposed an slotted asynchronous channel model and identified the inefficiency in existing training-based schemes, where synchronization is separated from data transmission.
- Proposed a joint synchronization-communication scheme that leads to significant performance gain in the high communication rate regime in terms of error exponents.
- Discovered alternative converse proofs for single-message unequal error protection as a side result.

Flash ADC design with noisy comparators

- Formulated the problem as scalar quantization with noisy partition points.
- Characterized quantization error using high resolution analysis.
- Derived optimal partition point densities for Gaussian and Uniform input distributions with significant resolution gain over existing designs.

Compression with Local Access and Editing

- Develop simple compression algorithms that supports efficient insertion, read and editing to arbitrary sub-sequences without decompression.

- Algorithm achieves near optimal compression ratio with little overhead for local access and editing.

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

LLN Technologies

Self-employed

Apex, NC
Jun. 2021–present

- Proprietary quantitative trading

Aigen Investment Management

Quantitative Researcher

New York, NY
Apr. 2018–May 2021

- Predict modeling for equity markets via machine learning and natural language processing.
- Co-develop firm-wide data and trading infrastructure.

Gardening Leave

Self-employed

New York, NY
Apr. 2017–Apr. 2018

- Consult for *Acuris*, a financial news and data company, on data product design and implementation.

Two Sigma Investments

Research Analyst

New York, NY
Aug. 2014–Apr. 2017

- Extract information from unstructured data and build statistical predictive models for equity markets.

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**, G. Joshi, G. Wornell, “Efficient Straggler Replication in Large-Scale Parallel Computing,” *ACM Transactions on Modeling and Performance Evaluation of Computing Systems*, vol 4, issue 2, pp. 1-23, June 2019
2. J. Tang, **D. Wang**, Y. Polyanskiy, G. Wornell, “Defect Tolerance: Fundamental Limits and Examples,” *IEEE International Symposium of Information Theory*, Barcelona, Spain, 2016
3. **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
4. **D. Wang**, G. Joshi, G. W. Wornell, “Using Straggler Replication to Reduce Latency in Large-scale Parallel Computing,” *ACM SIGMETRICS Performance Evaluation Review*, vol 43, issue 3, pp. 7-11, December 2015
5. **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
6. **D. Wang**, A. Mazumdar, and G. W. Wornell, “Lossy Compression of Permutations,” *Proc. IEEE International Symposium of Information Theory*, Honolulu, HI, 2014
7. 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
8. **D. Wang**, G. Joshi, and G. W. Wornell, “Efficient Job Replication for Fast Response Times in Parallel Computation,” *ACM SIGMETRICS*, Austin, TX, 2014
9. **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
10. **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
11. **D. Wang**, A. Ingber, Y. Kochman, “A Strong Converse for Joint Source-Channel Coding,” *Proc. IEEE International Symposium of Information Theory*, Cambridge, MA, 2012

12. 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
13. **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, 2011
14. **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, 2011
15. **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
16. 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
17. **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, 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

1. "Rank compression" (invited), *48th Annual Conference on Information Sciences and Systems (CISS)*, Princeton, NJ, March 2014
2. "Flash ADC design with noisy comparators", *RLE Immersion—Information Science and Systems*, MIT, Cambridge, MA, March 2014
3. "Distinguishing Codes from Noise", *2010 North American School of Information Theory*, University of Southern California, Los Angeles, CA, August 2010
4. "Coding and Analysis for Sparse Communication", *EECS Masterworks*, MIT, Cambridge, MA, April 2010
5. "Constricting the Adversary: A Broadcast Transformation for Network Coding", *Network Coding Day*, University of Toronto, Toronto, ON, Canada, November 2007

PROFESSIONAL SERVICES

- Reviewer for *IEEE Transaction on Information Theory*
- Reviewer for *IEEE Transaction on Communications*
- Reviewer for *IEEE Communications Letters*
- Reviewer for *SAIEE Africa Research Journal*
- Reviewer for IEEE International Symposium on Information Theory (ISIT)
- Reviewer for IEEE International Symposium on Network Coding (NetCod)
- Reviewer for IEEE International Conference on Communications (ICC)
- Reviewer for IEEE Global Communication Conference (GLOBALCOM)
- Reviewer for IEEE Wireless Communication and Networking Conference (WCNC)

TEACHING EXPERIENCE	6.437 Inference and Information <i>Teaching Assistant</i> <ul style="list-style-type: none"> • Instructors: Prof. P. Golland, Prof. G. W. Wornell • Led recitations, wrote problem sets and exams, and held office hours for the graduate-level statistical inference course. 	EECS, MIT Spring 2011
AWARDS AND HONORS	<ul style="list-style-type: none"> • Wellington and Irene Loh Fund Graduate Fellowship, MIT 2013 • Claude E. Shannon Research Assistantship, MIT 2011 • NSERC Postgraduate Scholarship (Master & Doctoral level), Natural Sciences and Engineering Research Council of Canada 2009 & 2010 • Hewlett Packard Fellowship, MIT 2009 • Irwin M. Jacobs and Joan K. Jacobs Presidential Fellowship, MIT 2008 • William L. Everitt Student Award of Excellence, International Engineering Consortium 2008 • J.E. Reid Memorial Prize, University of Toronto 2008 • 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	<ul style="list-style-type: none"> • EECS representative, <i>MIT Graduate Student Council (GSC)</i> Fall 2012–Spring 2012 • Co-organizer, <i>RLE Information & Signals Seminar Series (ISSS)</i> Spring 2010–Fall 2011 • VP Academic, EECS Graduate Student Association (GSA), MIT 2010 <ul style="list-style-type: none"> - Led a five-member team to organize academic and career events for EECS graduate students. • Student organizer, <i>6.454 Graduate Seminar in Area I</i>, MIT Fall 2009 	