

Mark A. Iwen

CONTACT INFORMATION

Institute for Mathematics and its Applications (IMA)
University of Minnesota
114 Lind Hall
207 Church Street S.E.
Minneapolis, MN 55455-0134 USA

Voice: (734) 645-9437
Fax: (612) 626-7370
E-mail: iwen@ima.umn.edu
Web: www.ima.umn.edu/~iwen/index.html

RESEARCH INTERESTS

Signal Processing, Computational Harmonic Analysis, Algorithms, Scientific Computing.

EMPLOYMENT

Institute for Mathematics and its Applications (IMA), University of Minnesota
Postdoctoral Fellow: September 2008 – Present

EDUCATION

University of Michigan, Ann Arbor

Ph.D., Applied and Interdisciplinary Mathematics, August, 2008

- Dissertation Title: “Combinatorial Compressive Sampling with Applications”
- Co-Advisers: Martin J. Strauss and Jignesh M. Patel
- Committee: John P. Boyd, Anna C. Gilbert, and Robert Krasny

University of Wisconsin, Milwaukee

B.S., Computer Science and Mathematics, May, 2002

AWARDS AND HONORS

- Nominated for 2008 Distinguished Dissertation Award by UM Mathematics Department
- University of Michigan Rackham Travel Grant: 2008, 2007
- University of Michigan Mathematics Graduate Departmental Scholarship: 2007, 2006
- University of Michigan Mathematics Alumni/Alumnae Scholarship: 2005

PUBLICATIONS

JOURNAL ARTICLES

- Iwen, M.A. *Combinatorial Sublinear-Time Fourier Algorithms*. Submitted, 2008 (Revised, 2009).
- Iwen, M.A., and C. V. Spencer. *A Note on Compressed Sensing and the Complexity of Matrix Multiplication*. Information Processing Letters, Vol. 109, Issue 10, April, 2009.
- Farrell, B., Yi Huang, Mark Iwen, Ting Wang, Lisa Zhang, and Jintong Zheng. *Wavelength Assignment in Optical Network Design*. Mathematics-in-Industry Case Studies (MICS), Vol. 1, 2008.
- Iwen, M.A., A. Gilbert, and M. Strauss. *Empirical Evaluation of a Sub-Linear Time Sparse DFT Algorithm*. Communications in Mathematical Sciences, Vol. 5, No. 4, December, 2007.

REFEREED CONFERENCE PROCEEDINGS

- Iwen, M.A., *Sublinear-Time Fourier Algorithms with Recovery Guarantees and Uniformly Bounded Sampling Requirements*. Submitted, 2009.
- Iwen, M.A., *Group Testing Strategies for Recovery of Sparse Signals in Noise*. 43rd Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, 2009.
- Iwen, M. A., *Simple Deterministically Constructible RIP Matrices with Sublinear Fourier Sampling Requirements*. 43rd Annual Conference on Information Sciences and Systems (CISS), Baltimore, MD, 2009.
- Iwen, M. A., *Empirical Evaluation of Two Deterministic Sparse Fourier Transforms*. 43rd Annual Conference on Information Sciences and Systems (CISS), Baltimore, MD, 2009.

- Gilbert, Anna C., Mark A. Iwen, and Martin J. Strauss. *Group Testing and Sparse Signal Recovery*. 42nd Asilomar Conference on Signals, Systems, and Computers, Monterey, CA, 2008.
- Iwen, M.A., and C.V. Spencer. *Improved Bounds for a Deterministic SubLinear-Time Sparse Fourier Algorithm*. 42nd Annual Conference on Information Sciences and Systems (CISS), Princeton, NJ, 2008.
- Iwen, M.A., W. Lang, J. Patel. *Scalable Rule-Based Gene Expression Data Classification*. IEEE International Conference on Data Engineering (ICDE), 2008. [ICDE'08 full paper acceptance rate: 12.1%]
- Iwen, M.A. *A Deterministic Sub-linear Time Sparse Fourier Algorithm via Non-adaptive Compressed Sensing Methods*. ACM-SIAM Symposium on Discrete Algorithms (SODA), 2008. [SODA '08 acceptance rate: 29.7%]
- Iwen, M.A., G.S. Mandair, M.D. Morris, M. Strauss. *Fast Line-Based Imaging of Small Sample Features*. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2007. [ICASSP'07 acceptance rate: 46.2%]
- Laska, J., S. Kirolos, Y. Massoud, R. Baraniuk, A. Gilbert, M. Iwen, and M. Strauss. *Random Sampling for Analog-to-Information Conversion of Wideband Signals*. IEEE Dallas Circuits and Systems Workshop (DCAS), 2006.
- Iwen, M., and A.D. Mali. *Distributed Graphplan*. IEEE International Conference on Tools with Artificial Intelligence (ICTAI), 2002. [ICTAI'02 regular paper acceptance rate: 30%]
- Iwen, M., and A.D. Mali. *Dsatz: A Directional SAT Solver for Planning*. IEEE International Conference on Tools with Artificial Intelligence (ICTAI), 2002. [ICTAI'02 regular paper acceptance rate: 30%]
- Iwen, M., and A.D. Mali. *Interaction Graphs for Planning Problem Decomposition*. International Conference on Autonomous Agents & Multi Agent Systems (AAMAS), 2002. [AAMAS'02 acceptance rate: 27%]
- Iwen, M., and A.D. Mali. *Automatic Problem Decomposition for Distributed Planning*. International Conference on Artificial Intelligence (ICAI'02), 2002. [ICAI'02 acceptance rate: 30%]

IN PREPARATION

- *Optimal Constructions of Recent Number Theoretic RIP Matrices.*
- *Sublinear-Time Fourier Algorithms with Recovery Guarantees.*
- *An Adaptive Strategy for Recovering Sparse Signals in Noise.*
- *An Empirical Comparison of Two Sparse Fourier Transforms.*

PUBLICLY AVAILABLE CODE

- Ann Arbor Fast Fourier Transform (**AAFFT**) 0.9/0.5. A C++ implementation of the Fourier Algorithm developed in "Improved Time Bounds for Near-Optimal Sparse Fourier Representations" (2003) by Gilbert et al.

TALKS AND PRESENTATIONS

- *Combinatorial Compressed Sensing: Fast algorithms with Recovery Guarantees*. INFORMS. San Diego, CA, October 14, 2009.
- *Interpolation with Sparsity Assumptions: From Syphilis Testing to Sparse Fourier Transforms*. UWM Math Colloquium. University of Wisconsin – Milwaukee. Milwaukee, December 5, 2008.
- *Interpolation with Sparsity Assumptions: From Syphilis Testing to Sparse Fourier Transforms*. University of Wisconsin. Madison, November 21, 2008.
- *Deterministic Interpolation Methods for Sparse Trigonometric Polynomials*. Lawrence Berkeley National Lab (LBNL). Berkeley, June 20, 2008.
- *Scalable Rule-Based Gene Expression Data Classification*. NCIBI: Tools and Technology Seminar. University of Michigan, Ann Arbor, March, 14, 2008.
- *Combinatorial Sublinear-Time Fourier Methods*. February Fourier Talks. Norbert Wiener Center, University of Maryland, College Park, Feb. 21, 2008.
- *Sparse Fourier Transforms via Compressed Sensing*. ACO Seminar. Georgia Institute of Technology, Atlanta, Feb. 7, 2008.
- *Faster Fourier Transforms via Compressed Sensing*. Computational and Applied Mathematics Seminar. Arizona State University, Tempe, Jan. 24, 2008.

- *Defect Detection in Steel via Infrared Thermography*. Industrial Mathematical and Statistical Modeling Workshop for Graduate Students (IMSM), North Carolina State University, July 23 – 31, 2007.
- *Sparse Spectral Methods*. Numerical Analysis of Multiscale Computations Workshop. Banff, Jan. 28 – Feb. 2, 2007.
- *Empirical Evaluation of a Sub-linear Time Approximate DFT Algorithm*. Sparse Approximation Workshop. Princeton, Nov. 10 – 12, 2006.
- *Integrated Circuit Layout Reconstruction*. IMA Mathematical Modeling in Industry IX. Minneapolis, Aug. 1 – 10, 2005.

TEACHING AND MENTORING

- | | |
|--|---|
| University of Minnesota,
MINNEAPOLIS,
MINNESOTA | <ul style="list-style-type: none"> • <i>Research Experience for Undergraduates (REU) Team Mentor</i> Summer 2009
Helped organize 5 week REU program for 9 undergraduate students working on 3 different research projects. Supervised and assisted one of the teams (consisting of three undergraduate students) with their research project on data clustering. |
| University of Michigan,
ANN ARBOR,
MICHIGAN | <ul style="list-style-type: none"> • <i>Math 216 Introduction to Differential Equations</i> Fall 2007 • <i>Math 215 Calculus III</i> Fall 2005 • <i>Math 116 Calculus II</i> Winter 2005, Fall 2006 • <i>Math 115 Calculus I</i> Winter 2004 • <i>Math 105 Algebra</i> Fall 2003 |
| University of Wisconsin,
MILWAUKEE,
WISCONSIN | <ul style="list-style-type: none"> • <i>Math 117 Trigonometry</i> Spring 2002 |

PROFESSIONAL ACTIVITIES AND SERVICE

- | | |
|--|---|
| CONFERENCE
SESSIONS CHAIRED | <ul style="list-style-type: none"> • WP7, Signal Processing I, 43rd Annual Conference on Information Sciences and Systems (CISS), Baltimore, MD, 2009. |
| REVIEWER | <ul style="list-style-type: none"> • IEEE Transactions on Information Theory • IEEE Transactions on Signal Processing • Proceedings of the ACM-SIAM Symposium on Discrete Algorithms (SODA) • Journal of Selected Topics in Signal Processing |
| SOCIETY
MEMBERSHIPS | <ul style="list-style-type: none"> • Society for Industrial and Applied Mathematics (SIAM) • Institute of Electrical and Electronics Engineers (IEEE) |
| WORKSHOPS AND
CONFERENCES
ATTENDED | <ul style="list-style-type: none"> • Theoretical Foundations and Numerical Methods for Sparse Recovery. Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences, Linz, Austria, August 31 – September 4, 2009. • Multi-manifold data modeling and applications. Institute for Mathematics and its Applications (IMA), Minneapolis, Minnesota, October 27 – 30, 2008. • Frames for the finite world: Sampling, coding and quantization. American Institute of Mathematics, Palo Alto, California, August 18 – 22, 2008. • Approximation and Learning in High Dimensions. Texas A&M University, College Station, Texas, Oct. 19 – 21, 2007. • SIAM Conference on Non-linear Waves and Coherent Structures. Seattle, Sept. 9 – 12, 2006. |

- IMA Combinatorics Workshop. Atlanta, July 12 – Aug. 2, 2003.

INDUSTRIAL
RESEARCH
EXPERIENCE

Hamilton-Sundstrand Aerospace, Rockford, IL

- *Applied Research Department* Sept. 1998 - Jan. 1999
Wrote software for simulating unbalanced loads on aircraft power systems. Assisted in constructing a prototype switch reluctance motor/generator controller.
- *Electrical Systems Software Design* Jan. 1998 - April. 1998, June 1999 - Sept. 1999
Wrote aircraft system software to test system circuits for faults. Tested software/hardware integration of a prototype generator controller.

REFERENCES

**University of
Minnesota**, ANN
MINNEAPOLIS, MN

- Fadil Santosa, Institute for Mathematics and its Applications, E-mail: santosa@ima.umn.edu, Office Phone: 612-626-0293, Web: <http://www.math.umn.edu/~santosa/>
- Gilad Lerman, Department of Mathematics, E-mail: lerman@umn.edu, Office Phone: 612-624-5541, Web: <http://www.math.umn.edu/~lerman/>

**University of
Michigan**, ANN
ARBOR, MI

- Martin Strauss, Department of Mathematics, E-mail: martinjs@umich.edu, Office Phone: 734-763-3005, Web: <http://www.eecs.umich.edu/~martinjs/>
- Anna Gilbert, Department of Mathematics, E-mail: annacg@umich.edu, Office Phone: 734-763-5728, Web: <http://www.math.lsa.umich.edu/~annacg/>
- Karen Rhea, Department of Mathematics, E-mail: krhea@umich.edu, Office Phone: 734-936-9936, Web: <http://www.math.lsa.umich.edu/~krhea/>

**University of
Wisconsin**,
MADISON, WI

- Jignesh Patel, Department of Computer Sciences, E-mail: jignesh@cs.wisc.edu, Office Phone: 608-263-7308, Web: <http://pages.cs.wisc.edu/~jignesh/>