

Nathan Axvig

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Education

- Ph.D. **University of Nebraska-Lincoln**, Lincoln, NE; August 2010 (expected)
Mathematics
Dissertation: Applications of Linear Programming to Coding Theory
Advisor: Judy L. Walker
- M.S. **University of Nebraska-Lincoln**, Lincoln, NE; May 2007
Mathematics
- B.S. **University of North Dakota**, Grand Forks, ND; May 2005
Mathematics with minor in Statistics; Summa Cum Laude

Employment

Graduate Teaching Assistant/Graduate Research Assistant/Graduate Fellow
University of Nebraska-Lincoln (UNL) Department of Mathematics; 2005-Present

Awards

Mentoring Through Critical Transition Points Advanced Traineeship

This was one of four fellowships awarded within the UNL Department of Mathematics through an NSF grant designed to prepare graduate students for faculty positions. It provided research funding for the 2009 calendar year.

Grace Chisholm Young and William Henry Young Award

This award is given by the UNL Department of Mathematics to support research by graduate students. I was one of two who received this in 2007.

Outstanding Qualifying Exam Award

I was the sole recipient of this award from the UNL Department of Mathematics in 2006.

Chancellor's Doctoral Fellowship

I received this university-wide fellowship for new doctoral students at UNL during the 2005-2006 and 2006-2007 academic years.

Publications

Note: All of the following are refereed publications, with the exception of the fourth.

Analysis of connections between pseudocodewords; (with D. Dreher, K. Morrison, E. Psota, L.C. Pérez and J.L. Walker), *IEEE Transactions on Information Theory*, 55(9):4099–4107, September 2009.

Towards universal cover decoding; (with D. Dreher, K. Morrison, E. Psota, L.C. Pérez and J.L. Walker), in *Proceedings of the 2008 International Symposium on Information Theory and its Applications*, December 2008.

Average min-sum decoding of LDPC codes; (with D. Dreher, K. Morrison, E. Psota, L.C. Pérez and J.L. Walker), in *Proceedings of the 2008 5th International Symposium on Turbo Codes and Related Topics*, pp. 356–361, September 2008.

A universal theory of decoding and pseudocodewords; (with D. Dreher, K. Morrison, E. Psota, L.C. Pérez and J.L. Walker), SGER Technical Report 0801, University of Nebraska-Lincoln, July 2008. Available online at <http://www.math.unl.edu/~jwalker7>

A universal theory of pseudocodewords; (with E. Price, E. Psota, D. Turk, L.C. Pérez and J.L. Walker), in *Proceedings of the 45th Annual Allerton Conference on Communication, Control and Computing*, pp. 336–343, September 2007.

Teaching

Instructor of Record

I have taught College Algebra and Math Excel. The latter is a freshmen calculus seminar that emphasizes group work.

Recitation Instructor

I have conducted recitation sections for both Calculus I and Calculus II.

Teaching Assistant for the Math in the Middle Institute Partnership

I was a teaching assistant for Math 804T: Experimentation, Conjecture and Reasoning. This is a distance education course for in-service middle school teachers.

“Super TA”

During the fall of 2008, I observed all first-time calculus teaching assistants and provided constructive feedback to each as to his or her teaching methods.

Conference Presentations

The generalized Omura decoder

I gave this 20 minute invited talk at the 2010 Spring Southeastern Sectional Meeting of the AMS (Lexington, KY; March 2010).

Characterizing linear programming pseudocodewords using graphical methods

I gave this 10 minute contributed talk at the 2010 Joint Mathematics Meetings (San Francisco, CA; January 2010).

Towards universal cover decoding

I gave this 15 minute talk at the 2008 International Symposium on Information Theory and its Applications (Auckland, New Zealand; December 2008).

Average min-sum pseudocodewords

I gave this 20 minute invited talk at the 2008 Fall Central Section Meeting of the American Mathematical Society (Kalamazoo, MI; October 2008).

Analyzing MS decoding of LDPC codes via universal covers

I gave this 15 minute talk at the Third Canadian Summer School on Communications and Information Theory (Banff, AB; August 2008).

Seminar Talks

The generalized Omura decoder

I gave this series of two talks in the UNL Probability Seminar (March 2010).

Rock, paper, scissors, dynamite!

During the summer of 2008 I defined and analyzed a family of two-player games. This material was presented in the UNL Graduate Student Seminar and again for a group of undergraduates at Nebraska Wesleyan University (September 2008 and December 2009).

An introduction to matroids

I gave this series of two talks in the UNL Discrete Mathematics Seminar (April 2009).

Some aspects of cycle codes

I gave this series of two talks in the UNL Discrete Mathematics Seminar (September/October 2008).

Service

Nebraska IMMERSE, Graduate Student Mentor; UNL Department of Mathematics, Summer 2009
This is a summer program designed to ease the transition from undergraduate to graduate school. Participants were taught the necessary mathematics to read and understand two research papers.

Graduate Student Advisory Board, Member; 2007 - 2009

This group acts as a liaison between graduate students and the faculty of the UNL Department of Mathematics.

Math Day, Volunteer; 2005 - 2009

This is an annual mathematics competition for Nebraska high school students hosted by the UNL Department of Mathematics.

New Teaching Assistant Orientation; UNL Department of Mathematics, August 2006 and 2007

I coordinated and conducted workshops for incoming graduate students and teaching assistants.

Conferences and Workshops Attended

2010 Spring Southeastern Sectional Meeting of the American Mathematical Society

Lexington, KY; March 2010.

2010 Joint Mathematics Meetings

San Francisco, CA; January 2010.

Applications of Matroid Theory and Combinatorial Optimization to Information and Coding Theory

Banff, AB; August 2009.

Information Theory and Applications

San Diego, CA; February 2009.

2008 International Symposium on Information Theory and its Applications

Auckland, New Zealand; December 2008.

2008 Fall Central Section Meeting of the American Mathematical Society

Kalamazoo, MI; October 2008.

Third Canadian Summer School on Communications and Information Theory

Banff, AB; August 2008.

45th Annual Allerton Conference on Communication, Control and Computing

Monticello, IL; September 2007.

Summer School on Coding Theory

Nordfjordeid, Norway; June 2007.

Computer Skills

Matlab

I use Matlab to conduct simulations of decoding algorithms for error-correcting codes.