

Amy N. Langville

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Education

Ph.D. Operations Research, North Carolina State University, May 2002
Minors: Mathematics, Computational and Engineering Sciences
Dissertation: *Preconditioning for Stochastic Automata Networks*, under Dr. William J. Stewart
M.S. Operations Research, North Carolina State University, May 1999
Minors: Mathematics, Statistics
B.S. Mathematics, Mt. St. Mary's College, May 1997, valedictorian

Grants and Fellowships

CAREER Award from National Science Foundation, 2006-2011
General Electric - Faculty for the Future Fellow, 2000-2001
National Science Foundation - Graduate Research Trainee, 1999-2000
Graduate Assistantship in Areas of National Need Fellow, 1998
North Carolina State University - First Year Engineering Fellow, 1997-1998
NCAA Postbaccalaureate Fellow, 1997-1998

Honors and Awards

G. E. Jones Distinguished Achievement Award, College of Charleston, 2005-2006
National Dean's List Member, 1993-2001
Mt. St. Mary's Honors Project, *Econometric Enrollment Forecasting at the Mount*, Barrett Prize
Honor Societies: Delta Epsilon Sigma, Pi Mu Epsilon (MA), Omega Rho (OR), Phi Kappa Phi
Professional Societies: MAA, SIAM, INFORMS
N. C. State U. Operations Research Program Vice President, 1998-1999
Member of Division I Basketball Team, 1993-1997
Northeast Conference Basketball First Team 1996-97, Player of the Year 1995-96,
First Team 1994-95, Newcomer Team 1993-94
GTE CoSida Academic All-American First Team 1996-97, Second Team 1995-96

Conferences and Presentations

Industrial

- Yahoo! Research. San Francisco, CA, October 18, 2005.
Presentation: *The Nonnegative Matrix Factorization in Data Mining*.
- SAS Institute, Inc. Cary, NC.
Presentation (Sept. 20, 2005): *Alternating Linear Programming for the NMF*.
Presentation (June 9, 2005): *Alternating Least Squares Algorithms for the NMF*.
Presentation (Apr. 22, 2005): *Algorithms for the NMF in Text Mining*.
Presentation (Feb. 9, 2005): *Experiments with the NMF and Reuters10 Dataset*.
Presentation (Dec. 20, 2004): *Scalability and Robustness of the NMF for Text Mining*.

- Presentation (Nov. 18, 2004): *The Nonnegative Matrix Factorization for Text Mining*.
- Presentation (Oct. 29, 2003): *Linked Data and a MFPT Alternative to LSI*.
- Dept. of Energy Computational Science Graduate Fellows Conference. Washington, DC, June
Invited Speaker: *Information Retrieval and Computing: The Big Picture*.
- The Boeing Company. Seattle, WA. January 23, 2003.
Presentation: *Markov Chains, Information Retrieval and the Updating Problem*.

Academic

- Davidson College, Mathematics Department Seminar. Charlotte, NC, February 16, 2006.
Presentation: *An Introduction to the Use of Link Analysis by Web Search Engines*.
- INFORMS Annual Meeting. San Francisco, CA, November 14, 2005.
Presentation: *The Nonnegative Matrix Factorization in Data Mining*.
- SIAM Annual Meeting. New Orleans, LA, July 11-15, 2005. Invited Symposium Organizer
Presentation: *Introduction to Eigenvector Methods in Information Retrieval*.
- University of Delaware, SIAM Student Chapter Seminar. Newark, DE, May 5, 2005.
Presentation: *An Introduction to the Use of Link Analysis by Web Search Engines*.
- SIAM Southeastern Section Annual Meeting. Charleston, SC, March 25-26, 2005.
Presentation: *Text Mining using the Nonnegative Matrix*.
- MAA Southeastern Section 84th Annual Meeting. Raleigh, NC, March 11-12, 2005.
Presentation: *Information Retrieval and Web Search*.
- SIAM Computational Science and Engineering Conference. Orlando, FL, Feb. 11-15, 2005.
Presentation: *Updating the Stationary Vector of an Irreducible Markov Chain*.
- Columbia University, Inaugural SIAM Student Chapter Seminar. NY, NY, Nov. 23, 2004.
Presentation: *An Introduction to the Use of Link Analysis by Web Search Engines*
- SIAM Annual Meeting. Portland, Oregon. July 12-16, 2004. SIAG-LA-sponsored symposium
Presentation: *Updating PageRank*.
- The Mathematics of Web Search and Meta-Search. Bertinoro, Italy, June 19-26, 2004.
Presentation: *Updating and Reordering for the PageRank Problem*
- World Wide Web Conference. New York, NY, May 19-21, 2004.
Poster Presentation: *Updating PageRank with Iterative Aggregation*
- Mt. St. Mary's College, Math. and Comp. Science Seminar. Emmitsburg, MD, Apr. 19, 2004.
Presentation: *An Introduction to the Use of Link Analysis by Web Search Engines*
- College of Charleston, Mathematics Seminar. Charleston, SC, Feb. 27, 2004.
Presentation: *Solution Methods for the PageRank Problem*.
- Emory University, Computational Mathematics Seminar. Atlanta, GA, Jan. 30, 2004.
Presentation: *Updating Large-Scale Markov Chains*.
- Stanford University, Scientific Computing and Comp. Math. Seminar. Palo Alto, CA, Nov. 17, 2004.
Presentation: *Updating PageRank*.
- Co-Chair. Fourth International Conference on the Numerical Solution of Markov Chains.
University of Illinois at Urbana-Champaign. September 3-5, 2003.
Keynote Address: *The Life and Work of A. A. Markov*.
- Minisymposium Organizer. Search Engines, Markov Chains and Clustering. SIAM Conference
on Applied Linear Algebra, College of William and Mary, July 15-19, 2003.
Presentation: *An Introduction to Markov-based Information Retrieval Systems*.
- Co-Chair. Matrix Analysis and Applied Linear Algebra: C.D. Meyer's 60th. Raleigh, NC, May 15-19, 2003.
- Third SIAM Int. Conference on Data Mining; Text Mining Workshop. San Francisco, CA, May 15-19, 2003.
- Second SIAM Int. Conference on Data Mining; Text Mining Workshop. Arlington, VA, Apr. 15-19, 2002.
- Preconditioning Techniques for Large Sparse Matrix Problems, Tahoe City, CA, Apr. 29, 2001
Presentation: *Preconditioning for Stochastic Automata Networks*.

RESEARCH Publications

- Amy N. Langville and Carl D. Meyer. *Google's PageRank and Beyond: The Science of Search Engine*. Princeton University Press, forthcoming.
- Amy N. Langville, Michael W. Berry, Murray Browne, V. Paul Pauca, and Robert J. Plemmons. Algorithms and Applications for the Nonnegative Matrix Factorization. *Computational Statistics Analysis*. Elsevier. Submitted Jan. 2006.
- Amy N. Langville, Carl D. Meyer, Russell Albright, James Cox, and David Duling. Initializations for Nonnegative Matrix Factorization. *Proceedings of the Twelfth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*. ACM, August 23-26, 2006. Submitted.
- Andre Berger, Nader Razouk, Greg Angelides, Andy Bartlett, Amy N. Langville, Zhilin Li, Craig Lipl Mavinga, Elizabeth Perez, Eamonn Tweedy, Erik Wheeler. Locally Constrained Shortest Paths as Application in Mission Planning. *Proceedings of the 44th ACM Southeast Conference*. ACM, M
- Amy N. Langville and Carl D. Meyer. A Survey of Eigenvectors methods for Web Information Retrieval. *Review*, 47(1):135-161, 2005.
- Amy N. Langville and Carl D. Meyer. Deeper Inside PageRank. *Internet Mathematics*, 1(3):335-380,
- Amy N. Langville and Carl D. Meyer. The Use of Linear Algebra by Web Search Engines. *IMAGE Newsletter*, 33:2-6, Dec. 2004.
- Amy N. Langville and Carl D. Meyer. A Reordering for the PageRank problem. *SIAM Journal on Scientific Computing*, forthcoming.
- Amy N. Langville and Carl D. Meyer. Updating the Stationary Vector of an Irreducible Markov Chain with an Eye on Google's PageRank. *SIAM Journal of Matrix Analysis*, forthcoming.
- Amy N. Langville and Carl D. Meyer. Updating PageRank with Iterative Aggregation. *Proceedings of Thirteenth World Wide Web Conference*. New York: ACM Press, 392-393, 2004.
- Gely P. Basharin, Amy N. Langville, and Valeriy A. Naumov. The Life and Work of A. A. Markov. *Linear Algebra and its Applications*, 386:3-26, 2004.
- Amy N. Langville and William J. Stewart, eds. *Proceedings of the 4th International Conference on the Numerical Solution of Markov Chains*. University of Illinois at Urbana-Champaign Press, Sept.
- Amy N. Langville. The Linear Algebra behind Search Engines. *JOMA Online*, December 2005.
- Amy N. Langville and William J. Stewart. A Kronecker Product Approximate Preconditioner for SAA. *Journal of Numerical Linear Algebra*, 11(8):723-752, 2004.
- Amy N. Langville. The Kronecker Product and Stochastic Automata Networks. *Journal of Computational and Applied Mathematics*, 167(2): 429-447, 2004.
- Amy N. Langville and William J. Stewart. Testing the nearest Kronecker product preconditioner on MCs and SANs. *INFORMS Journal on Computing*, 16(3):300-315, 2004.
- Norm Curet and Amy N. Langville. Applying Mathematical Programming Techniques to the Network Diversion Problem. NSA Unclassified Internal Report. R55-052-98. Sept. 1998.

RESEARCH Experience

Consultant to Text Mining Group at SAS Institute, Inc., 2004-present

- develop algorithms for the nonnegative matrix factorization
- produce prototype code in Matlab
- survey work in field and give progress presentations

Consultant to The Boeing Company, Inc., 2003

- developed link analysis algorithms for directed graphs

Postdoctoral Researcher, Center for Research in Scientific Computation, 2002-2005

- developed algorithms for information retrieval systems
- discovered new theoretical results for clustering and updating Markov chains
- wrote NSF proposals with NCSU and SAS to study Markov chains and information retrieval
- organized recent Markov chain conferences and symposia at SIAM and INFORMS conference
- referee for Linear Algebra and its Applications, SIAM journals, Performance Evaluation, BIT,

National Security Agency SPORT Program, 1998

- one of 5 participants in national program to work NSA's operations research problems
- developed and implemented network cutset algorithms in GAMS
- briefed product to customers and demonstrated its capability

TEACHING

College of Charleston Assistant Professor

MATH 105 – Business Calculus, spring 2006
MATH 120 – Calculus I, fall 2005
MATH 552 – Operations Research, spring 2006
MATH 551 – Optimization, fall 2005

North Carolina State University Instructor

MA 305 – Elementary Linear Algebra, summer 2004, spring 2005
MA 523 – Matrix Theory and Applied Linear Algebra, fall 2004
MA 242 - Calculus III, spring 2003, fall 2004, spring 2005
MA 241 - Calculus II, summer 2002, fall 2002
MA 107 - Precalculus, fall 2001
MA 421 - Introduction to Probability, spring 2001
MA 141 - Calculus I, fall 2000, fall 1998
MA 121 - Elements of Calculus, summer 2000, summer 1999
MA 131 - Calculus for Life and Management Sciences, spring 1999, spring 2002

Meredith College Adjunct Faculty

MAT 120 - Finite Mathematics, fall 2001
MAT 141 – College Algebra, summer 2004

Teaching Programs and Workshops at North Carolina State University

Preparing the Professoriate, for MA 421, 2000-2001

Awards:

G E. Jones Distinguished Achievement Award, 2005-2006
Maltbie Award for Outstanding Teaching, 2000-2001
Outstanding Teaching Assistant, 1999-2000

Courses:

EMS 786-Teaching in College
ENG 610A-Advanced Writing for Academics

Workshops:

EDTECH – Education and Technology
Mentoring Graduate Students for Success
Felder/Brent Effective College Teaching
Women in Academic Careers Conference

Faculty Center for Teaching and Learning - Portfolio Workshop
Preparing the Professoriate Lecture series
Campus Writing and Speaking Lecture series
Certificates: NCSU Teaching, MA Dept. Teaching, NCSU Leadership Program