

Neng Fan, PhD

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Discrete Math and Complex Systems
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Education

Ph.D. Industrial & Systems Engineering, University of Florida, August 2011.

Advisor: Distinguished Professor Panos M. Pardalos

Dissertation Topic: Combinatorial and Nonlinear Optimization Methods with Applications in Data Clustering, Biclustering and Power Systems

M.S. Industrial & Systems Engineering, University of Florida, May 2009.

M.S. Applied Mathematics (Combinatorics & Graph Theory), Nankai University, China, June 2007.

B.S. Information & Computational Science, Wuhan University, China, June 2004.

Research Interests

Large-Scale Mathematical Programming Methods, including cutting plane and decomposition methods for integer programming, combinatorial optimization, stochastic programming and multilevel programming, High-performance Computing, Energy Systems Modeling and Optimization, Data Mining

Academic Appointments

Postdoctoral Appointee, Discrete Math and Complex Systems, Sandia National Laboratories, Albuquerque, New Mexico, August 2011–present.

- Develop novel methods in large-scale combinatorial optimization and stochastic optimization, bilevel integer programming.
- Perform applications of novel methods in smart grids, power systems, etc. , e.g., transmission expansion planning, unit commitment with renewable energy, PMU placement problem, contingency analysis, etc.

Graduate Research Assistant, D-6 Risk Analysis and Decision Support Systems, Los Alamos National Laboratory, Los Alamos, New Mexico, August 2010–May 2011.

- Developed novel methods in integer programming for network interdiction problems.
- Analyzed vulnerability of networks, electrical power grids, etc.

Research and Teaching Assistant, Center for Applied Optimization, Department of Industrial and Systems Engineering, University of Florida, Gainesville, Florida, August 2007–August 2011.

- Conducted research in integer programming, combinatorial optimization, data mining and stochastic and robust optimization methods for problems like graph partitioning, crossing minimization problem, biological and social network analysis, etc.

- Involved in writing proposals for funding with Dr. Pardalos, e.g.,
one proposal obtained \$1.5M from Veterans Health Administration, Improvement Capability Grant "Applying Systems Engineering Concepts to Improve Efficiency, Patient Satisfaction, and Quality of Care in a Veterans Health Administration Medical Center", 3 years (2009-2011).
- Acted as a teaching assistant for 9 courses.

Publications

Journals [J]

- N. Fan, D. Izraelevitz, F. Pan, P.M. Pardalos, J. Wang, A mixed integer programming approach for optimal power grid intentional islanding, *Energy Systems*, Vol. 3(1), pp 77-93, DOI: 10.1007/s12667-011-0046-5, 2012. [J1]
- H. Liu, N. Fan, P.M. Pardalos, Generalized Lagrange function and generalized weak saddle points for a class of multiobjective fractional optimal control problems, *Journal of Optimization Theory and applications*, DOI: 10.1007/s10957-012-0007-8, online first, 2012. [J2]
- N. Fan, P.M. Pardalos, Multi-way clustering and biclustering by the Ratio cut and Normalized cut in graphs, *Journal of Combinatorial Optimization*, Vol. 23(2), pp 224-251, DOI: 10.1007/s10878-010-9351-5, 2012. [J3]
- N. Fan, Q.P. Zheng, P.M. Pardalos, Robust optimization of graph partitioning involving interval uncertainty, *Theoretical Computer Science*, DOI: 10.1016/j.tcs.2011.10.015, online first, 2011. [J4]
- N. Fan, P.M. Pardalos, A rearrangement of adjacency matrix based approach for solving the crossing minimization problem, *Journal of Combinatorial Optimization*, Vol. 22(4), pp 747-762, DOI: 10.1007/s10878-010-9326-6, 2011. [J5]
- N. Fan, H. Xu, F. Pan, P.M. Pardalos, Economic analysis of the $N-k$ power grid contingency selection and evaluation by graph algorithms and interdiction methods, *Energy Systems*, Vol. 2(3-4), pp 313-324, DOI: 10.1007/s12667-011-0038-5, 2011. [J6]
- N. Fan, P.M. Pardalos, Linear and quadratic programming approaches for the general graph partitioning problem, *Journal of Global Optimization*, Vol. 48(1), pp 57-71, DOI: 10.1007/s10898-009-9520-1, 2010. [J7]
- N. Fan, S. Mujahid, J. Zhang, P. Georgiev, P. Papajorgji, I. Radziukyniene, B. Neugaard, P.M. Pardalos, Nurse scheduling problem: an integer programming model with a practical application in a VA hospital, submitted, 2010. [J]
- N. Fan, J.-P. Watson, Advanced optimization models and algorithms for the multi-channel PMU placement problem considering redundancy and contingencies, extended abstract accepted by *IEEE Trans. Power Systems*, 2011. [J]

Proceeding [P] and Book Chapters [C]

- N. Fan, J.-P. Watson, Solving the Connected Dominating Set Problem and Power Dominating Set Problem by Integer Programming, submitted to *The 6th Annual International Conference on Combinatorial Optimization and Applications (COCOA 2012)*, 2012. [P]
- R. Chen, A. Cohn, N. Fan, A. Pinar, $N-k-\epsilon$ survivable power system design, *Proc. of 12th Intl. Conf. Probabilistic Methods Applied to Power Systems, PMAAPS 2012*, accepted, 2012. [P1]

N. Fan, R. Chen, J.-P. Watson, $N-1-1$ contingency-constrained optimal power flow by interdiction methods, *Proceedings of IEEE PES General Meeting 2012*, accepted, 2012. [P2]

N. Fan, Q.P. Zheng, P.M. Pardalos, On the two-stage stochastic graph partitioning problem, In: Wang, W., Zhu, X., Du, D.-Z. (eds.) *Combinatorial Optimization and Applications (COCO A 2011)*, pp. 500–509, DOI: 10.1007/978-3-642-22616-8_39, *Lecture Notes in Computer Science* Vol. 6831, 2011. [P3]

N. Fan, F. Pan, Locating phasor measurements and detecting cutset angles in power systems, *Proceedings of IEEE PES Conference on Innovative Smart Grid Technologies (ISGT 2011)*, DOI: 10.1109/ISGT.2011.5759187, 2011. [P4]

N. Fan, P.M. Pardalos, Robust optimization of graph partitioning and critical node detection in analyzing networks, In: Wu, W., Daescu, O. (eds.) *Combinatorial Optimization and Applications (COCO A 2010)*, Part I, pp. 170–183, DOI: 10.1007/978-3-642-17458-2_15, *Lecture Notes in Computer Science* Vol. 6508, 2010. [P5]

N. Fan, J. Zhang, A time-series-clustering method for analyzing and forecasting stock market based on graph models, *Proceedings of IERC-Industrial Engineering Research Conference*, 2010. [P6]

N. Fan, P.M. Pardalos, A. Chinchuluun, Graph partitioning approaches for analyzing biological networks, In: R.P. Mondaini (eds.) *BIOMAT 2009-International Symposium on Mathematical and Computational Biology*, World Scientific, pp 250-262, DOI: 10.1142/9789814304900_0017, 2009. [P7]

N. Fan, A. Chinchuluun, P.M. Pardalos, Integer programming of biclustering based on graph models, In: A. Chinchuluun, P.M. Pardalos, R. Enkhbat, I. Tseveendorj (eds.) *Optimization and Optimal Control: Theory and Applications*, Series: Springer Optimization and Its Applications, Vol. 39, pp 479-498, DOI: 10.1007/978-0-387-89496-6_23, 2010. [C1]

N. Fan, N. Boyko, P.M. Pardalos, Recent advances of data biclustering with application in computational neuroscience, In: W. A. Chaovalitwongse, P.M. Pardalos, P. Xanthopoulos (eds.) *Computational Neuroscience*, Series: Springer Optimization and Its Applications, Vol. 38, pp 105-132, DOI: 10.1007/978-0-387-88630-5_6, 2010. [C2]

P. Xanthopoulos, N. Boyko, N. Fan, P.M. Pardalos, Biclustering: algorithms and applications in data mining, *Wiley Encyclopedia of Operations Research and Management Science*, DOI: 10.1002/9780470400531.e-orms0105, 2010. [C3]

Working Papers

Integer programming approaches for the multistage PMU placement problem in power systems, to be submitted. [J]

Cutting plane algorithms for stochastic generation unit commitment with $N-k$ contingency constraints, in progress. [J]

$N-1-1$ Contingency-Constrained Generation Unit Commitment Problem, in preparation. [J]

Robust support vector machines with polyhedral uncertainty of the input data, to be submitted. [J]

Awards

Graduate Student Award for Excellence in Research, Department of Industrial and Systems Engineering, University of Florida, 2011.

Outstanding International Student Award, College of Engineering, University of Florida, 2010-2011.

INFORMS Annual Conference Future Academician Colloquia, Nominated by Dept. of Industrial and Systems Engineering, University of Florida, 2010.

Recipient of the Academic Achievement Certificate, University of Florida, 2008.

Recipient, Travel grant from Graduate Student Council, University of Florida, 2007, 2010.

Recipient of the Certificate of Achievement for successful participation, Mathematical Contest in Modeling (MCM), COMAP, 2003.

First Place Scholarship, Wuhan University, 2002-2003.

First Place Prize of National Award of China Undergraduate Mathematical Contest in Modeling (CUMCM), CSIAM, 2002.

National Scholarship for Undergraduate Students, Ministry of Education and Ministry of Finance, P. R. China, 2001-2002.

The Outstanding Student Award, Wuhan University, 2001, 2002, 2003.

Academic Services

Referee Service:

Associate Editor for journals Optimization Letters (OPTL), Energy Systems (ENSY), published by Springer.

Reviewer for IEEE Transactions on Smart Grid, Journal of Optimization Theory and Applications, Journal of Combinatorial Optimization, Environmental Modeling and Assessment, Computer Vision and Image Understanding, Science China Mathematics, etc.

Conference Organizer:

Stream Chair for Energy Applications, The 13th INFORMS Computing Society Conference, Santa Fe, NM, January 6-8, 2013. [[website](#)]

Member of Advisory Board, Conference on Systems and Optimization Aspects of Smart Grid Challenges, Gainesville, FL, April 28-30, 2011.

Member of Local Committee, International Conference on Systems Analysis Tools for Better Health Care Delivery: A New Engineering/Health Care Partnership, Gainesville, Florida, March 24 - 26, 2010.

Session Organizer:

Optimization Methods for Optimal Power Flow in Power Systems, in Cluster: Optimization/Global Optimization at the INFORMS Annual Meeting, Phoenix, AZ, Oct 2012.

Global Optimization Methods in Power Systems, in Cluster: Optimization/Global Optimization at the INFORMS Annual Meeting, Charlotte, NC, Nov 2011.

Applications of Stochastic Programming in Energy Systems, in Cluster: Optimization/Stochastic Programming at the INFORMS Annual Meeting, Charlotte, NC, Nov 2011.

Global Optimization & MINLP with Applications, in Cluster: Optimization/Global Optimization at the INFORMS Annual Meeting, Austin, TX, Nov 2010.

Academic Member:

Institute of Electrical and Electronics Engineers (IEEE) since 2011, Institute of Industrial Engineers (IIE) since 2010, Society for Industrial and Applied Mathematics (SIAM) since 2008, and Institute for Operations Research and Management Science (INFORMS) since 2007.

Presentations

Contingency-constrained stochastic unit commitment problem, INFORMS Optimization Society Conference, Coral Gables, FL, Feb 24, 2012

Contingency-constrained optimal power flow in power systems, 4th International Conference on the Dynamics of Information Systems, Gainesville, FL, Feb 21, 2012

PMU placement problems in smart grids, 5th Annual Postdoctoral Technical Showcase, Sandia National Laboratories, Albuquerque, NM, Dec 15, 2011.

Stochastic optimized restoration of interdicted power grids by mobile generators, INFORMS Computing Society 2011 Conference, Monterey, CA, Jan 10, 2011. & INFORMS 2011 Annual Meeting, Charlotte, NC, Nov 13, 2011.

Economic analysis of the $N-k$ power grid contingency selection and evaluation by graph algorithms and interdiction methods, Conference on Systems and Optimization Aspects of Smart Grid Challenges, Gainesville, FL, April 29, 2011.

Multi-way clustering and biclustering by graph partitioning approaches, Seminar at Center for Non-linear Studies (CNLS), Los Alamos National Laboratory, Los Alamos, NM, Apr 4, 2011.

Optimal power grid islanding, 3rd International Conference on Dynamics of Information Systems, Gainesville, FL, Feb 16, 2011.

Robust optimization of graph partitioning and critical node detection in analyzing networks, Industrial Engineering Research Conference, Cancun, Mexico, Jun 6, 2010 & The 4th Annual International Conference on Combinatorial Optimization and Applications (COCOA'10), Big Island, Hawaii, Dec 19, 2010.

Decomposition methods for solving the two-stage stochastic graph partitioning problem, INFORMS Annual Meeting, Austin, TX, Nov 9, 2010.

A rearrangement of adjacency matrix based approach for solving the crossing minimization problem, INFORMS Annual Meeting, Austin, TX, Nov 9, 2010.

Multi-way clustering and biclustering by the Ratio Cut and Normalized Cut in graphs, INFORMS Annual Meeting, Austin, TX, Nov 7, 2010.

Robust support vector machines with polyhedral uncertainty of the input data, Toulouse Global Optimization 2010 (TOGO), ENSEIHT and Ecole Polytechnique, France, Sep 1, 2010 & International Conference on Computational Management Science (CMS2010), Vienna, Austria, Jul 28, 2010 (Presented by Dr. Panos M. Pardalos).

Global optimization applications in biomedicine, Toulouse Global Optimization 2010 (TOGO), ENSEIHT and Ecole Polytechnique, France, Aug 31, 2010 (Presented by Dr. Pardalos).

A time-series-clustering method for analyzing and forecasting stock market based on graph models, Industrial Engineering Research Conference, Cancun, Mexico, Jun 6, 2010.

Graph partitioning based models for data clustering and biclustering, ISE Graduate Seminar, University of Florida, Apr 1, 2010.

Nurse scheduling problem: an integer programming model with a practical application in a VA hospital, International Conference on Systems Analysis Tools for Better Health Care Delivery: A New Engineering/Health Care Partnership, Gainesville, Florida, Mar 25, 2010.

Direct multi-group approaches of clustering for microarray data, INFORMS Annual Meeting 2009, San Diego, CA, Oct 14, 2009.

Integer programming and network flow approaches for solving gas transmission problem, INFORMS Annual Meeting 2009, San Diego, CA, Oct 13, 2009.

Graph models behind biclustering, 2009 Graduate Student Council Interdisciplinary Research Conference, University of Florida, Gainesville, FL, Feb 12, 2009.

Models of high-dimensional clustering of microarray data, INFORMS Annual Meeting 2008, Washington, DC, Oct 13, 2008.

RNA secondary structures and discrete structures: trees, paths, partitions, INFORMS Annual Meeting 2007, Seattle, WA, Nov 5, 2007.

Teaching Experience

Teaching Assistant, Dept. of Industrial & Systems Engineering, University of Florida, Gainesville, Florida, August 2007-August 2011.

EIN4354: Engineering Economy, Summer 2008, Spring/Summer 2009.

ESI4313: Operations Research 2, Fall 2008.

ESI4567: Matrix and Numerical Methods in Systems Engineering, Fall 2007/2009, Summer 2010.

ESI6321: Applied Probability Methods in Engineering, Spring 2008.

ESI6912: Introduction to Nonlinear Optimization, Spring 2010.

Skills

Computer: C++, ILOG CPLEX, Matlab, Maple, LaTeX, SPSS, Microsoft Office, etc.

Language: Fluent in English and Chinese.