

Steffen Rebennack, PhD

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Division of Economics & Business
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Employment

Assistant Professor, Operations Research
Division of Economics & Business
Colorado School of Mines, Golden, CO, USA

Since August 2010

Research Interests

Power Systems Optimization, Power Systems Modeling, Stochastic Optimization, Global Optimization, Decomposition Methods, Combinatorial Optimization, Integer Programming

Education

PhD, Industrial & Systems Engineering

August 2010

University of Florida, Gainesville, FL, USA

Thesis Title: "A Unified State-Space and Scenario Tree Framework for Multi-Stage Stochastic Optimization: An Application to Emission-Constrained Hydro-Thermal Scheduling"

Honorable Mention at 2010 George B. Dantzig Dissertation Award

Advisor: Prof. Panos M. Pardalos

GPA: 4.00 / 4.00

Master of Science Management

August 2010

University of Florida, Gainesville, FL, USA

Warrington College of Business Administration

GPA: 3.89 / 4.00

Master of Science

December 2007

University of Florida, Gainesville, FL, USA

College of Engineering

GPA: 4.00 / 4.00

Diploma in Mathematics (equivalent to US Master's)

July 2006

Ruprecht-Karls Universität Heidelberg, Heidelberg, Germany

Minor: Computer Science

Thesis Topic: "Maximum Stable Set Problem: A Branch & Cut Solver"

Advisor: Prof. Gerhard Reinelt

Degree: "Mit Auszeichnung" (Summa cum laude)

Publications

Journal Papers

8. Steffen Rebennack, Bruno Flach, Mario V.F. Pereira, and Panos M. Pardalos, "Stochastic Hydro-Thermal Scheduling under CO₂ Emission Constraints," *accepted* for publication in **IEEE Transactions in Power Systems**
7. Steffen Rebennack, Gerhard Reinelt, and Panos M. Pardalos, "A Tutorial on Branch & Cut Algorithms for the Maximum Stable Set Problem," *accepted* for publication in **International Transactions in Operational Research**, DOI:10.1111/j.1475-3995.2011.00805.x
6. Steffen Rebennack, Marcus Oswald, Dirk Oliver Theis, Hanna Seitz, Gerhard Reinelt, and Panos M. Pardalos, "A Branch and Cut Solver for the Maximum Stable Set Problem," *accepted* for publication in **Journal of Combinatorial Optimization**, DOI:10.1007/s10878-008-9175-8

Publications (cont'd)

Journal Papers (cont'd)

5. Steffen Rebennack, Josef Kallrath, and Panos M. Pardalos, “*Optimal Storage Design for a Multi-Product Plant: A Non-Convex MINLP Formulation*,” *accepted* for publication in **Computers & Chemical Engineering**, 35(2): 255-271, 2011
The corresponding GAMS code has been added to the GAMS library with the name “`tanksize`”
4. Vitaliy Yatsenko, Nikita Boyko, Steffen Rebennack, and Panos M. Pardalos, “*Space Weather Influence on Power Systems: Prediction, Risk Analysis, and Modeling*,” **Energy Systems**, 1(2): 197–207, 2010
3. Steffen Rebennack, Ashwin Arulsevan, Lily Elefteriadou, and Panos M. Pardalos, “*Complexity Analysis for Maximum Flow Problems with Arc Reversals*,” **Journal of Combinatorial Optimization**, 19(2): 200-216, 2010
2. Steffen Rebennack, Artyom Nahapetyan, and Panos M. Pardalos, “*Bilinear Modeling Solution Approach for Fixed Charged Network Flow Problems*,” **Optimization Letters**, 3(3): 347–355, 2009
1. Steffen Rebennack, Josef Kallrath, and Panos M. Pardalos, “*Column Enumeration based Decomposition Techniques for a Class of Non-Convex MINLP Problems*,” **Journal of Global Optimization**, 43(2-3): 277–297, 2009

Invited and Reviewed Book Chapters

7. Steffen Rebennack, Josef Kallrath, and Panos M. Pardalos, “*Energy Portfolio Optimization for Electric Utilities: Case Study for Germany*,” chapter 14 in “*Energy, Natural Resources and Environmental Economics*,” edited by Endre Bjørndal, Mette Bjørndal, Panos M. Pardalos, and Mikael Rönnqvist, series “*Energy Systems*,” Energy Systems, Springer, pp. 221-246, 2010
The corresponding GAMS code has been added to the GAMS library with the name “`poutil` (Portfolio Optimization for electric UTILities)”
6. Qipeng Phil Zheng, Steffen Rebennack, Niko A. Iliadis, and Panos M. Pardalos, “*Optimization Models in The Natural Gas Industry*,” chapter 6 in “*Handbook of Power Systems I*,” Energy Systems, Springer, pp. 121–148, 2010
5. Panos M. Pardalos and Steffen Rebennack, “*Computational Challenges with Cliques, Quasi-cliques and Clique Partitions in Graphs*,” chapter 2 in “*Experimental Algorithms*,” series “*Lecture Notes in Computer Science*,” vol. 6049/2010, Springer, pp. 13–22, 2010
4. Vitaliy A. Yatsenko, Panos M. Pardalos, and Steffen Rebennack, “*Critical States of Nuclear Power Plant Reactors and Bilinear Modeling*,” chapter 7 in “*Optimization in the Energy Industry*,” edited by Josef Kallrath, Panos M. Pardalos, Steffen Rebennack, and Max Scheidt, series “*Energy Systems*,” vol. 1, Springer, pp. 149–166, 2009
3. Saed Alazamir, Steffen Rebennack, and Panos M. Pardalos, “*Improving the Neighborhood Selection Strategy in Simulated Annealing using Optimal Stopping Problem*,” in “*Global Optimization: Focus on Simulated Annealing*,” edited by Cher Ming Tan, I-Tech Education and Publication, pp. 363-382, 2008
2. Steffen Rebennack, “*The Ellipsoid Method*,” in *Encyclopedia of Optimization*, 2nd edition, edited by Christodoulos A. Floudas and Panos M. Pardalos, Springer, pp. 890-899, 2008
1. Steffen Rebennack, “*Stable Set Problem: Branch & Cut Algorithms*,” in *Encyclopedia of Optimization*, 2nd edition, edited by Christodoulos A. Floudas and Panos M. Pardalos, Springer, pp. 3676-3688, 2008

Refereed Conference Proceedings

3. Petros Xanthopoulos, Steffen Rebennack, Chang-Chia Liu, Panos M. Pardalos, Gregory Holmes, and Basim Uthman, “*A novel wavelet based algorithm for spike and wave detection in absence epilepsy*,” *published* in the proceedings of IEEE International Conference on Bioinformatics & Bioengineering, May/June, 2010
2. Steffen Rebennack, Niko A. Iliadis, Josef Kallrath, and Panos M. Pardalos, “*Short Term Portfolio Optimization for Discrete Power Plant Dispatching*,” *published* in the IEEE PES GM proceedings, July 2009
1. Steffen Rebennack, Niko A. Iliadis, Mario V.F. Pereira, and Panos M. Pardalos, “*Electricity and CO2 Emissions System Prices Modeling and Optimization*,” *published* in the IEEE PowerTech conference proceedings, June 2009

Publications (cont'd)

Books Edited

2. *“Handbook of Power Systems,”* edited by Steffen Rebennack, Panos M. Pardalos, Mario V.F. Pereira, and Niko A. Iliadis, Springer, to appear, 2 volumes, ISBN: 978-3-642-02492-4, 978-3-642-12685-7
1. *“Optimization in the Energy Industry,”* edited by Josef Kallrath, Panos M. Pardalos, Steffen Rebennack, and Max Scheidt, in series “Energy Systems,” vol. 1, Springer, 533 pp., 2009, ISBN: 978-3-540-88964-9

Special Issue of Journals Edited

1. Computational Management Science, 5(4), 2008, edited by Josef Kallrath, Panos M. Pardalos and Steffen Rebennack

Patent (pending)

1. Basim Uthman, Panos M. Pardalos, Petros Xanthopoulos, Chang-Chia Liu, and Steffen Rebennack, *“Time Frequency Transformation Analysis for Detection and Quantification of Epileptiform Activity Load in Generalized Epilepsies,”* patent application UF-731P

Conference Presentations

19. **“15th Combinatorial Optimization Workshop,” Aussois, France, January 2011**
Title of presentation: “Two-Stage Stochastic Minimum $s - t$ Cut Problem and Total Unimodularity”
18. **“INFORMS Annual Meeting” Austin, USA, November 2010**
Title of presentation: “A Unified State-space and Scenario Tree Framework for Multi-Stage Stochastic Optimization”
17. **“INFORMS Annual Meeting” Austin, USA, November 2010**
Title of presentation: “Optimization Challenges for Energy System with CO₂ Emission Targets”
16. **“Energy, Sustainability and Climate Change,” Gainesville, USA, February 2010**
Title of presentation: “CO₂ Emissions Allowance Effects on Optimal Expansion Planning”
15. **“Mathematical Optimization in Transportation - Airline, Public Transport, Railway,” Bad Honnef, Germany, November 2009**
Title of presentation: “Branch and Price Algorithm for Multimodal Evacuation Problems”
14. **“INFORMS Annual Meeting,” San Diego, USA, October 2009**
Title of presentation: “Electricity System Price and CO₂ Emission Allowance System Price Modeling via Stochastic Programming”
13. **“ISMP,” Chicago, USA, August 2009**
Title of presentation: “Modeling of Multiple Stochasticities in Energy Optimization Using SDP/SDDP”
12. **“EURO XXIII,” Bonn, Germany, July 2009**
Title of presentation: “Optimization Applications in the Natural Gas Industry”
11. **“IEEE PowerTech 2009,” Bucharest, Romania, June-July 2009**
Title of presentation: “Electricity and CO₂ Emissions System Prices Modeling and Optimization”
10. **“Scheduling in the Process Industry,” Bad Honnef, Germany, November 2008**
Title of presentation: “Optimal Tank Design: A Nonconvex MINLP Formulation”
9. **“MedPower 2008,” Thessaloniki, Greece, November 2008**
Title of presentation: “Utilities Short-Term Power Portfolio Optimization”
8. **“INFORMS Annual Meeting,” Washington, USA, October 2008**
Title of presentation: “A Review on Stochastic Optimization Algorithms for Power Systems Optimization”
7. **“INFORMS Annual Meeting,” Washington, USA, October 2008**
Title of presentation: “Electricity Portfolio Optimization for Public Services: A Case Study”
6. **“Yalta Conference on Discrete and Global Optimization,” Yalta, Ukraine, July-August 2008**
Title of presentation: “Unit Commitment Problem for German Public Services”
5. **“Energy, Natural Resource and Environmental Economics,” Bergen, Norway, May 2008**
Title of presentation: “Portfolio Optimization for Electric Utilities: Case study for Germany”

Conference Presentations (cont'd)

4. **“Sensors 2008: Theory, Algorithms, and Applications,” Shalimar, USA, April 2008**
Title of presentation: “Complexity Analysis for Network Flow Problems with Arc Reversals”
3. **“1st Annual Student Conference,” Gainesville, USA, March 2008**
Title of presentation: “Complexity Analysis for Network Flow Problems with Arc Reversals”
2. **“INFORMS Annual Meeting,” Seattle, USA, November 2007**
Title of presentation: “Packing Circles and Polygons into Rectangles”
1. **“Advances in Global Optimization: Methods and Applications,” Mykonos, Greece, June 2007**
Title of presentation: “Column Enumeration based Decomposition Techniques for a Class of Non-Convex MINLP Problems”

Invited Presentations (other than conference):

7. **“Eidgenössische Technische Hochschule (ETH),” Zürich , Switzerland, March 2011**
Title of presentation: “Combining Sampling Based and Scenario Based Methods: A Case Study for Stochastic Dual Dynamic Programming”
6. **“Technische Universität (TU) Berlin,” Berlin, Germany, January 2011**
Title of presentation: “On the Two-Stage Stochastic Minimum $s - t$ Cut Problem and Total Unimodularity”
5. **“NREL and NOAA ESRL,” Boulder, USA, December 2010**
Title of presentation: “Calculation of Marginal CO₂ Emissions Allowances Operational Cost for Hydro-Dominated Power Systems”
4. **“Universidad Autónoma de Nuevo León,” Monterrey, Mexico, October 2010**
Title of presentation: “Stochastic Hydro-Thermal Scheduling under CO₂ Emission Constraints”
3. **“Universidad Autónoma de Nuevo León,” Monterrey, Mexico, October 2010**
Title of presentation: “Workshop on Stochastic Hydro-Thermal Scheduling”
2. **“Universidade Federal do Rio de Janeiro,” Rio de Janeiro, Brazil, August 2009**
Title of presentation: “Complexity Analysis for Static and Dynamic Maximum Flow Problems with Arc Reversals”
1. **“University of L’Aquila,” L’Aquila, Italy, March 2006**
Title of presentation: “Maximum Stable Set Problem: A Branch & Cut Solver”

Conference (Co-)Organization

2. Co-organizer together with Panos M. Pardalos, “SEA2011 - 10th Internatioanl Symposim on Experimental Algorithms,” 5-7 May 2010, Chania, Crete, Greece
1. Co-organizer together with Niko A. Iliadis, Mario V.F. Pereira, Luiz-Augusto Barroso and Panos M. Pardalos, “Power Systems Modeling 2009,” 18-21 March 2009, University of Florida, Gainesville, Florida, USA

Conference Sessions (Co-)Organization

- INFORMS 2010: “Multi-stage Stochastic Optimization Applied to Energy Planning”
- INFORMS 2009: “Green Energy I-III,” “Energy II,” “Risk Management,” “Networks and Pricing,” “Optimal Pricing”
- ISMP 2009: “Risk Management, Networks & Pricing”
- EURO XXIII 2009: “Optimization in Sustainable Energy,” “Financial Aspects of Energy Topics,” “Energy, Oil and Gas 1”

Associate Editor

- Journal of Global Optimization since 2010
- Optimization Letters since 2010
- Energy Systems since 2009

Scientific Reviewer

- Applied Thermal Engineering
- Computational Management Science
- Computational Optimization and Applications
- Computers & Operations Research
- Energy Systems
- IEEE Transactions on Power Systems
- International Journal of Operations Research and Information Systems
- Journal of Combinatorial Optimization
- Journal of Global Optimization
- Journal of Optimization Theory and Applications
- Networks
- OMEGA: The International Journal of Management Science
- Operations Research
- Optimization and Engineering
- Optimization Letters
- Springer book chapters

Teaching Experience

Course	Description	Term	# students	evaluation	∅ department evaluation	∅ student grade
ESI 4312	Operations Research I	Spring 2009	48	4.90 / 5.00	4.01 / 5.00	3.16 / 4.00
EBGN 525	Operations Research Methods	Fall 2010	65	3.40 / 4.00	3.10 / 4.00	3.14 / 4.00
EBGN 528	Industrial Systems Simulation	Fall 2010	21	2.90 / 4.00	3.10 / 4.00	3.33 / 4.00

Professional Experience

BASF SE, Ludwigshafen, Germany

Freelancer

June 2004 to present

- Worked in a scheduling project directed by Dr. Kallrath and Prof. Floudas, Princeton University
- Tested and evaluated data for input from computational results
- Designed, implemented and maintained software for visualizing the state task network, the schedule in gantt-charts and the tank filling levels

Intern

February 2004 to May 2004

- Implemented and tested a solver for a time constrained shortest path problem via Branch & Price
- Participated in the first meetings for a large scheduling project of a chemical plant which transformed into a freelance project
- Analyzed system processes and extracted data

EnerCoRD, Athens, Greece

Intern

June 2008 to July 2008 and September 2008 to January 2009

- Participated in consulting project for Public Power Company (PPC); responsible for the selection, communication and evaluation of potential software provider for PPC
- Performed research in the area of stochastic optimization applied to power systems
- Submitted two research papers and presented two talks at scientific conferences

DASH-Optimization, Tokyo, Japan

Intern

August 2004 to October 2004

- Provided customer support regarding Mosel and XpressMP
- Analyzed the introduction into the Japanese market of the constraint programming based software package XpressCP
- Recommended best possible use for industrial applications

Academic Experience

University of Florida , Gainesville, FL, USA	
<i>Research Assistant</i> for Prof. Pardalos	Spring 2007, 2010 Summer 2007, 2008, 2009, 2010 Fall 2006, 2008
<i>Teaching Assistant</i> for Global Optimization	Fall 2009
<i>Teaching Assistant</i> for Operations Research I	Spring 2008
<i>Teaching Assistant</i> for Deterministic Methods of Operations Research	Fall 2007
PSR , Rio de Janeiro, Brazil	
<i>Research Collaboration</i>	May to August 2009
University of Pittsburgh , Pittsburgh, PA, USA	
<i>Invited Research Trip</i> , collaboration with Dr. Prokopyev	March 2009
Glushkov Institute of Cybernetics , Kyiv, Ukraine	
<i>NSF Fellowship</i> to participate in the <i>International Research Experience for Students (IRES)</i> , a workshop on <i>Discrete and Nondifferentiable Optimization: Algorithms and Applications</i>	July to August 2008
University of L'Aquila , L'Aquila, Italy	
<i>Invited Research Trip</i>	March 2006
Ruprecht-Karls Universität Heidelberg , Heidelberg, Germany	
<i>Scientific Assistant</i> for Prof. Reinelt	October 2005 to March 2006
<i>Teaching Assistant</i> for Linear Algebra I	April 2004 to September 2004
Universität Mannheim , Mannheim, Germany	
<i>Teaching Assistant</i> for Calculus I & II	October 2002 to September 2003

Awards

13. Honorable Mention at 2010 George B. Dantzig Dissertation Award (of INFORMS)	November 2010
12. Graduate Student Award for Excellence in Teaching (of Department of Industrial & Systems Engineering, University of Florida)	April 2010
11. HHMI Science for Life Graduate Student Mentor Award (of Howard Hughes Medical Institute, University of Florida)	April 2010
10. Franklin Ethics Fellow (of Poe Center for Business Ethics, University of Florida)	April 2010
9. CARIPLO scholarship (of Stochastic Programming School, Bergamo, Italy)	September 2009
8. Graduate Student Award for Excellence in Research (of Department of Industrial & Systems Engineering, University of Florida)	April 2009
7. Gilbreth Memorial Fellowship (of IIE)	August 2008 to July 2009
6. Academic Achievement Certificate (of University of Florida International Center)	May 2007 and May 2008
5. Graduate Student Travel Grant Competition Winner (of Center for European Studies at the University of Florida)	March 2008
4. University of Florida Alumni Graduate Award	August 2006 to July 2010
3. Diploma in Mathematics "Mit Auszeichnung" (Summa cum laude) (of Ruprecht-Karls Universität Heidelberg, first award in 2 years)	August 2006
2. Medal of honor of the federal state of Sachsen, Germany	Spring 2003
1. Medal of honor of the DLRG organization	Spring 2003