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## RESEARCH EXPERTISE

Stochastic Combinatorial Optimization, Network Modeling for Disease Control and Nuclear Smuggler Interdiction

## ACADEMIC EXPERIENCE

### University of Texas at Austin

*Postdoctoral Fellowship in Operations Research* May 2008 – present  
With Dr. David Morton, focused on stochastic optimization for national security and epidemiology.

### University of Texas at Austin

*PhD Computer Science* Sep. 2002 – May 2008  
Advisor Dr. Greg Plaxton. 4.0/4.0 GPA. Merit scholarship.  
Thesis: *Coping with Dynamic Membership, Selfishness, and Incomplete Information: Applications of Probabilistic Analysis and Game Theory*

### University of Michigan – Ann Arbor

*B.S. Mathematics, B.S. Computer Science* Sep. 1999 – May 2002  
4.0/4.0 GPA. Graduated in 3 years. Merit scholarships.

## JOURNAL AND BOOK CHAPTER PUBLICATIONS

1. **Nedialko B. Dimitrov**, Dennis P. Michalopoulos, David P. Morton, Michael V. Nehme, Feng Pan, Elmira Popova, Erich A. Schneider, and Gregory G. Thoreson. Network Deployment of Radiation Detectors with Physics-Based Detection Probability Calculations. *Annals of Operations Research*, doi:10.1007/s10479-009-0677-2 in press, December 2009.
2. **Nedialko B. Dimitrov**, Sebastian Goll, Nathaniel Hupert, Babak Pourbohloul, and Lauren Ancel Meyers. Optimizing Tactics for use of the U.S. Antiviral Strategic National Stockpile for Pandemic (H1N1) Influenza, 2009. *PLoS Currents: Influenza*, November 2009.
3. **Nedialko B. Dimitrov** and C. Greg Plaxton. Buyer-Supplier Games: Optimization Over the Core. *Theoretical Computer Science*, doi:10.1016/j.tcs.2009.05.017 in press, June 2009.
4. **Nedialko B. Dimitrov** and Stefanka Chukova. Warranty Optimization in a Dynamic Environment. *Journal of Applied Mathematics and Decision Sciences*, March 2009.
5. **Nedialko B. Dimitrov** and David P. Morton. Combinatorial Design of a Stochastic Markov Decision Process. in *Operations Research and Cyber-Infrastructure*, M.J. Saltzman, J.W. Chinnek and B. Kristjansson (eds.), Springer, New York, December 2008.

## COMPUTER SCIENCE CONFERENCE PUBLICATIONS

1. **Nedialko B. Dimitrov** and C. Greg Plaxton. Competitive Weighted Matching in Transversal Matroids. *Proceedings of the 35th International Colloquium on Automata, Languages and Programming (ICALP)*, July 2008.
2. **Nedialko B. Dimitrov** and Indrajit Roy. A Primal-Dual Resource Augmentation Analysis of a Constant Approximate Algorithm for Stable Coalitions in a Cluster. *Proceedings of the 20th Annual ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)*, June 2008.

3. **Nedialko B. Dimitrov** and C. Greg Plaxton. Optimal Cover Time for a Graph-Based Coupon Collector Process. *Proceedings of the 32nd Annual International Colloquium on Automata, Languages and Programming (ICALP)*, July 2005.

#### OTHER REFEREED CONFERENCE PUBLICATIONS

1. Harish Ganapathy, Siddhartha Banerjee, **Nedialko B. Dimitrov**, and Constantine Caramanis. Optimal Feedback Allocation For Cellular Uplink: Theory and Algorithms. *Proceedings of 47th Annual Allerton Conference on Communication, Control and Computing*, October 2009.
2. **N. Dimitrov**, M. Gonzalez, D. Michalopoulos, D. Morton, M. Nehme, F. Pan, E. Popova, K. Saeger, E. Schneider, and G. Thoreson. Interdiction of Smuggled Nuclear Material. *Proceedings of the American Nuclear Society 2008 Winter Meeting*, November 2008.
3. **N. Dimitrov**, M. Gonzalez, D. Michalopoulos, D. Morton, M. Nehme, E. Popova, E. Schneider and G. Thoreson. Interdiction Modeling For Smuggled Nuclear Material. *Proceedings of the 49th Annual Meeting of the Institute of Nuclear Materials Management (INMM)*, July 2008.
4. **Nedialko B. Dimitrov** and C. Greg Plaxton. Buyer-Supplier Games: Core Characterization and Computation. *Proceedings of the 5th Annual Workshop on Approximation and Online Algorithms (WAOA)*, October 2007.

#### PUBLICATIONS IN REVIEW

1. **Nedialko B. Dimitrov** and C. Greg Plaxton. Optimal Cover Time for a Graph-Based Coupon Collector Process. *Journal of Discrete Algorithms*, In Review. Submitted September 2009.
2. **Nedialko B. Dimitrov**, Sebastian Goll, Nathaniel Hupert, Babak Pourbohloul, and Lauren Ancel Meyers. Optimizing Tactics for use of the U.S. Antiviral Strategic National Stockpile for Pandemic (H1N1) Influenza, 2009. *PLoS Computational Biology*, Under second Review. Submitted November 2009.
3. **Nedialko B. Dimitrov** and Indrajit Roy. A Primal-Dual Resource Augmentation Analysis for the Cluster Profit Problem. *Mathematical Programming*, In Review. Submitted July 2009.
4. **Nedialko B. Dimitrov** and C. Greg Plaxton. Competitive Weighted Matching in Transversal Matroids. *SIAM Journal on Computing*, In Review. Submitted September 2008.

#### NON-PEER-REVIEWED PUBLICATIONS

1. **Nedialko B. Dimitrov** and C. Greg Plaxton. Competitive Weighted Matching in Transversal Matroids. *UT Austin, Technical Report TR-08-03*, January 2008.
2. **Nedialko B. Dimitrov** and Indrajit Roy. A Competitive, Primal-Dual Algorithm for Stable Coalitions in a Cluster. *UT Austin, Technical Report T-07-22*, May 2007.
3. **Nedialko B. Dimitrov** and C. Greg Plaxton. Buyer-Supplier Games: Core Characterization and Computation. *UT Austin, Technical Report T-06-19*, April, 2006.
4. **Nedialko B. Dimitrov** and C. Greg Plaxton. Optimal Cover Time for a Graph-Based Coupon Collector Process. *UT Austin, Technical Report TR-05-01*, January 2005.

#### WORK IN PROGRESS

The results for all these papers are complete and available, the papers are currently being written.

1. Constantine Caramanis, **Nedialko B. Dimitrov**, and David P. Morton. Tractability of Searching for Markovian Particles. [View a talk](#) on the results online.
2. Constantine Caramanis, **Nedialko B. Dimitrov**, and David P. Morton. Fast Algorithms for Markov Decision Processes with Expected Budget Constraints. [View a talk](#) on the results online.
3. **Nedialko B. Dimitrov**, and David P. Morton. Combinatorial Design of a Markov Decision Process. [View a talk](#) on the results online.

4. **Nedialko B. Dimitrov**, Sebastian Goll, and Lauren Ancel Meyers. Optimization of Targeted Epidemic Intervention Strategies.
5. Stavana Strutz, **Nedialko B. Dimitrov**, Stephen Szymanski, David P. Morton and Sahotra Sarkar. Mathematical Modeling and Control for Leishmaniasis in Texas.

### INVITED TALKS

1. Tutorial on Infectious Disease Modeling and Control. INFORMS Annual Meeting, Austin, TX. October 2010.
2. Optimizing U.S. Antiviral Strategic National Stockpile Countermeasures for 2009 (H1N1) Pandemic Influenza. Texas Advanced Computing Center Summer Supercomputing Institute, Austin, TX. August 2009.
3. Computing Epidemic Interventions Using MDPs. University of Michigan OR Seminar, Ann Arbor, MI. November 2008.
4. Competitive Weighted Matching in Transversal Matroids. Victoria University Stat/OR Seminar, Wellington, NZ. August 2008.

### ORGANIZED CONFERENCE SESSIONS

1. Markov Decision Processes in Healthcare. The Institute for Operations Research and the Management Sciences (INFORMS), San Diego, CA. October 2009.
2. Scheduling. The Institute for Operations Research and the Management Sciences (INFORMS), San Diego, CA. October 2009.
3. Stochastic Optimization for National Security and Military Applications. International Symposium on Mathematical Programming (ISMP), Chicago, IL. August 2009.
4. Algorithms for Uncertainty and Market Forces. The Institute for Operations Research and the Management Sciences (INFORMS), Washington, DC. October 2008.
5. Network Interdiction. Southwest Regional INFORMS Conference (SW Regional INFORMS), Texas A&M University, TX. April 2008.

### CONFERENCE PRESENTATIONS

1. Optimization of Targeted Epidemic Intervention Strategies. Epidemics, Athens, Greece. December 2009.
2. Computing Interventions for Vector Borne Diseases. The Institute for Operations Research and the Management Sciences (INFORMS), San Diego, CA. October 2009.
3. Fast Algorithms for MDPs with Expected Budget Constraints. International Symposium on Mathematical Programming (ISMP), Chicago, IL. August 2009.
4. Interdicting Smuggled Nuclear Material. European Conference on Operational Research (EURO), Bonn, Germany. July 2009.
5. New Developments in Searching for Markovian Particles. Applied Probability Society Conference (APS), Cornell University, NY. July 2009.
6. Interdicting Smuggled Nuclear Material: Models of Smuggler Movement (poster). Domestic Nuclear Detection Office Academic Research Initiative (DNDO ARI), Washington, DC. April 2009.
7. Combinatorial Design of a Stochastic Markov Decision Process. INFORMS Computing Society Conference (ICS), Charleston, SC. January 2009.
8. Interdiction, Search and Forensics for Smuggled Nuclear Material (poster). DIMACS Conference on Port Security, Rutgers University, NJ. November 2008.
9. Budgeted Disease Interdiction. The Institute for Operations Research and the Management Sciences (INFORMS), Washington, DC. October 2008.
10. Search. The Institute for Operations Research and the Management Sciences (INFORMS), Washington, DC. October 2008.
11. Competitive Weighted Matching in Transversal Matroids. International Colloquium on Automata, Languages and Programming (ICALP), Reykjavik, Iceland. July 2008.

12. Budgeted Disease Interdiction. Southwest Regional INFORMS Conference (SW Regional INFORMS), Texas A&M University, TX. April 2008.
13. Interdicting Smuggled Nuclear Material: Models of Smuggler Behavior (poster). Domestic Nuclear Detection Office Academic Research Initiative (DNDO ARI), Washington, DC. April 2008.
14. Buyer-Supplier Games: Optimization Over the Core. Workshop on Approximation and Online Algorithms (WAOA), Eilat, Israel. October 2007.
15. Optimal Cover Time for a Graph-Based Coupon Collector Process. International Colloquium on Automata, Languages and Programming (ICALP), Lisbon, Portugal. July 2005.

### ADDITIONAL CONFERENCES

1. Diseases in Nature Transmissible to Man (DIN), Fort Worth, TX. June 2009.
2. ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), Munich, Germany. June 2008.
3. Foundations of Computer Science (FOCS), Cambridge, MA. October 2003.

### PROPOSAL WRITING EXPERIENCE

1. National Institutes of Health (NIH). PI: Lauren Ancel Meyers and Alison Galvani. Co-wrote a funded grant supplement for computing controls for influenza epidemics. 2009-2014
2. Texas Department of State Health Services (DSHS). PI: Lauren Ancel Meyers. Co-wrote a funded grant to evaluate the performance of, and redesign, the Texas influenza-like illness monitoring network (ILINet) in preparation for Novel H1N1 in the fall of 2009. 2009-2009
3. National Science Foundation (NSF). PI: Greg Plaxton. Co-wrote a funded grant on computation in game theoretic environments. 2007-2010

### OTHER FUNDING SOURCES

1. Canadian Institutes of Health Research (CIHR). PI: Babak Pourbohloul. Partially funded to implement a modular, reusable optimization system to compute epidemic controls. 2009-2010
2. Domestic Nuclear Detection Office (DNDO). PI: David Morton. Postdoctoral fellowship on optimal distribution of nuclear detectors across border crossings, subject to a deployment budget. 2007-2012
3. Defense Threat Reduction Agency (DTRA). PI: Constantine Caramanis. Partially funded to optimize interventions and information gathering on networks in response to WMD attacks. 2008-2011

### PROFESSIONAL EXPERIENCE

#### University of Texas at Austin – Research

*Sep. 2002 – present*

Conduct research in optimization, algorithm design, probabilistic analysis, with applications in disease control and nuclear non-proliferation.

#### Los Alamos National Laboratory – Research

*May 2008 – Aug. 2008*

Conducted research in nuclear non-proliferation, focusing on placing nuclear detectors on border crossings.

#### Pulse Meridian – Startup Foundation

*May 2007 – Jan. 2008*

Founded a startup with focus on data driven optimization techniques. Work includes data modeling, optimization, and software design. The startup completed contracts for CNET Networks and others. Control of the startup was continued by other group members.

#### Pintail Technologies – Manufacturing Optimization

*Sep. 2007 – Dec. 2007*

Performed data modeling and optimization of semiconductor fabrication, with the goal of maximizing yield of good chips. This work was done through the Pulse Meridian startup.

**D. E. Shaw & Co. – Quantitative Analysis***May 2006 – Sep. 2006*

Performed statistical analysis and risk modeling of financial instruments. Applied efficient numerical and algorithmic techniques to create and evaluate models used in hedging against market moves.

**Amazon.com – Automated Record Linkage***May 2005 – Sep. 2005*

Applied recent machine learning research to the problem of record linkage. Used natural language processing to automate duplicate removal from a billion item database.

**Xoran Technologies – Low-Level Optimization***Jul. 2001 – Aug. 2001*

Optimized reconstruction of 3D CT scans through inline assembler in Windows and Linux. Specialized in using recent MMX and SSE technologies to increase parallelism of existing algorithms.

**TEACHING**

1. Taught a graduate course on *Stochastic Combinatorial Optimization*, Jan. 2009 - May 2009.  
Class website: <http://neddimitrov.org/index.php?page=200901SCO>
  - Class topics include: Approximation Algorithms, Online Algorithms, Bandit Optimization
  - Guided a semester-long research project for each student
  - Project focused on reading papers, writing a summary, and giving a research talk
  - Instructor approval rating: 4.4/5.0
  - One research project resulted in a peer-reviewed publication in the annual Allerton conference
2. More than 2.5 years of leading class sections in:
  - Applied Algorithms
  - Introductory Java
  - Introductory C++
3. Over 2.5 years of creating and grading homeworks, and holding office hours in:
  - Graduate Algorithms
  - Graduate Combinatorics
  - Numerical Methods
  - Discrete Math
4. Lifetime instructor approval rating: 4.2/5.0

**PROGRAMMING EXPERTISE**

- Expert in Python, including parallel programming, databases, visualization, scientific computing
- Expert in software design
- Expert in Geographic Information System (GIS) visualization tools
- Highly proficient in C++, Java, Perl, Matlab, SQL
- Experience in Lisp, Haskell, x86 assembler including SSE and SSE2

**PEER-REVIEW SERVICE**

- *Operations Research*
- *Annals of Operations Research*
- *Proceedings of the ACM-SIAM Symposium on Discrete Algorithms (SODA)*
- *Proceedings of the Symposium on Parallelism in Algorithms and Architectures (SPAA)*
- *Proceedings of the International Symposium on Distributed Computing (DISC)*

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LIST OF REFERENCES  
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## References

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Assistant Professor at University of Texas at Austin  
Collaborator  
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Dr. Lauren Ancel Meyers  
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Associate Professor at University of Texas at Austin  
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Professor at University of Texas at Austin  
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