

## David Bergman

Assistant Professor  
Operations and Information Management Department  
School of Business, University of Connecticut

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### PROFESSIONAL EXPERIENCE

**School of Business, University of Connecticut** (UConn), Storrs, CT

Department of Operations and Information Management

Assistant Professor Aug 2014 - Present  
Visiting Assistant Professor Aug 2013 - Jul 2014

**McKinsey & Company**, Waltham, MA

McKinsey Analytics

Data Scientist Specialist Jan 2017 - Jul 2017  
Knowledge Specialist Aug 2016 - Dec 2016

**Mitsubishi Electric Research Labs**, Cambridge, MA

Data Analytics

External Consultant Sep 2014 - Present  
Visiting Researcher Jun 2014 - Aug 2014

### PROFESSIONAL INTERESTS

Operations research, management science, discrete optimization, integer programming, data analytics, integration of optimization techniques, sports analytics

### EDUCATION

**Tepper School of Business, Carnegie Mellon University** (CMU), Pittsburgh, PA

Ph.D., Algorithms, Combinatorics, and Optimization May 2013

- Member of the Operations Research group
- Dissertation: *New Techniques for Discrete Optimization*
- Committee Members: John Hooker (co-advisor), Willem-Jan van Hoeve (co-advisor), R. Ravi, Tuomas Sandholm

M.S., Algorithms, Combinatorics, and Optimization May 2010

**Stony Brook University**, Stony Brook, NY

M.S., Applied Mathematics and Statistics May 2008

- Concentration in Operations Research

B.S., Mathematics, Applied Mathematics and Statistics May 2007

HONORS,  
GRANTS,  
AND AWARDS

- ACP Doctoral Research Award** Sep 2014
- Annual research award given by the Association for Constraint Programming for the best doctoral dissertation in the area of constraint programming
- UConn Curriculum Development** May 2014
- \$11,000.00 awarded for the development of undergraduate course 3510 - *Business Data Analytics*
- CMU Graduate Student Teaching Award** Apr 2012
- Annual university-wide award recognizing best graduate student teacher at Carnegie Mellon University
- First Place, CMU McKinsey Case Competition** Oct 2011
- Annual team-based case competition administered in the Tepper School of Business at Carnegie Mellon University
- Egon Balas Award** Mar 2010
- Annual award recognizing best student paper in the area of Operations Research or Algorithms, Combinatorics, and Optimization at Carnegie Mellon University
- William Larimer Mellon Fellowship** Feb 2008
- Three-year fellowship awarded for doctoral work in the Tepper School of Business at Carnegie Mellon University

EDITORIAL  
ROLES

**Editor** for *Constraints*

BOOKS

**D. Bergman**, A. A. Cire, W.-J. van Hoes, and J.N. Hooker. Decision Diagrams for Optimization. Springer-Verlag New York, 2016.

ARTICLES  
UNDER  
REVIEW

**D. Bergman**. An Exact Algorithm for the Quadratic Multiknapsack Problem with an Application to Event Seating. Major Revision, *INFORMS Journal on Computing*.

**D. Bergman**, C.H. Cardonha, A.A. Cire, and A. Raghunathan. On the Minimum Chordal Completion Polytope. Major Revision, *Operations Research*.

WORKING  
PAPERS

**D. Bergman**, M. Bodur, C.H. Cardonha, and A.A. Cire. Multiobjective Optimization using State-Space Relaxations. In preparation.

H. Atef Yekta, **D. Bergman**, and R. Day. Efficiency and Stability in Team Formation Problems. In preparation.

**D. Bergman**, L. Lozano, and J.C. Smith. On the Consistent Path Problem. In preparation.

**D. Bergman**, R. Gopal, and T. Huang. Location Models for Products with Derived Demand. In preparation.

**D. Bergman**, A. Raghunathan, N. Sahinidis, and T. Serra. Multiperiod Synchronized Vehicle Routing Problem with Time Windows (MSynVRPTW). In preparation.

**D. Bergman** and A.A. Cire. Discrete Nonlinear Optimization by State-Space Decompositions. *Management Science*, to appear.

**D. Bergman** and J.P. Imbrogno. Surviving an NFL Survival Pool. *Operations Research*, to appear.

**D. Bergman**, A.A. Cire, W.-J. van Hoeve, and J.N. Hooker. Discrete Optimization with Decision Diagrams. *INFORMS Journal on Computing*, volume 18(1), pages 47-66, 2016.

**D. Bergman** and A.A. Cire. Theoretical Insights and Algorithmic Tools for Decision Diagram-Based Optimization. *Constraints*, volume 21(4), pages 533-556, 2016.

**D. Bergman**, A.A. Cire, and W.-J. van Hoeve. Lagrangian Bounds from Decision Diagrams. *Constraints*, volume 20(3), pages 346-361, 2015.

**D. Bergman**, A. A. Cire, W.-J. van Hoeve, and J.N. Hooker. Optimization Bounds from Binary Decision Diagrams. *INFORMS Journal on Computing*, volume 26(2), pages 253-268, 2014.

**D. Bergman** and J. N. Hooker, Graph coloring inequalities from all-different systems. *Constraints*, volume 19(4) pages 404-433, 2014.

**D. Bergman**, A.A. Cire and W.-J. van Hoeve. MDD Propagation for Sequence Constraints. *Journal of Artificial Intelligence Research*, volume 50, pages 697-722, 2014.

**D. Bergman**, A.A. Cire, W.-J. van Hoeve, and T. Yunes. BDD-Based Heuristics for Binary Optimization. *Journal of Heuristics*, volume 20(2), pages 211-234, 2014.

**D. Bergman** and A.A. Cire. On Finding the Optimal Relaxed Decision Diagram. *Proceedings of the International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2017)*, accepted.

**D. Bergman** and A.A. Cire. Multiobjective Optimization by Decision Diagrams. *Proceedings of the International Conference on Principles and Practice of Constraint Programming (CP 2016)*, volume 9892 of Lecture Notes in Computer Science, pages 86 - 95, 2016.

**D. Bergman** and A.A. Cire. Decomposition Based on Decision Diagrams. *Proceedings of the International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2016)*, volume 9676 of Lecture Notes in Computer Science, pages 45 - 54, 2016.

**D. Bergman**, A.A. Cire, and W.-J. van Hoeve. Improved Constraint Propagation via Lagrangian Decomposition. *Proceedings of the International Conference on Principles and Practice of Constraint Programming (CP 2015)*, volume 9255 of Lecture Notes in Computer Science, pages 30 - 38, 2015.

**D. Bergman** and A. Raghunathan. A Benders Approach to the Minimum Chordal Completion Problem. *Proceedings of the International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2015)*, volume 9075 of Lecture Notes in Computer Science, pages 47-64, 2015.

**D. Bergman**, A.A. Cire, A. Sabharwal, H. Samulowitz, W.-J. van Hoeve. DDX10: Parallel Combinatorial Optimization with Decision Diagrams. *Proceedings of the*

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<sup>1</sup>Note that refereed conference proceedings are the preferred academic outlet in computer science

*International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2014)* , volume 8451 of Lecture Notes in Computer Science, pages 351-367, 2014.

**D. Bergman**, A.A. Cire, W.-J. van Hoeve, and J.N. Hooker. Variable Ordering for the Application of BDDs to the Maximum Independent Set Problem. *Proceedings of the International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2012)*, volume 7298 of Lecture Notes in Computer Science, pages 34 - 49, 2012.

**D. Bergman** and J.N. Hooker. Graph Coloring Facets from All-Different Systems. *Proceedings of the International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2012)*, volume 7298 of Lecture Notes in Computer Science, pages 50 - 65, 2012.

**D. Bergman**, W.-J. van Hoeve, and J.N. Hooker. Manipulating MDD Relaxations for Combinatorial Optimization. *Proceedings of the International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2011)*, volume 6697 of Lecture Notes in Computer Science, pages 20 - 35, 2011.

EXTENDED  
ABSTRACTS

**D. Bergman**. New Techniques for Discrete Optimization [Extended Dissertation Abstract]. *Constraints*, volume 20(4), pages 486-487, 2015.

**D. Bergman**, A. A. Cire, W.-J. van Hoeve, and J.N. Hooker. Discrete Optimization with Decision Diagrams [Extended Abstract]. *Proceedings of the International Conference on Principles and Practice of Constraint Programming (CP 2015)* , to appear.

**D. Bergman**, A.A. Cire and W.-J. van Hoeve. MDD Propagation for Sequence Constraints [Extended Abstract]. *Proceedings of the International Conference on Principles and Practice of Constraint Programming (CP 2015)* , to appear.

**D. Bergman**, A.A. Cire, and W.-J van Hoeve. Lagrangian Bounds from Decision Diagrams [Extended Abstract - Paper Selected for *Journal Fast Track*]. *Proceedings of the International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR 2015)* , volume 9075 of Lecture Notes in Computer Science, page XIV, 2015.

**D. Bergman**, A.A. Cire, W.-J van Hoeve, and J.N. Hooker. Optimization Bounds from Binary Decision Diagrams [Extended Abstract]. *Proceedings of the International Conference on Principles and Practice of Constraint Programming (CP 2014)* , volume 8656 of Lecture Notes in Computer Science, pages 903-907, 2014.

CONFERENCE /  
INVITED TALKS

### **Discrete Nonlinear Optimization by State-Space Decompositions**

- 2017 Mixed Integer Programming Workshop. Montreal, Canada. June 2017.
- Clemson University Department Seminar. Clemson, SC. Jan 2017.

### **Decision Diagram Decomposition**

- ISAIM 2016 - The International Symposium on Artificial Intelligence and Mathematics. Ft. Lauderdale, Fl. Jan 2016.
- INFORMS Annual Meeting 2015. Philadelphia, PA. Nov 2015.

### **MDD Propagation for Sequence Constraints**

- 21st International Conference on Principles and Practice of Constraint Programming. Cork, Ireland. Sept. 2015.

#### **A Benders Approach to the Minimum Chordal Completion Problem**

- 12th International Conference on Integration of Artificial Intelligence (AI) and Operations Research (OR) techniques in Constraint Programming (CPAIOR 2015). Barcelona, Spain. May 2015.

#### **Computational Techniques for Incentive Auctions**

- INFORMS Annual Meeting 2014. San Francisco, CA. Nov 2014.

#### **Solving Binary Quadratic Programming with Decision Diagrams**

- CORS/INFORMS Annual Meeting, 2015. Montreal, Canada. Jun 2015.
- INFORMS Annual Meeting 2014. San Francisco, CA. Nov 2014.

#### **New Techniques for Discrete Optimization**

- 20th International Conference on Principles and Practice of Constraint Programming. Lyon, France. Sept. 2014.

#### **Parallel Combinatorial Optimization with Decision Diagrams**

- 11th International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems. Cork, Ireland. May 2014.

#### **Decision Diagrams for Discrete Optimization**

- College of Business Department Seminar, Stony Brook University. March 2017.
- 15th Haifa Workshop on Graph Theory, Combinatorics, and Algorithms. Haifa, Israel, Jun 2015.
- CMU Chemical Engineering Department Seminar. Pittsburgh, PA. Nov 2014.
- INFORMS Annual Meeting 2013. Minneapolis, MN. Oct 2013.
- Operations and Information Management Department Seminar Series, University of Connecticut. Storrs, CT. Apr 2013.
- Department of Applied Mathematics and Statistics Seminar Series, Johns Hopkins University. Baltimore, MD. Mar 2013.
- Management Department Seminar Series, University of Iowa. Iowa City, IA. Feb 2012.
- BAE Systems Seminar. Burlington, MA. Dec 2012.

#### **Bounds from Multiple Binary Decision Diagrams**

- INFORMS Annual Meeting 2012. Phoenix, AZ. Oct 2012.

#### **Variable Ordering for the Application of Binary Decision Diagrams to the Maximum Independent Set Problem**

- 9th International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems. Nantes, France. May 2012.

#### **Manipulating MDD Relaxations for Combinatorial Optimization**

- 8th International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems. Berlin, Germany. May 2011.
- INFORMS Annual Meeting 2011. Charlotte, NC. Nov 2011.
- Algorithms Seminar, Stony Brook University. Stony Brook, NY. March 2010.

#### **Facets for All-Different Systems**

- Doctoral Programme, 16th International Conference on Principles and Practice of Constraint Programming. St. Andrews, Scotland. Sep 2010.

#### **Graph Coloring Cuts for All-Different Systems**

- 54th Annual conference of the Canadian Operational Research Society and the 10th International Conference on Multiple Objective Programming and Goal Programming. Niagara Falls, Canada. Jun 2012.
- 12th Annual Modeling and Optimization: Theory and Applications Conference. Bethlehem, PA. Jul 2012.

#### **A Branch and Bound Algorithm Based on Approximate Binary Decision Diagrams.**

- Cirrelt Seminar, University of Montreal. Montreal, Canada. Jan 2012.
- INFORMS Optimization Society Conference. Miami, Fl. Feb 2012.

#### **Polyhedral Results for All-Different System**

- INFORMS Annual Meeting 2010. Austin, TX. Nov 2010.

#### POSTER PRESENTATIONS

#### **Bounds from Binary Decision Diagrams**

- Mixed Integer Programming Workshop 2012. Davis, California. Jul 2012.

#### **Optimization for Food Rescue Program**

- 2nd International Conference on Computational Sustainability. Cambridge, MA. Jun 2010.

#### **Facets for All-different Systems**

- 16th International Conference on Principles and Practice of Constraint Programming. Davis, California. St. Andrews, Scotland. Sep 2010.

#### TEACHING EXPERIENCE

#### **Instructor**

OPIM 5641: Business Decision Modeling. Spring 2016.

- Graduate course in the Business Analytics and Project Management M.S. degree program at the University of Connecticut
- Course includes spreadsheet modeling and optimization.

OPIM 3510: Business Data Analytics. Fall 2015, Spring 2015, Fall 2014.

- Undergraduate course in Business Data Analytics major in the School of Business at the University of Connecticut
- Course includes data visualization, predictive analytics, and optimization

OPIM 5272: Business Process Modeling and Data Management. Fall 2014, Spring 2014, Fall 2013.

- Graduate course in the Business Analytics and Project Management M.S. degree program at the University of Connecticut
- Course covers database design and implementation

OPIM 3506: Business Application Programming. Spring 2014, Fall 2013.

- Undergraduate course in the Business and Technology major in the School of Business at the University of Connecticut
- Course covers programming for developing applications for businesses Required course in the Business and Technology major
- Course is fully administered online, including assignments, exams, lectures, etc.

BUS 70-374: Forecasting and Data Mining. Spring 2011.

- Undergraduate course in the Tepper School of Business at Carnegie Mellon University
- Upper-level elective course for Business major
- Designed this new course, including the drafting of all course materials, which are still used today, both in undergraduate and graduate courses at Carnegie Mellon University

## SERVICE

### **Conference Program Committee Member**

- CPAIOR - International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems, 2015, 2016, 2017
- CP - International Conference on Principles and Practice of Constraint Programming, 2015, 2016, 2017
- AAAI - Conference on Artificial Intelligence, 2015, 2016, 2017
- IJCAI - International Joint Conference on Artificial Intelligence, 2015, 2016, 2017
- ICORES - International Conference on Operations Research and Enterprise Systems, 2017, 2018
- Lash - Workshop on Logic and Search, 2014.

### **Conference Organization**

- CP 2017 - Operations Research Track - Chair
- CORS/INFORMS International Conference 2015 - Cluster Chair, Session Chair
- CP 2015 - Doctoral Program Chair
- CPAIOR 2015 - Publicity Chair, Session Chair
- CPAIOR 2016 - Session Chair
- ACP Summer School 2016 - Co-organizer

### **Professional Memberships**

- The Institute for Operations Research and the Management Sciences (INFORMS); INFORMS New York Metro Chapter

## Reviewer

- Swiss National Science Foundation Ambizione Grant reviewer
- Ad-hoc reviewer for the following journals: INFORMS Journal on Computing; International Conference on Principles and Practice of Constraint Programming; International Conference on Integration of Artificial Intelligence and Operations Research Techniques in Constraint Programming; International Joint Conference on Artificial Intelligence; Journal of Combinatorial Optimization; The Journal of Artificial Intelligence Research; Mathematical Programming Computation; Constraints; Annals of Mathematics and Artificial Intelligence; Production and Operations Management; Management Information Systems Quarterly. European Journal of Operational Research; Production and Operations Management.

## CONSULTING EXPERIENCE

### Data Science and Optimization Consulting

McKinsey & Company (2016 - 2017)

- Designed algorithms for large-scale planning, scheduling, and asset allocation problems, primarily for public and social sector clients

Additech, Inc (2015 - Present)

- Integrating advanced data science and optimization algorithms to select expansion locations to maximize expected revenue

Mitsubishi Electric (2014 - Present)

- Developing optimization algorithms for large multinational electronics and electrical equipment manufacturing company for various service lines and product-research projects

Westchester Management, LLC (2010-Present)

- Creating and maintaining information and database systems for residential real estate company

Jacksonville Jaguars (2014)

- Analyzed exercise data to understand player attributes and fatigue levels