

David Bergman

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

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PROFESSIONAL **McKinsey & Company**, Waltham, MA
EXPERIENCE

McKinsey Analytics

Knowledge Specialist

Aug 2016 - Present

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

Mitsubishi Electric Research Labs, Cambridge, MA

Data Analytics

External Consultant

Sep 2014 - Present

Visiting Researcher

Jun 2014 - Aug 2014

RESEARCH Operations research, discrete optimization, integer programming, data analytics,
INTERESTS 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, **ACP Doctoral Research Award** Sep 2014
GRANTS, AND AWARDS

- 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 Hoeve, and J.N. Hooker. Decision Diagrams for Optimization. Springer-Verlag New York, 2016.

ARTICLES
UNDER
REVIEW

D. Bergman and A.A. Cire. Nonlinear Optimization by State-Space Decompositions. Under second-round review. *Management Science*.

D. Bergman, C.H. Cardonha, A.A. Cire, and A. Raghunathan. On the Minimum Chordal Completion Polytope. Under first-round review, *Operations Research*.

D. Bergman and J.P. Imbrogno. Surviving an NFL Survival Pool. Major Revision. *Operations Research*.

REFEREED
JOURNAL
PUBLICATIONS

D. Bergman and A.A. Cire. Theoretical Insights and Algorithmic Tools for Decision Diagram-Based Optimization. *Constraints*, accepted, 2016.

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

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 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.

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

¹Note that refereed conference proceedings are the preferred academic outlet in computer science

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

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

- 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
- CP - International Conference on Principles and Practice of Constraint Programming, 2015, 2016
- AAAI - Conference on Artificial Intelligence, 2015, 2016
- IJCAI - International Joint Conference on Artificial Intelligence, 2015, 2016
- Lash - Workshop on Logic and Search, 2014.

Conference Organization

- CORS/INFORMS International Conference 2015 - Cluster Chair, Session Chair
- CP 2015 - Doctoral Program Chair
- CPAIOR 2015 - Publicity Chair, Session Chair
- CPAIOR 2016 - Session Chair

- Association for Constraint Programming Summer School - Co-organizer

Professional Memberships

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

Reviewer

- 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 ENGAGEMENTS

Data Analytics Consulting Engagements

- McKinsey & Company
- Mitsubishi Electric
- Additech, Inc
- Jacksonville Jaguars
- Westchester Management, LLC