

James M. Davis

Curriculum Vitae

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Research Interest and Objectives

I have a background in developing approximation algorithms, efficient algorithms that generate provably good solutions for NP-hard problems. I apply these techniques to problems involving customer choice models, mathematical models that describe how customers behave when faced with choices. With these models I answer questions such as “What products should we display?” or “What prices should we post?”. I have also worked on a variety of other problems, such as job scheduling and combinatorial problems on graphs.

Education

2010–2015 **Ph.D in Operations Research**, *Cornell University*, Ithaca NY.

2007–2010 **Bachelor of Arts in Mathematics**, *Rutgers University-Camden*, Camden NJ.

Ph.D Thesis

Title **Customer Choice and Assortment Optimization**

Advisers Huseyin Topaloglu & David P. Williamson

Description This thesis explores customer choice models, mathematical models that describe customer behavior. Under various models it develops efficient algorithms to compute assortments that maximize expected revenue.

Experience

2015–Present **Assistant Professor**, UNIVERSITY OF ILLINOIS, INDUSTRIAL AND ENTERPRISE SYSTEMS ENGINEERING, Urbana-Champaign.

Summer 2014 **Research Scientist Intern**, AMAZON.COM, Seattle.

Used customer choice models to guide inventory placement decisions.

2013-2014 **Instructor**, CORNELL PRISON EDUCATION, Auburn Correctional Facility, Auburn, NY.

Instructed a two semester algebra course for inmates earning an Associates degree.

Awards

2014 **George Nicholson Student Paper Competition Honorable Mention**, *INFORMS*.

Awarded for the paper *Assortment Planning under the Multinomial Logit Model with Totally Unimodular Constraint Structures*.

2011 **NSF Graduate Research Fellowship**, *National Science Foundation*.

The program recognizes and supports outstanding graduate students in science, technology, engineering, and mathematics disciplines who are pursuing research-based master’s and doctoral degrees.

2011 **Undergraduate Operations Research Prize Honorable Mention**, *INFORMS*.

Awarded for the paper *Combinatorial Algorithms for Minimizing the Weighted Sum of Completion Times on a Single Machine*.

- 2010 **Dean's Undergraduate Research Prize**, *Rutgers University-Camden*.
Awarded for a research project entitled *Approximation Algorithms for Facility Location and Scheduling Problems* conducted with Rajiv Gandhi while at Rutgers University-Camden.
- 2010 **Margaret Marsh Undergraduate Research Award**, *Rutgers University-Camden*.
Awarded for a research project entitled *Approximation Algorithms for Facility Location and Scheduling Problems* conducted with Rajiv Gandhi while at Rutgers University-Camden.
- 2009 **Career Motivation Award in Mathematics**, *Rutgers University-Camden*.
Awarded to encourage and motivate gifted undergraduate mathematics majors who have shown early promise of exceptional scholarship in mathematics.
- 2007 **Dustin Lobb Memorial Scholarship**, *Cumberland County College*.
Awarded to an excellent student in mathematics that is congenial and friendly.

Papers

- Submitted Alice Paul, James M. Davis, Jake Feldman, *Revenue Management under a Nonparametric Ranking Based Choice Model*, Manufacturing and Service Operations Management.
- Submitted James M. Davis, Guillermo Gallego, Huseyin Topaloglu, *Assortment Planning under the Multinomial Logit Model with Totally Unimodular Constraint Structures*, Manufacturing and Service Operations Management.
- Submitted James M. Davis, Huseyin Topaloglu, David P. Williamson, *Quality Consistent Discrete Pricing Under the Nested Logit Model*, INFORMS Journal on Computing.
- 2015 James M. Davis, Huseyin Topaloglu, David P. Williamson, *Assortment Optimization Over Time*, Operations Research Letters.
- 2013 James M. Davis, Guillermo Gallego, Huseyin Topaloglu, *Assortment Optimization under Variants of the Nested Logit Model*, Operations Research.
- 2013 Basile Couëtoux, James M. Davis, David P. Williamson, *A Dual-Fitting $\frac{3}{2}$ -Approximation Algorithm for Some Minimum-Cost Graph Problems*, Mathematical Programming.
- 2013 James M. Davis, Rajiv Gandhi, Vijay Kothari, *Combinatorial Algorithms for Minimizing the Weighted Sum of Completion Times on a Single Machine*, Operations Research Letters.
- Working Paper James M. Davis, Daniel Fleischman, Patrick Steele, *Assortment Optimization Under the Nested Logit Model with Competition*.

Skills

Python, SQL, \LaTeX , Java, Pyomo

Advising

- Christopher Jung Explored integer programming formulations for the capacitated vertex cover problem when restricted to bipartite graphs. Summer 2013.

Teaching

- 2015 **IE300: Introduction to Probability and Statistics**, Professor, University of Illinois.
- 2013-2014 **Algebra I/II**, Instructor, Cornell Prison Education Program.
- 2014 **Revenue Management**, TA, Cornell.
- 2013 **Inventory Management**, TA, Cornell.
- 2013 **Managing Operations**, TA, Johnson School of Business, Cornell.
- 2011 **Stochastic Processes**, TA, Cornell.

- 2010 **Optimization I**, TA, Cornell.
2009 **Mathematical Foundations of Computer Science**, TA, Rutgers University-Camden.

Presentations

Incremental Assortment Optimization.

INFORMS 2015

Capacitated Assortment Optimization Under the Markov Chain Choice Model.

INFORMS Revenue Management and Pricing Conference 2015

Constrained Assortment Planning.

University of Chicago Booth School of Business 2015, Carnegie Mellon 2015, University of Pittsburgh 2015, University of Illinois at Urbana Champaign 2015

Customer Choice and Assortment Optimization.

Cornell 2015

Assortment Planning: Algorithms for Offering the Right Items.

3 Minute Thesis Finalist-Cornell 2015

Quality Consistent Discrete Pricing Under the Nested Logit Model.

INFORMS 2015, INFORMS 2014

Assortment Planning Under the Multinomial Logit Model with Totally Unimodular Constraint Structures.

INFORMS 2014, INFORMS 2013, INFORMS Revenue Management and Pricing Conference 2013, CNY Operations Research and Information Science Conference 2013

A 3/2-Approximation Algorithm for Some Minimum-Cost Graph Problems.

ISMP 2012, Rutgers University-Camden 2012

Approximating Graphic TSP by Matchings.

Rutgers University-Camden 2011

Single Machine Scheduling with Release Dates.

INFORMS 2010

Iterative Rounding and Relaxation.

University of Penn. 2010, University of Maryland 2009

Capacitated Vertex Cover.

Rutgers University-Camden 2009

Professional Activities

- 2015 IE300 SIIP Committee
2015 University of Illinois ISE Bylaw Review Committee
2014-2015 Cornell ORIE Ph.D Colloquium Organizer
2011-2012 Cornell ORIE Graduate Student President

Other Interests

I enjoy building things and exploring manufacturing processes. I work mostly with electronics and wood. These interests culminated in the construction of a full sized computer numeric controlled (CNC) milling machine in my garage.