

# James Patrick Bailey

Blk 17 Pasir Ris Link, Unit 08-39  
Singapore, 518183

james.bailey@sutd.edu.sg

+65-9239-4324  
jamespbailey.com

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## Research Interests

Online/Machine Learning  
Integer Programming and Combinatorial Optimization  
Game Theory (and Applications to Economics)  
Dynamical Systems  
Graph Theory

## Employment

Postdoctoral Researcher, Singapore University of Technology and Design September 2017-Present

Department: Engineering Systems and Design  
Supervisor: Dr. Georgios Piliouras  
Primary Research Topic: Online Optimization and Learning

## Education

**Georgia Institute of Technology**, Atlanta, GA

Ph.D. Algorithms, Combinatorics, and Optimization, August 2012 - December 2017  
Dissertation Topic: Manipulation in Mechanism Design and the Price of Deception  
Advisor: Dr. Craig A. Tovey  
Home Department: Industrial and Systems Engineering  
Minor: Machine Learning  
Supported by NSF Grant 1335301.

**Kansas State University**, Manhattan, KS

M.S., Industrial Engineering, August 2011 - May 2012  
Thesis Title: *Octanary Branching Algorithm*  
Advisor: Dr. Todd Easton  
Area of Study: Operations Research  
  
B.S., Mathematics, August 2008 - May 2012  
B.S., Industrial and Manufacturing Systems Engineering, August 2008 - May 2012  
I-Center Scholar for research on the use of integer programs for the fast recovery of fourier compressible functions for compressed sensing.  
McNair Scholar.

## Funding

**NSF Grant 1335301 – The Price of Deception**

Amount Awarded: \$276,880.00 July 1, 2013 - June 30, 2017  
Provided preliminary research and assisted Craig A. Tovey in writing grant to support my research as a Ph.D. student.

## Publications

- [P1] James P. Bailey and Georgios Piliouras. *Multiplicative Weights Update in Zero-Sum Games*. In the Proceedings of the *19th ACM Conference on Economics and Computation (EC)*. 2018.
- [P2] James P. Bailey, and Craig A. Tovey. *The Price of Deception in Facility Location*. In the Proceedings of the *7th International Workshop on Computational Social Choice (COMSOC)*. 2018.
- [P3] James P. Bailey, Craig A. Tovey, Tansel Uras, Sven Koenig, and Alex Nash. *Path Planning on Grids: The Effect of Vertex Placement on Path Length*. In *Proceedings of the Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE)*. 2015.

- [P4] James P. Bailey, Mark A. Iwen, and Craig V. Spencer. On the Design of Deterministic Matrices for Fast Recovery of Fourier Compressible Functions. *SIAM Journal on Matrix Analysis and Applications*, Vol. 33, No. 1, pages 263-289. 2012.

### Current Submissions

- [P5] James P. Bailey and Craig A. Tovey. Conditions for Stability In Strategic Matching. Submitted to *Mathematics of Operations Research (MOR)*.
- [P6] James P. Bailey and Georgios Piliouras. Connections Between Online Optimization, Learning in Games and Hamiltonian Systems. Submitted to the *10th Innovations in Theoretical Computer Science (ITCS)*. San Diego, California. January 10-12, 2019.
- [P7] James P. Bailey, Todd Easton, and Fabio Vitor. Octanary Branching Algorithm. Submitted to *International Journal of Operations Research*.

### Working Papers

- [W1] James P. Bailey and Georgios Piliouras. Divergence from Nash Equilibrium in Regularized Learning. Will submit to *Mathematics of Operations Research (MOR)* in October, 2018. Draft available upon request.
- [W2] James P. Bailey and Georgios Piliouras. Sublinear Regret for Gradient Descent with Constant Step-size in Games. Will submit to *ACM Symposium on the Theory of Computing (STOC)* by November 2, 2018. Draft available upon request.
- [W3] James P. Bailey, Alex Nash, Sven Koenig, and Craig A. Tovey. Path Length Analysis for Grid-Based Path Planning. Will resubmit to *Journal of Artificial Intelligence Research* in October, 2018. Draft available upon request.
- [W4] James P. Bailey and Craig A. Tovey. The Price of Deception in Voting. Will submit to *Game and Economic Theory* in 2018. Draft available upon request.
- [W5] James P. Bailey. The LP Yolk is a Poor Approximation of the Yolk. Target journal: *Social Choice and Welfare*.
- [W6] James P. Bailey. The Yolk is Almost Always Unique, A Rejoinder to “On The Uniqueness of the Yolk”. Target journal: *Social Choice and Welfare*.

### Conference Presentations

- [C1] Multiplicative Weights Update in Zero-Sum Games.
- *13th Data Mining & Decision Analytics Workshop*. Phoenix, Arizona. November 3, 2018.
  - *INFORMS*. Phoenix, Arizona. November 4-7, 2018.
  - *19th ACM Conference on Economics and Computation (EC)*. Ithaca, New York. June 19-21, 2018.
- [C2] The Price of Deception in Facility Location. *7th International Workshop on Computational Social Choice (COMSOC)*. 2018. Troy, New York. June 25-27, 2018.
- [C3] Strategic Stable Marriage.
- *Microsoft Match-Up*. Cambridge, Massachusetts. April 20-21, 2017.
  - *INFORMS*. Nashville, Tennessee. November 13-16, 2016.
  - *The 3rd annual Young Researchers Workshop on Data-Driven Decision Mechanisms*. Cornell University. October 14-16, 2016.
- [C4] The Price of Deception in Elections. *The 13th Meeting of the Society for Social Choice and Welfare*. Lund, Sweden. June 28-July 1, 2016.
- [C5] Path Planning on Grids: The Effect of Vertex Placement on Path Length. *The Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE)*. Santa Cruz, CA. October 8-12, 2015.
- [C6] An Intermediate Perfect Graph Theorem. *2011 Annual Ronald E. McNair Heartland Research Conference*. Kansas City, MO. September 23-25, 2011.

## Experience in Education

### Instructor of Record

Industrial and Systems Engineering, Georgia Institute of Technology

- ISyE 3833 Engineering Optimization Fall 2015, Spring 2016
  - Taught two courses per semester for 25-30 students focusing on linear and integer programming. Specific emphasis included modeling of linear and integer programs, primal algorithms for simplex, sensitivity analysis and the branch and bound algorithm.
- ISyE 2028 Basic Statistical Methods Summer 2017, Summer 2015
  - Developed a lesson plan and taught courses for 62 and 69 students focusing on the approximation of population statistics, hypothesis testing, confidence intervals and simple and multivariate linear regression.
- ISyE 3133 Engineering Optimization Summer 2013
  - Developed a lesson plan and taught a course for 73 students focusing on linear, integer and dynamic programming with a minor emphasis on graph based algorithms and the stable marriage problem. Specific emphasis included modeling of linear and integer programs, primal/dual algorithms for simplex, sensitivity analysis and the branch and bound algorithm.

### Teaching Assistant

Industrial and Systems Engineering, Georgia Institute of Technology

- ISyE 6669: Deterministic Optimization Fall 2013
  - Held office hours for 30+ master's students. Reviewed and graded assignments focused on linear and integer programming.
- ISyE 3133: Engineering Optimization Fall 2012, Spring 2013
  - Organized and taught recitation once a week and office hours for a class of 73 and 80 students respectively. Reviewed and graded assignments pertaining to the linear and integer optimization, dynamic programming and graph based algorithms.

Industrial and Manufacturing Systems Engineering, Kansas State University

- IMSE 822: Network Flows and Graph Theory Spring 2012
  - Served as the primary contact for students enrolled in the course. Reviewed and graded assignments pertaining to the theoretical sides of network flows and graph theory.
- IMSE 643: Simulation Fall 2011
  - Held office hours and taught students to develop computer programs to model complex stochastic systems using ARENA and use those models to improve the system.

### Math Grader

May 2009 - December 2011

Graded students in Discrete Math, Real Number Systems, Algebraic Systems, Number Theory, and Foundations of Analysis for the Department of Mathematics at Kansas State University.

### Tutor

January 2008 - May 2012

Worked privately and for a variety of programs at Kansas State University tutoring students in advanced mathematics, statistics, physics, and programming courses.

### Peer Assistant

January 2008 - May 2011

Mentored and tutored "at-risk" students through the Kansas State Pilots Program. 58% of the students are first-generation and 51% of the students are multicultural.

## Community Service

Tutored elementary school students with Georgia Tech CCF at local shelter.  
Mentored high school students at a local shelter.