

# James Patrick Bailey

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## Research Interests

Machine Learning and Dynamics Created by Learning Algorithms  
Integer Programming and Combinatorial Optimization  
Game Theory (and Applications to Economics)  
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 - August 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

- [1] J. P. Bailey, and G. Piliouras. Multiplicative Weights Update in Zero-Sum Games. In the Proceedings of the *19th ACM Conference on Economics and Computation (EC)*. 2018.
- [2] J. P. Bailey, and C. A. Tovey. The Price of Deception in Facility Location. In the Proceedings of the *7th International Workshop on Computational Social Choice (COMSOC)*. 2018.
- [3] J. P. Bailey, C. A. Tovey, T. Uras, S. Koenig, and A. 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.
- [4] J. P. Bailey, M. A. Iwen, and C. 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

- [5] J. P. Bailey, and G. Piliouras. Online Optimization in Learning in Games are Hamiltonian Systems. Submitted to the *32nd Conference on Neural Information Processing Systems (NIPS)*. Montreal, Canada. December 3-8, 2018.

## Working Papers

- [6] J. P. Bailey, A. Nash, S. Koenig and C. A. Tovey. Path Length Analysis for Grid-Based Path Planning. Will revise and resubmit to *Journal of Artificial Intelligence Research*.
- [7] J. P. Bailey, and C. A. Tovey. Strategic Stable Matchings. Will submit to *Math of OR*.
- [8] J. P. Bailey. The LP Yolk is a Rotten Approximation of the Yolk. Will submit to *Social Choice and Welfare*.
- [9] J. P. Bailey, and T. Easton. Octanary Branching Algorithm.
- [10] J. P. Bailey, and C. A. Tovey. The Price of Deception in Voting. Will submit to *Econometric Theory*.
- [11] J. P. Bailey. The Yolk is Almost Always A Unique, A Rejoinder to “On The Uniqueness of the Yolk”. Will submit to *Social Choice and Welfare*.

## Conference Presentations

- [12] J. P. Bailey, and C. A. Tovey. The Price of Deception in Facility Location. In the Proceedings of the *7th International Workshop on Computational Social Choice (COMSOC)*. 2018. Troy, New York. June 25-27, 2018.
- [13] J. P. Bailey, and G. Piliouras. Multiplicative Weights Update in Zero-Sum Games. In the Proceedings of the *19th ACM Conference on Economics and Computation (EC)*. Ithaca, New York. June 19-21, 2018.
- [14] J. P. Bailey, and C. A. Tovey. Strategic Stable Marriage. *Microsoft Match-Up*. Cambridge, Massachusetts. April 20-21, 2017.
- [15] J. P. Bailey, and C. A. Tovey. Strategic Stable Marriage. *INFORMS*. Nashville, Tennessee. November 13-16, 2016.
- [16] J. P. Bailey, and C. A. Tovey. Strategic Stable Marriage. *The 3rd annual Young Researchers Workshop on Data-Driven Decision Mechanisms*. Cornell University. October 14-16, 2016.
- [17] J. P. Bailey, and C. A. Tovey. The Price of Deception in Elections. *The 13th Meeting of the Society for Social Choice and Welfare*. Lund, Sweden. June 28-July 1, 2016.
- [18] J. P. Bailey, C. A. Tovey, T. Uras, S. Koenig, and A. Nash. 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.
- [19] J. P. Bailey 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
  - Worked with Georgia Tech faculty to develop smaller and more consistent courses for engineering optimization.
  - 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.
  - Used hands on approaches to engage students in the learning process including in class discussions, games, and competitions.
  - Designed homeworks to help students learn the Xpress optimization solver to solve and interpret the solutions for linear and integer programs.
- 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.
  - Wrote textbook consistent with lectures that also incorporated the usage of R statistical software for statistical analysis.
  - Arranged individualized projects for students to apply new-found knowledge to a topic relating to their interests and emphasize the importance of communicating results from hypothesis testing, confidence intervals and 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.
  - Wrote textbook for course that was distributed by tutors in the Georgia Tech tutoring center for several years after the course.
  - Designed homework to help students learn the GAMS mathematical programming language to solve and interpret the solutions for linear and integer programs.

### 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 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 local shelter.