Vishal Gupta

http://faculty.marshall.usc.edu/Vishal-Gupta/

CONTACT INFORMATION

Marshall School of Business
University of Southern California
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Los Angeles, CA 90025

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RESEARCH INTERESTS

Data-driven optimization in settings with scarce data, or high-dimensional uncertainty. Applications in causal inference, risk-management, and pricing.

EMPLOYMENT

Marshall School of Business, Los Angeles CA — **2014- Present**
Assistant Professor of Data Sciences and Operations

Analytics Operations Engineering, Inc., Boston MA — **Summer 2011**
Summer Associate

Barclays Capital, New York, NY — **2005-2009**
New York Head of Commodities Tactical Modeling 2008-2009
Manager, Quantitative Analytics Commodities Modeling Group 2007-2008
Analyst, Quantitative Analytics Commodities Modeling Group 2005-2007

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA — **2009-2014**
Ph.D. in Operations Research
- Thesis: Data-Driven Models for Uncertainty and Behavior
- Advisor: Prof. Dimitris Bertsimas

University of Cambridge, Cambridge, England — **2004-2005**
Part III Mathematics Tripos
- Graduated with Distinction
- Essay: Hedging Financial Derivatives as a Differential Game

Yale University, New Haven, CT — **2000-2004**
B.A. Mathematics and Philosophy
- Graduated with Honors, Magna Cum Laude
- Phi Beta Kappa

HONORS / AWARDS

Finalist in the 2018 Pierskalla Best Paper Competition — **2018**
Awarded by the Health Applications Society of INFORMS for the paper "Maximizing Intervention Effectiveness" (*w. B.R. Han, S.H. Kim and H. Paek).* INFORMS selects 3-5 finalists each year to recognize research excellence in the field of health care management science.

Finalist in the 2018 Service Science Best Paper Competition — **2018**
Awarded by the INFORMS Service Science Section for the paper "Value of Personalized Pricing" (*w. A. Elmachtoub and M.Hamilton).* 8 finalists are chosen each year to recognize outstanding papers in theory, methodologies and applications of Service Science.

Finalist in the 2018 POMS CHOM Best Paper Competition **2018**
Awarded by the College of Healthcare Operations Management (CHOM) for the paper "Maximizing Intervention Effectiveness" (*w. B.R. Han, S.H. Kim and H. Paek).* CHOM selects 3-5 finalists each year to honor outstanding papers in the field of Healthcare Operations Management.

Evan C. Thompson Teaching and Learning Innovation Award **2016**
Awarded to one Marshall Faculty per year for developing innovative course materials, implementing new learning pedagogies and demonstrating commitment to students' learning and success.

Finalist in the George Nicholson Student Paper Competition **2013**
Awarded for the paper "Data-Driven Robust Optimization," *(w. D. Bertsimas and N. Kallus)* The George Nicholson Prize Committee selects approximately 8 papers each year to identify and honor outstanding papers in the field of operations research written by a student.

Best Student Paper Prize MIT Operations Research Center **2013**
Awarded for the paper "Robust SAA," *(w. D. Bertsimas and N. Kallus).* Awarded to one paper written by students each year in the MIT ORC PhD Program, recognizing outstanding achievement in operations research.

MIT Teaching Certificate **2013**
Issued at the completion of a semester long, intensive course on best-practice for teaching in higher education

Honorable Mention, Hubway Data Visualization Challenge **2013**
Open challenge to create a visualization for data comprising a half-million rides on Boston's Bike-Share network *(w. H. Barrigan and A. Calmon).*

Best Student Presentation, INFORMS Financial Services Section **2012**
Awarded for "Fitting Investor Risk Preferences to Data."

Nominated for Excellence in Teaching Award **2012**
Awarded for Teaching Assistant to the MBA Core Course "Data, Models and Decisions" at MIT Sloan. Selected by MBA students.

Charles M. Vest Presidential Fellowship for Doctoral Studies **2009-10**
Awarded to only three first-year graduate students at MIT across all fields to support their doctoral work, covering their tuition and stipend.

Paul Mellon Fellowship for Graduate Research **2005**
Awarded to only one graduating Yale senior to support two years of study (tuition and stipend) at the University of Cambridge, UK, in the discipline of their choice.

Timothy Dwight Masters Cup **2004**
Awarded each year to a graduating senior who exemplifies high academic rank, scholarly achievement, and the values of Timothy Dwight College at Yale.

GRANTS

CAREER: Incorporating Idiosyncratic Effects in Decision-Making under Uncertainty through Data-Pooling (Pending)
Amount: $524,734
Submitting in July 2020.
Role: Sole Principal Investigator

Optimization in the Small Data Regime **2017-2021**
Role: Sole Principal Investigator Amount: $221,592
NSF Grant CMMI-1661732

Small Data Linear Optimization **2017-2018**
Role: Principal Investigator Amount: $25,000
Outlier Research Grant
Institute for Advanced Study in Business, USC

JOURNAL PUBLICATIONS

1. "Small-Data, Large-Scale Linear Optimization with Uncertain Objectives," with P. Rusmevichientong.
Management Science (to appear), accepted 2019.

2. "Maximizing Intervention Effectiveness," with B.R. Han, S.H. Kim, and H. Paek.
Finalist in the 2018 Pierskalla Best Paper Competition.
Finalist in the 2018 POMS College of Healthcare Operations (CHOM) Best Paper Competition.
Management Science (to appear), accepted 2019.

3. "Near-Optimal, Bayesian Ambiguity Sets for Distributionally Robust Optimization."
Management Science, Vol. 65 Issue 9, 2019.

4. "Robust Sample Average Approximation," with D. Bertsimas and N. Kallus.
Awarded 2013 Best Student Paper MIT Operations Research Center.
Mathematical Programming*,* Vol. 171, Issue 1, 2018.

5. "Data-Driven Robust Optimization**,"** with D. Bertsimas and N. Kallus.
Finalist in the 2013 George Nicholson Student Paper Competition.
Mathematical Programming*,* Vol 167, Issue 2, 2017.

6. "A Comparison of Monte Carlo Tree Search and Mathematical Optimization for Large Scale Dynamic Resource Allocation," with D. Bertsimas, D. Griffith, M. Kochenderfer, V. Misic,
European Journal of Operations Research*,* Vol. 263, Issue 2*,* 2017.

7. "Advanced Software Tools for Operations Research and Analytics," with I. Dunning, A. King, J. Kung, M. Lubin and J. Silberholz.
INFORMS Transaction on Education*,* Volume: 15, Issue 2, 2015.

8. "Data-Driven Estimation in Equilibrium using Inverse Optimization," with D. Bertsimas and I. Ch. Paschalidis.
Mathematical Programming*,* Vol. 153, Issue 2, 2014.

9. "Inverse Optimization: A New Perspective on the Black-Litterman Model," with D. Bertsimas and I. Ch. Paschalidis.
   Operations Research, Vol. 60, Issue 6, 2012.

UNDER REVIEW

10. "Data-Pooling in Stochastic Optimization," with N. Kallus.
    Major Revision at Management Science. (Resubmitted March 2020)

11. "Value of Personalized Pricing," with A. Elmachtoub and M. Hamilton.
    Finalist in the 2018 INFORMS Service Science Best Paper Competition.
    Accepted to 15th Conference on Web and Internet Economics (WINE), 2019.
    Minor Revision at Management Science. (Resubmitted March 2020)

BOOK CHAPTERS

12. "The Small-Data Optimization Regime and Inventory Management."
    Joint Learning and Optimization in Operations Management, Editors: Xi Chen, Stefanus Jasin, and Cong Shi. Targeted Publication: March 2021.

WORK IN PROGRESS

13. "Decomposing Graphs to Simultaneously Learn and Optimize," with M. Huang and P. Rusmevichientong.
    Targeting Management Science, June 2020

14. "Optimal Plug-In Policies for Contextual Stochastic Optimization," with N. Kallus.
    Targeting International Conference on Machine Learning (ICML), July 2020.

15. "Learning Heterogeneous Preferences through Data-Pooling," with V. Misic.
    Targeting Management Science, Sept. 2020.

16. "Incorporating Idiosyncratic Effects in Contextual Stochastic Optimization," with N. Kallus.
    Targeting Management Science, Dec. 2020.

INVITED TALKS

An asterisk (*) by a presentation below indicates that it was given by a student co-author.

Data-Pooling in Stochastic Optimization

- **INFORMS Annual Meeting**, Phoenix, AZ (11/2018)
- Joint Industrial Engineering and Operations Research and Decision, Risk and Operations Departmental Seminar, **Columbia University**, NY, New York (12/2018)
- Models and Algorithms for Sequential Decision-Making Problems Under Uncertainty Workshop, **Banff International Research Station**, Banff, Canada (1/2019)
- Southern California OR/OM Day, **UC Irvine,** Irvine, CA, (5/2019)
- Operations and Information Technology Departmental Seminar, **Stanford Graduate School of Business,** Palo Alto, CA (5/2019)

- 6th International Conference on Continuous Optimization (**ICCOPT**), Berlin, Germany (8/2019).
- Industrial and Systems Engineering Departmental Seminar, **University of Southern California,** Los Angeles, CA (9/2019)
- DSO Graduate Research Forum, **USC Marshall**, Los Angeles, CA (9/2019)
- Operations Management Departmental Seminar, **Booth School of Business at University of Chicago,** Chicago, IL (9/2019)
- **INFORMS Annual Meeting, Seattle**, WA (10/2019)
- Desautels Faculty of Management Departmental Seminar, **McGill University,** Montreal, CA (10/2019)
- Decisions, Operations and Technology Management Seminar, **UCLA Anderson School of Management,** Los Angeles, CA (11/2019)
- Guest Lecture, "IEOR 8100 Prescriptive Analytics," **Columbia University,** New York, NY (11/2019)
- Technology and Operations Departmental Seminar, **University of Michigan Ross School of Business**, Ann Arbor, MI (12/2019)

Discrete Optimization in the Small-Data, Large-Scale Regime via Decomposition

- **INFORMS Annual Meeting**, Seattle, WA (10/2019)*

Probability Guarantees in Data-Driven Robust Optimization

- Guest Lecture, ISyE Reading Group, **USC Viterbi**, Los Angeles, CA (10/2019)

"Operations Research and Analytics Education" (Panel Speaker)

- 65th Operations Research Center Reunion, **Massachusetts Institute of Technology (MIT)**, Cambridge, MA (11/2018)

Optimization in the Small-Data, Large-Scale Regime

- 5th International Conference on Continuous Optimization (**ICCOPT**), Tokyo, Japan (8/2016). *Invited Session Chair for "Recent Advances in Data-Driven Optimization."*
- **INFORMS Annual Meeting**, Nashville, TN (11/2016)
- **INFORMS Annual Meeting**, Houston, TX (10/2017)
- DSO Graduate Research Forum, **USC Marshall**, Los Angeles, CA (12/2017)
- Operations and Logistics Division Seminar, **UBC Sauder School of Business**, Vancouver, Canada (1/2018)
- Technology and Operations Management Group Seminar, ***INSEAD***, Paris, France (4/2018)
- Decision Sciences Group, **Duke Fuqua School of Business**, Durham, NC (5/2018)
- 23rd International Symposium on Mathematical Programming **(ISMP)**, Bordeaux, France (7/2018)
- 29th European Conference on Operations Research **(EURO)**, Valencia Spain (7/2018)
- Management Sciences and Operations Department Seminar, **Imperial College School of Business,** London, UK (7/2018)

Calibrating Uncertainty Sets in the Small-Data, Large-Scale Regime
- Distributionally Robust Optimization Workshop, **Banff International Research Station**, Banff, Canada (3/2018)

Maximizing Intervention Effectiveness
- **INFORMS Annual Meeting**, Nashville, TN (11/2016)*
- **MSOM** Conference, Chapel Hill, NC (6/2017)*
- **INFORMS Annual Meeting**, Houston, TX (11/2017)*
- **POMS Best Healthcare Paper Competition,** Houston, TX (5/2018)*
- **MSOM Healthcare SIG**, Dallas TX (7/2018)*
- International Conference on Stochastic Optimization **(ICSP),** Trondheim, Norway (7/2019). *Co-Chair of Mini-symposium: ``Doing Good with Good RO."*

Value of Personalized Pricing
- **INFORMS Annual Meeting**, Houston, TX (11/2017)*
- **POMS Annual Meeting,** Houston, TX (5/2018)*
- **INFORMS Revenue Management and Pricing (RMP) Conference,** Toronto CA (6/2018)*

Data-Driven Distributionally Robust Optimization
- Electrical Engineering Group, **USC Viterbi**, Los Angeles, CA (1/2016)

Near-Optimal Ambiguity Sets Distributionally Robust Optimization
- **INFORMS Annual Meeting**, San Francisco, CA (11/2014)
- Southern California OM/OR Conference, **UCLA** (5/2015)
- British-French-German **(BFG)** Conference on Optimization, London, UK (6/2015)
- 22nd International Symposium on Mathematical Programming (**ISMP**), Pittsburgh, PA (7/2015)
- **INFORMS Annual Meeting**, Philadelphia, PA (11/2015)

Modeling Uncertainty in Optimization
- DSO Graduate Research Forum, **USC Marshall**, Los Angeles, CA (2/2015)

Data-Driven Robust Optimization
- Conference on **Computational Management Science (CMS)**, Montreal, Canada (5/2013). *Invited Session Chair for "Robust Optimization II"*
- **MSOM Conference**, Paris, France (7/2013)
- **INFORMS Annual Meeting**, Minneapolis, MN (10/2013)
- Operations Management Seminar, **MIT Sloan School of Management**, Cambridge, MA (11/2013)
- **London Business School (LBS)**, London, UK (1/2014)
- **NYU Stern School of Business**, New York, NY (1/2014)
- **USC Marshall School of Business**, Los Angeles, CA (2/2014)
- **McCombs Business School** at University of Texas at Austin, Austin, TX (2/2014)
- Industrial and Operations Engineering at **University of Michigan**, Ann Arbor, MI (2/2014)

- **Carnegie Mellon University**, Pittsburgh, PA (2/2014)

Inverse Optimization Approaches to Estimation

- **21st International Symposium on Mathematical Programming (ISMP)**, Berlin, Germany (6/2012)
- **INFORMS Annual Meeting**, Phoenix, AZ (10/2012). *Invited Session Chair for "Optimization under Uncertainty."*

Constructing Investor Risk Preferences from Data

- **INFORMS Annual Meeting**, Phoenix, AZ (10/2012)
- **INFORMS Annual Meeting**, Minneapolis, MN (10/2013)

Inverse Optimization: A New Perspective on the Black-Litterman Model

- **INFORMS Annual Meeting**, Charlotte, NC (11/2011)

TEACHING

BUAD425 Data-Analysis for Decision Making **2016, 2017**
Undergraduate Core
USC Marshall School of Business
Instructor, Course Coordinator
Redesigned course with new emphasis on critical thinking and decision-making. Authored cases, created online videos, and developed new curriculum content.

BUAD311 Introduction to Operations Management **2015, 2019-Present**
Undergraduate Core
USC Marshall School of Business
Instructor

15.S60 Software Tools for Operations Research **2013, 2014**
Ph.D., MBA and Executive MBA Elective
MIT Sloan School of Management
Instructor
Designed new course with primary role in curriculum development. Oversaw course logistics and lectured on select topics in convex optimization.

15.S05 Risk Management **2012, 2013**
Executive MBA Program Elective
MIT Sloan School of Management
Teaching Assistant
Assisted with curriculum development, course logistics and advising students on term projects.

15.060 Data, Models and Decisions **2012**
MBA Core
MIT Sloan School of Management
Teaching Assistant

Lead weekly recitation and office hours, co-authored exams, and graded case-studies and problem sets.

15.081J Introduction to Mathematical Programming **2011**
Ph.D. Core
MIT Sloan School of Management
Teaching Assistant
Lead weekly recitation and office hours, lectured select topics, designed exams and problem sets.

PHD MENTORSHIP

- Advisor
  - Michael Huang, USC Marshall (2017-Present)

- Co-Author
  - Brian Rongqing Han, USC Marshall, (2016 – 2019)
    First Placement: Tenure-Track Assistant Professor at University of Illinois at Urbana-Champaign (**UIUC**), Giess School of Business
  - Michael Hamilton, Columbia IEOR (2016-2019)
    First Placement: Tenure-Track Assistant Professor at University of Pittsburgh, Katz Graduate School of Business

- Qualifying Examination Committee
  - Shobhit Jain, USC Marshall Operations Management (2018)
  - Bradley Rava, USC Marshall Statistics (2019)

- Dissertation Committee
  - Junyi Liu, USC ISyE (2019)
  - Michael Hamilton, Columbia IEOR (2019)
  - Brian Rongqing Han, USC Marshall (2020)

OTHER PROJECTS

Data-Driven Uncertainty Sets (DDUS) **2014-2015**
Software Developer
- Created open-source library in Julia implementing a variety of data-driven methods for robust optimization (available via GitHub)
- Used by graduate classes at MIT, Columbia and others

Sloan Educational Services (SES), Cambridge MA **2010-2014**
Consultant
- Liaised with educational services to design custom suite of software tools to streamline internal processes.
- Tools included:
  - *ClassE* - A tool for fair and efficient scheduling/timetabling of classes. *ClassE* has been used to schedule classes at Sloan since Spring 2012.
  - *StudyBuddies* - A tool to partition students in the Sloan Fellows Program into learning cohorts. Cohorts should be diversified in terms of gender, nationality, work experience and age.

UNIVERSITY SERVICE

DSO OM Group Tenure-Track Hiring Committee **2019 - Present**
Co-Chair
Lead hiring committee, coordinating logistics with faculty and candidates for fly-outs and interviews.

DSO-Marketing Seminar Coordinator **2018 - Present**
Coordinated a bi-semester, brown-bag seminar with DSO and Marketing faculty to promote cross-group research collaboration

DSO OM Group PhD Committee **2017-Present**
Helped design curriculum requirements for PhD program. Wrote the optimization screening exam each year. Served on PhD admissions committee, including reviewing applications and interviewing candidates.

DSO Seminar Series Coordinator **2014-2019**
Invited visiting faculty to present research in departmental seminar. Coordinated all logistical aspects of visits and curated yearly speaker series.

ACADEMIC SERVICE

Associate Editor – *Management Science* **2019 - Present**
Big Data Analytics Section

Journal Reviewer / Referee
Operations Research, Management Science, Management Science and Operations Management, Production and Operations Management, OR Letters, SIAM Journal on Control and Optimization, SIAM Review, INFORMS Journal on Computing, INFORMS Journal on Optimization, IISE Transactions, Optimization Letters

Conference Program Committee / Reviewer
- NIPS (2016)
- AAAI (2020)
- AISTATS (2020)

National Science Foundation (NSF) Panel Reviewer
- CMMI / OE Program (2017)

INFORMS Best Case Competition Judge **2020-2021**
Reviews submissions and selects winner. Competition seeks instructional cases focusing on real-world applications of Operations Research and Operations Management.

OTHER SERVICE

- MIT ORC Informal Research Seminar Coordinator (2012-2014)
- ORC Seminar Series Coordinator (Spring 2013)
- INFORMS Student Chapter President (2009)

LANGUAGES English (native), Spanish (conversational), Hindi (conversational)
COMPUTING Julia, Python, C++, VBA, Matlab, R, CPLEX/Gurobi
INTERESTS Running (5K – Half-Marathon), Rock-climbing, Tai Chi Chuan
CITIZENSHIP USA

REFERENCES Available upon request