Gian-Gabriel P. Garcia

Postdoctoral Research Fellow
@ MGH-ITA Harvard Medical School

Updated July 2020

Address: 101 Merrimac St., Suite 1010
Boston, MA 02114
E-mail: garciagg@umich.edu
ORCID: http://orcid.org/0000-0001-9315-0195
Website: http://www.giangabrielgarcia.com

Employment

Georgia Institute of Technology, Atlanta, GA
Assistant Professor, H. Milton Stewart School of Industrial and Systems Engineering　　Starting 8/2021

Harvard Medical School, Boston, MA
Postdoctoral Fellow, Massachusetts General Hospital Institute for Technology Assessment　　7/2020-7/2021

Education

PhD, Industrial and Operations Engineering　　8/2020
University of Michigan, Ann Arbor, MI
"Predictive and Prescriptive Analytics for Optimizing Concussion Management Decisions"
Thesis Advisor: Mariel S. Lavieri

M.S. Industrial and Operations Engineering　　12/2016
University of Michigan, Ann Arbor, MI

B.S. Industrial Engineering, *Summa Cum Laude*　　12/2014
University of Pittsburgh, Pittsburgh, PA

Selected Awards and Honors

College of Engineering Towner Prize for Distinguished Academic Achievement　　2020

Society of Medical Decision Making Lee B. Lusted Student Prize　　2018
Stephen Pauker Award for Quantitative Methods and Theoretical Developments

INFORMS Bonder Scholarship for Applied OR in Health Services　　2018

National Science Foundation Graduate Research Fellowship　　2017-2020

IOE Graduate Student Instructor of the Semester　　2017

Research Interests

My current research aims to develop data-driven frameworks for *Predictive Analytics* and *Prescriptive Analytics* as motivated by and applied to high-impact problems in *Medical Decision-Making*. I am especially interested in modeling the role of behavioral and social dynamics in these decision processes.

Methodology

Predictive modeling, data-driven optimization, dynamic programming, Markov decision processes, machine learning, stochastic optimization, robust optimization, Kalman filtering, stochastic control, applied statistics, game theory, social network analysis

Applications

Medical decision-making, concussion management, opioid use disorder, detecting glaucoma progression, cardiovascular disease, value-based insurance design, vaccine delivery under resource constraints

Publications

Journal Articles

1. **G.-G. P. Garcia**, J. Yang, M. S. Lavieri, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2020). Optimizing Components of the Sport Concussion Assessment Tool for Acute Concussion Assessment. *Neurosurgery* (Accepted). [1]

2. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, M. A. McCrea, T. W. McAllister, and S. P. Broglio (2020). Data-driven Stochastic Optimization Approaches to Determine Decision Thresholds for Risk Estimation Models. *IISE Transactions* (Accepted), 1–24.

3. **G.-G. P. Garcia**, M. S. Lavieri, C. Andrews, X. Liu, M. P. Van Oyen, M. A. Kass, M. O. Gordon, and J. D. Stein (2019). Accuracy of Kalman Filtering in Forecasting Visual Field and Intraocular Pressure Trajectory in Patients With Ocular Hypertension. *JAMA Ophthalmology* **137**(12), 1416–1423. [2]

4. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2019). A Data-Driven Approach to Unlikely, Possible, Probable, and Definite Acute Concussion Assessment. *Journal of Neurotrauma* **36**(10), 1571–1583. [3]

5. **G.-G. P. Garcia**, K. Nitta, M. S. Lavieri, C. Andrews, X. Liu, E. Lobaza, M. P. Van Oyen, K. Sugiyama, and J. D. Stein (2019). Using Kalman Filtering to Forecast Disease Trajectory for Patients With Normal Tension Glaucoma. *American Journal of Ophthalmology* **199**, 111–119. [4]

6. G. J. Schell, **G.-G. P. Garcia**, M. S. Lavieri, J. B. Sussman, and R. A. Hayward (2019). Optimal Coinsurance Rates for a Heterogeneous Population under Inequality and Resource Constraints. *IISE Transactions* **51**(1), 74–91.

7. **G.-G. P. Garcia**, S. P. Broglio, M. S. Lavieri, M. McCrea, and T. McAllister (2018). Quantifying the Value of Multidimensional Assessment Models for Acute Concussion: An Analysis of Data from the NCAA-DoD Care Consortium. *Sports Medicine* **48**(7), 1739–1749. [5]

8. M. H. Mofrad, **G.-G. P. Garcia**, L. M. Maillart, B. A. Norman, and J. Rajgopal (2016). Customizing Immunization Clinic Operations to Minimize Open Vial Waste. *Socio-Economic Planning Sciences* **54**(March 2016), 1–17.

Submitted Papers

1. L. L. Czerniak, S. W. Liebel, **G.-G. P. Garcia**, M. S. Lavieri, M. A. McCrea, T. W. McAllister, and S. P. Broglio (2020). Sensitivity and Specificity of Computer-Based Neurocognitive Assessments in Sport-Related Concussion: Findings from the NCAA-DoD CARE Consortium. *Sports Medicine* (Under revision)

Working Papers

1. **G.-G. P. Garcia**, C. M. Schumb, M. S. Lavieri, H. Koffijberg, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2020). Developing Insights for Possible and Probable Acute Concussions Using Cluster Analysis. *Journal of Neurotrauma* (Target Journal)

2. **G.-G. P. Garcia**, M. S. Lavieri, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2020). Estimating the Value of Incorporating Patient Behavior in Return-to-play from Concussion: A Behavior-Learning Multi-agent POMDP Approach. *Operations Research* (Target Journal)

Presentations

Invited Talks and Seminars

1. "Predictive and Prescriptive Analytics for Concussion Management Decisions"

   ➤ Department of Industrial and Systems Engineering, University of Minnesota, January 2020

   ➤ Department of Industrial Engineering, Clemson University, January 2020

   ➤ School of Industrial Engineering and Regenstrief Center for Healthcare Engineering, Purdue University, December 2019

   ➤ H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, December 2019

---

[1] Impact Factor: 4.61
[2] Impact Factor: 6.17
[3] Impact Factor: 5.00
[4] Impact Factor: 4.80
[5] Impact Factor: 7.58

➤ Department of Industrial and Systems Engineering, University of Florida, December 2019

2. "Data-driven Decision Thresholds for Risk Estimation Models with Application to Acute Concussion Assessment"

➤ Edward P. Fitts Department of Industrial & Systems Engineering Department, North Carolina State University, April 2019

3. "Data-driven Optimization for Concussion Management Decisions"

➤ Department of Industrial and Operations Engineering, University of Michigan, September 2018

Refereed Conference Abstracts and Presentations

1. **G.-G. P. Garcia**, M. S. Lavieri, C. Andrews, X. Liu, M. P. Van Oyen, M. A. Kass, M. O. Gordon, and J. D. Stein (2019). Using a Machine Learning Technique Called Kalman Filtering to Forecast Conversion from Ocular Hypertension to Primary Open Angle Glaucoma. *The Association for Research in Vision and Ophthalmology*, Vancouver, BC

2. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, M. A. McCrea, T. W. McAllister, and S. P. Broglio (2018). A Novel Data-Driven Framework for Improving Risk-Based Medical Diagnosis with Application to Acute Concussion Assessment. *Society of Medical Decision Making 40th Annual Meeting*, Montreal, QC

3. M. S. Lavieri, X. Liu, **G.-G. P. Garcia**, Z. Zhou, E. Lobaza, J. Wang, K. Sugiyama, K. Nitta, C. Andrews, M. P. Van Oyen, and J. D. Stein (2017). Using Kalman Filtering to Personalize the Monitoring of Persons with Normal Tension Glaucoma. *The Association for Research in Vision and Ophthalmology*, Baltimore, MD

4. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2017). A Markov Decision Process to Model Symptom Self-Reporting Behavior in Concussion Management. *The 3rd Multidisciplinary Conference on Reinforcement Learning and Decision Making*, Ann Arbor, MI

5. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2016). Quantifying Risk Thresholds for On-field Concussion Diagnosis. *Industrial and Systems Engineering Research Conference*, Anaheim, CA

Conference Presentations

1. **G.-G. P. Garcia**, M. S. Lavieri, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2020). The Value of Incorporating Symptom-Reporting Behavior in Return-to-play from Concussion. *INFORMS Annual Meeting*, National Harbor, MD

2. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2019). Optimizing Treatment Decisions Under Strategically Reported Symptoms. *INFORMS Annual Meeting* (Bonder Scholars Session), Seattle, WA

3. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2019). Data-driven Stochastic Optimization Approaches to Determine Decision Thresholds for Risk Estimation Models. *INFORMS Annual Meeting* (Invited Session), Seattle, WA

4. **G.-G. P. Garcia**, J. Yang, M. S. Lavieri, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2019). Doing More with Less: Applying Modern Predictive Modeling Methods to Improve Acute Concussion Assessment. *INFORMS Healthcare* (Bonder Scholars Session), Boston, MA

5. **G.-G. P. Garcia**, M. S. Lavieri, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2019). Optimizing Treatment Decisions Under Objective Clinical Measures and Strategically Reported Symptoms. *INFORMS Healthcare* (Invited Session), Boston, MA

6. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2018). Optimization Approaches for Concussion Management Decisions. *INFORMS Annual Meeting* (Invited Session), Phoenix, AZ

7. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2018). Data-driven Optimization Models for Concussion Management Decisions. *INFORMS Annual Meeting* (Bonder Scholars Session), Phoenix, AZ

8. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, M. McCrea, T. W. McAllister, S. P. Broglio, and CARE Consortium Investigators (2017). A Novel Framework to Determine Decision Thresholds for Medical Diagnosis. *INFORMS Annual Meeting* (Invited Session), Houston, TX

9. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2016). An Optimization Approach to Concussion Management. *INFORMS Annual Meeting* (Invited Session), Nashville, TN

Poster Presentations

1. L. L. Czerniak, S. W. Liebel, **G.-G. P. Garcia**, M. S. Lavieri, M. A. McCrea, T. W. McAllister, and S. P. Broglio (2020). Sensitivity and Specificity of Computer-Based Neurocognitive Assessments in Sport-Related Concussion. *Traumatic Brain Injury Conference*, Washington D.C.

2. L. L. Czerniak, S. W. Liebel, **G.-G. P. Garcia**, M. S. Lavieri, M. A. McCrea, T. W. McAllister, and S. P. Broglio (2020). Characterizing the Accuracy of Computer-Based Neurocognitive Tests in Sport-Related Concussion. *INFORMS Annual Meeting Minority Issues Forum Poster Competition*, National Harbor, MD

3. **G.-G. P. Garcia**, J. Yang, M. S. Lavieri, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2019). Optimization of the SAC, BESS, and SCAT Symptom Checklist for Acute Concussion Assessment. *Traumatic Brain Injury Conference*, Washington D.C.

4. **G.-G. P. Garcia**, M. S. Lavieri, C. M. Schumb, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2018). Developing Insights For Hard-to-Diagnose Concussions Using Machine Learning. *INFORMS Annual Meeting Minority Issues Forum Poster Competition*, Phoenix, AZ

5. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, M. McCrea, T. W. McAllister, S. P. Broglio, and CARE Consortium Investigators (2018). A Stochastic Programming Approach to Determine Decision Boundaries for Medical Diagnosis. *YinzOR Conference* **3rd Place**, Carnegie Mellon University, Pittsburgh, PA

6. M. S. Lavieri, X. Liu, **G.-G. P. Garcia**, Z. Zhou, E. Lobaza, J. Wang, K. Sugiyama, K. Nitta, C. Andrews, M. P. Van Oyen, and J. D. Stein (2017). Using Kalman Filtering to Personalize the Monitoring of Persons with Normal Tension Glaucoma. *The Association for Research in Vision and Ophthalmology*, Baltimore, MD

7. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, M. McCrea, T. W. McAllister, S. P. Broglio, and CARE Consortium Investigators (2017). A Stochastic Programming Approach to Determine Decision Boundaries for Medical Diagnosis. *Center for Healthcare Engineering and Patient Safety Symposium*, University of Michigan, Ann Arbor, MI

8. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, M. McCrea, T. W. McAllister, S. P. Broglio, and CARE Consortium Investigators (2017). A Stochastic Programming Approach to Determine Decision Boundaries for Medical Diagnosis. *Engineering Graduate Symposium* **2nd Place**(Session IOF-2), University of Michigan, Ann Arbor, MI

9. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, M. Mccrea, T. W. McAllister, S. P. Broglio, and CARE Consortium Investigators (2017). A Stochastic Programming Approach to Determine Decision Boundaries for Medical Diagnosis. *INFORMS Annual Meeting Minority Issues Forum Poster Competition* **1st Place**, Houston, TX

10. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2016). Optimal Return-to-Play From Concussion. *Center for Healthcare Engineering and Patient Safety Symposium*, University of Michigan, Ann Arbor, MI

11. **G.-G. P. Garcia**, M. S. Lavieri, and S. P. Broglio (2016). Optimal Return-to-Play From Concussion. *Engineering Graduate Symposium*, University of Michigan, Ann Arbor, MI

Other Presentations

1. **G.-G. P. Garcia** and S. P. Broglio (2020). Optimizing Acute Concussion Assessment. *Concussion Assessment, Research and Education Consortium Investigators Meeting*, Chicago, IL

2. **G.-G. P. Garcia**, M. S. Lavieri, R. Jiang, T. W. McAllister, M. A. McCrea, and S. P. Broglio (2019). A Data-driven Approach to Unlikely, Possible, Probable, and Definite Acute Concussion. *Concussion Assessment, Research and Education Consortium Investigators Meeting*, Chicago, IL

3. **G.-G. P. Garcia**, S. P. Broglio, and M. S. Lavieri (2017). Quantifying The Added Value of a Multidimensional Model for Assessing Acute Concussion. *Concussion Assessment, Research and Education Consortium Investigators Meeting*, Chicago, IL

4. **G.-G. P. Garcia** and B. A. Norman (2011). Maximizing Vaccine Coverage Through Wastage Reduction. *Pitt EXCEL Summer Research Internship*, University of Pittsburgh, Pittsburgh, PA

Awards and Honors

Graduate Awards and Honors

Richard F. and Eleanor A. Towner Prize for Distinguished Academic Achievement	2020
Cornell ORIE Young Researchers Workshop - Departmental Nomination	2019
Society of Medical Decision Making Lee B. Lusted Prize	2018
Quantitative Methods and Theoretical Developments	
INFORMS Bonder Scholarship for Applied OR in Health Services	2018

INFORMS Doctoral Colloquium - Departmental Nomination	2018
INFORMS Minority Issues Forum Doctoral Colloquium Student Sponsorship	
INFORMS Minority Issues Forum Poster Competition - First Place	2017
INFORMS Bonder Scholarship for Applied OR in Health Services - Finalist	2017
IOE Graduate Student Instructor of the Semester	Winter 2017
National Science Foundation Graduate Research Fellowship	2017-2020
Ford Foundation Fellowship Predoctoral Competition - Honorable Mention	2016, 2017
IOE Bonder Scholar Fellowship - Honorable Mention	2016
Rackham Merit Fellowship	2015-2020

Grants and Funding

Cornell ORIE Young Researchers Workshop	2019
Amount Awarded: $500	
California Alliance Research Exchange Travel Grant	2019
Amount Awarded: $1500	
Building Future Faculty, North Carolina State University, Raleigh, NC	2019
Amount Awarded: Cost of travel to workshop	
Future Faculty Development Program, University of Pittsburgh, Pittsburgh, PA	2018
Amount Awarded: Cost of travel to workshop	
NextProf Nexus Travel Grant, University of California, Berkeley	2018
Amount Awarded: Cost of travel to workshop	
INFORMS Bonder Scholarship and Travel Support	2018
Amount Awarded: $6000	
INFORMS Minority Issues Forum Travel Grant	2018
Amount Awarded: $500	
National Science Foundation Graduate Research Fellowship	2017-2020
Amount Awarded: $102,000	
INFORMS Minority Issues Forum Travel Grant	2017
Amount Awarded: $500	
Rackham Travel Grant	Fall 2018
Amount Awarded: $1050	
INFORMS Student Leadership Conference	2017
Amount Awarded: $200	
Rackham Travel Grant	Fall 2017
Amount Awarded: $800	
Rackham Travel Grant	Fall 2016
Amount Awarded: $800	
Rackham Travel Grant	Winter 2016
Amount Awarded: $800	

Undergraduate Awards and Honors

American Society of Engineering Education - National Intern Student of the Year	2014
University of Pittsburgh - Co-op Student of the Year	2014
University of Pittsburgh IIE Chapter - Outstanding Senior Award	2014
Eaton Multicultural Scholarship	2014
UPS Minority Scholarship	2013
Allias-Holzman Undergraduate Teaching Fellowship	Spring 2014, Fall 2014
University of Pittsburgh Dean's List	Spring 2011-Fall 2014
University of Pittsburgh's Honor's List	Fall 2010
Saw Creek Men's Club Scholarship	2010

Teaching Experience

University Teaching

I have teaching experience with the following courses at the University level:

- ➤ IOE316: Introduction to Markov Processes, University of Michigan

- ➤ IE1082: Probablistic Methods of Operations Research, University of Pittsburgh

- ➤ IE1055: Facility Layout and Material Handling, University of Pittsburgh

➤ IE1070: Probability, Random Variables, and Distributions, University of Pittsburgh

➤ IE1052: Manufacturing Processes and Analysis, University of Pittsburgh

Course	Position	Semester	Instructor Rating	College-wide Median	Response
IOE316	Instructor	Winter 2018	4.71	4.48	100/112
IOE316	GSI	Winter 2017	4.76	4.23**	88/93
IOE316	GSI	Fall 2016	4.49	4.50**	97/115
IE1082*	UTA	Summer 2015	NA	NA	NA
IE1055*	UTA	Spring 2015	NA	NA	NA
IE1070	Grader	Fall 2014	NA	NA	NA
IE1052	UTA	Spring 2014	NA	NA	NA

GSI: Graduate Student Instructor, UTA: Undergraduate Teaching Assistant
*denotes a course taught with a flipped lecture style
**University-wide median reported if college-wide median was unavailable

Other Teaching

In addition to teaching at the University level, I have had the opportunity to teach in other capacities.

Course	Position	Grade Level	Institution	Dates
Math	Course Instructor	7th Grade	FAME Academy, Pittsburgh, PA	Jan 2015 - May 2015
Math	Course Instructor	8th Grade	FAME Academy, Pittsburgh, PA	Jan 2015 - May 2015

Professional Development

Cornell ORIE Young Researchers Workshop, Cornell University, Ithaca, NY	2019
California Alliance Research Exchange	2019
Faculty Host: Anil Aswani, IEOR, University of California Berkeley	
Building Future Faculty, North Carolina State University, Raleigh, NC	2019
INFORMS Doctoral Colloquium, Phoenix, AZ	2018
Future Faculty Development Program, University of Pittsburgh, Pittsburgh, PA	2018
NextProf Nexus, University of California Berkeley, Berkeley, CA	2018
INFORMS Student Leadership Conference, Baltimore, MD	2017

Industry Experience

Eaton Corporation, Horseheads, NY
Quality Engineer Intern   5/2014-8/2014

Universal Electronic Corporation, Canonsburg, PA
Manufacturing Engineer Co-op   5/2012-12/2013

Service Activities

Journal Refereeing

➤ Journal of Athletic Training

➤ The Clinical Neuropsychologist

➤ International Journal of Sports Medicine

Service to the Profession

Institute for Operations Research and the Management Sciences (INFORMS)
Session Chair, *Personalized and Data-driven Medical Decision-Making*, INFORMS Healthcare   2019
Session Chair, *Personalized Medical Decision-Making*, INFORMS Annual Meeting   2017

Institute of Industrial and Systems Engineers (IISE)
Session Chair, *Diagnosis Modeling*, ISERC Annual Conference   2016

Service to the University

INFORMS Student Chapter, University of Michigan
President*   2018
Vice President and Treasurer**   2017
Outreach Chair***   2016

Society of Hispanic Professional Engineers, University of Pittsburgh
External Vice President   2013-2014
Scholarship Chair   2012-2013

Pitt EXCEL, BROTHERHOOD, and INVESTING NOW, University of Pittsburgh
Alumni Council   2020-Present
BROTHERHOOD Leader, 1st Foundation Member   2013
Peer Mentor   2011-2012
Freshman Engineering Leadership Team   2011-2013

*Received INFORMS Student Chapter Award at *Cum Laude* level
**Received INFORMS Student Chapter Award at *Magna Cum Laude* level
***Received INFORMS Student Chapter Award at *Summa Cum Laude* level

Service to the Community

FAME Academy, Pittsburgh, PA
MathCounts Coach   2014-2015

Legacy Stem Project, Pittsburgh, PA
Activity Facilitator   2014-2015

Professional References

Mariel S. Lavieri, PhD
Associate Professor
Department of Industrial and Operations Engineering, University of Michigan
E-mail: lavieri@umich.edu **Phone:** (734) 647-0872

Brian T. Denton, PhD
Professor and Chair
Department of Industrial and Operations Engineering, University of Michigan
E-mail: btdenton@umich.edu **Phone:** (734) 763-2060

Ruiwei Jiang, PhD
Assistant Professor
Department of Industrial and Operations Engineering, University of Michigan
E-mail: ruiwei@umich.edu **Phone:** (734) 764-5723

Steven P. Broglio, PhD
Professor
Michigan Concussion Center and School of Kinesiology, University of Michigan
E-mail: broglio@umich.edu **Phone:** (734) 936-1925

Joshua D. Stein, MD
Associate Professor
Ophthalmology and Visual Sciences, University of Michigan
E-mail: jdstein@med.umich.edu **Phone:** (734) 763-9147

Programming Languages

LaTeX, MATLAB, Python, R, VBA, C++