Esmaeil Keyvanshokooh

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Address: Mays Business School, Texas A&M University,
Department of Information & Operations Management, 4217 TAMU, College Station, TX, 77843.

EDUCATION

University of Michigan, Ann Arbor, Michigan *May 2021*
Ph.D. in Operations Research,
Department of Industrial and Operations Engineering (IOE).
Thesis: *Personalized Data-Driven Learning and Optimization: Theory & Applications to Healthcare.*

University of Michigan, Ann Arbor, Michigan *May 2018*
M.Sc. in Statistics, Department of Statistics.

Iowa State University, Ames, Iowa *August 2015*
M.Sc. in Industrial Engineering and Operations Research.
Thesis: *Hybrid Robust & Stochastic Optimization Approaches for Closed-loop Supply Chain Systems.*

K. N. Toosi University of Technology (KNTU), Tehran, Iran *May 2010*
B.Sc. in Industrial Engineering and Operations Research

ACADEMIC EMPLOYMENT & EXPERIENCE

Assistant Professor of Information & Operations Management *August 2021-Present*
Mays Business School, Texas A&M University, College Station, TX.
Department of Information & Operations Management.

Research Affiliate Faculty, Texas A&M Data Science Institute (TAMIDS) *Jan 2022-Present*
Texas A&M University, College Station, TX.

INDUSTRY EMPLOYMENT & EXPERIENCE

Machine Learning & Operation Research Engineer & Analyst *May 2015-September 2015*
Norfolk Southern Corporation, Atlanta, Georgia.

SUMMARY OF RESEARCH INTERESTS

My research aims to develop data-driven analytical decision-making methodologies through design and analysis of *statistical machine learning* mechanisms and *data-driven optimization* algorithms with emphasis on deriving *theoretical performance guarantees*. My research problems are motivated by high-impact problems in healthcare analytics and operations, medical decision-making, business analytics, and service operations management.

Methodology: Data-Driven Optimization, Online and Offline Statistical Learning, Sequential Decision Making under Uncertainty, Distributionally Robust and Stochastic Optimization.

Applications: Big Data and Business Analytics, Healthcare Analytics and Operations, Medical Decision Making, and Service Operations Management.

Google Scholar Profile: 1481 citations with h-index of 9 and i10-index of 9.

Recent Accepted Papers

[P1] Online Advance Scheduling with Overtime: A Primal-Dual Approach,
Esmaeil Keyvanshokooh, Cong Shi, Mark Van Oyen,
Manufacturing and Service Operations Management, Vol. 23(1), 246-266, 2021.

- Winner of Richard C. Wilson Best Student Paper Award on Service Systems, 2019.

[P2] Online Resource Allocation with Personalized Learning,
Mohmmad Zhalechian, Esmaeil Keyvanshokooh, Cong Shi, Mark Van Oyen,
Operations Research, Vol 70 (4), 2138-2161, 2022.

[P3] Coordinated and Priority-based Surgical Care:
An Integrated Distributionally Robust Stochastic Optimization Approach,
Esmaeil Keyvanshokooh, Pooyan Kazemian, Mohammad Fattahi, Mark Van Oyen,
Production and Operations Management, Vol. 31(4), 1510-1535, 2022.

- Winner of IOE Bonder Fellowship Award in Applied Operations Research, 2017.

[P4] Resource Planning Strategies for Healthcare Systems during a Pandemic,
Mohmmad Fattahi, Esmaeil Keyvanshokooh, Devika Kannan, Kannan Govindan,
European Journal of Operational Research, Vol 304(1), 192-206, 2023.

[P5] Data-Driven Hospital Admission Control: A Learning Approach,
Mohmmad Zhalechian, Esmaeil Keyvanshokooh, Cong Shi, Mark Van Oyen,
Operations Research, Accepted (forthcoming), 2023.

- Winner of Richard Wilson Best Student Paper on Service Systems, 2021.

[P6] Mitigating the COVID-19 Pandemic through Data-Driven Resource Sharing,
Esmaeil Keyvanshokooh, Mohammad Fattahi, Kenneth Freedberg, Pooyan Kazemian,
Naval Research Logistics, Accepted (forthcoming), 2023.

- Collaboration with Massachusetts General Hospital and Harvard Medical School.

Under Revision Papers

[R1] Contextual Learning with Online Convex Optimization:
Theory and Application to Medical Decision-Making,
Esmaeil Keyvanshokooh, Mohammad Zhalechian, Cong Shi, Mark Van Oyen, Pooyan Kazemian,
Minor Revision (3rd round of review), ***Management Science***, 2023.

- Finalist, POMS College of Healthcare Operations Management Best Paper Competition, 2022.
- Finalist, INFORMS MSOM Society Best Student Paper, 2021.
- Finalist, INFORMS Health Application Society (HAS) Best Student Paper, 2021.
- Second-place, INFORMS Decision Analysis Society (DAS) Best Student Paper, 2020.
- Winner of Katta G. Murty Best Student Paper Award on Optimization, 2020.

Under Review Papers

[R2] Data-Driven Counterfactual Optimization for Personalized Clinical Decision-Making,
Che-Yi Liao, Esmaeil Keyvanshokooh, Gian-Gabriel Garcia,

[R3] Contextual Reinforcement Learning under Safe Exploration
with Application to Personalized Multimorbidity Management,
Esmaeil Keyvanshokooh, Junyu Cao,

[R4] Contextual Bandits with Budgeted Information Reveal,
Kyra Gan, Esmaeil Keyvanshokooh, Xueqing Liu, Susan Murphy,
Submitted to NeurIPS 2023.

[R5] Contextual Recourse Bandits: Optimizing Decisions through Counterfactual Explanations,
Junyu Cao, Ruijiang Gao, Esmaeil Keyvanshokooh,
Submitted to NeurIPS 2023.

Working Papers

[W1] Contextual Bandits with Budgeted Information Reveal:
With Applications to Digital Health Interventions,
Kyra Gan, Esmaeil Keyvanshokooh, Xueqing Liu, Anna Trella, Susan Murphy, 2023.

[W2] Contextual Bandits with Confounded Observational Data,
Prateek Jaiswal, Junyu Cao, Esmaeil Keyvanshokooh, 2023.

[W3] Online Uniform Risk Time Sampling with Predictors,
Kyra Gan, Esmaeil Keyvanshokooh, Xueqing Liu, Susan Murphy, 2023.

[W4] Drone Delivery in Humanitarian Applications,
Mahdi Noorizadegan, Mohammad Fattahi, Esmaeil Keyvanshokooh, Jon M. Stauffer, 2023.

Selected Published Papers (Prior to PhD)

[P7] A Dynamic Pricing Approach for Returned Products in Integrated Logistics Network Design,
Esmaeil Keyvanshokooh, Mohammad Fattahi, Mohammad Hosseini, Reza Tavakkoli-Moghaddam,
Applied Mathematical Modeling, Vol 37(24), 10182-10202, (2013).

[P8] Investigating Replenishment Policies for the Centralized and Decentralized Supply Chains using Stochastic Programming approach,
Mohammad Fattahi,, M. Mahootchi, Esmaeil Keyvanshokooh, Farid Alborzi, ***International Journal of Production Research***, 53(1), 41-69, (2015).

[P9] Hybrid Robust and Stochastic Optimization Approach for Closed-loop Supply Chain Design Network using an Accelerated Benders Decomposition,
Esmaeil Keyvanshokooh, Sarah Ryan, Elnaz Kabir,
European Journal of Operational Research, Vol 249(1), 76-92, (2016). (Cited by 290 papers)

[P10] Supply Chain Network Design under Uncertainty: A Comprehensive Review & Future Research,
Kannan Govindan, Mohammad Fattahi, Esmaeil Keyvanshokooh,
European Journal of Operational Research, Vol 263(1), 108-141, (2017). (Cited by 621 papers)

[P11] A Multi-stage Stochastic Program for Supply Chain Network Re-design Problem with Uncertain Price-dependent Demands,
Mohammad Fattahi, Kannan Govindan, Esmaeil Keyvanshokooh,
Computers and Operations Research, Vol 100, 314-332, (2018).

HONORS AND AWARDS

Finalist, POMS Healthcare Operations Management (CHOM) Best Paper *2022*
One of the six finalists, Awarded for the paper *"Contextual Learning with Online Convex Optimization: Theory and Applications to Chronic Diseases"*.

Finalist, INFORMS MSOM Society Best Student Paper *2021*
One of the four finalists, Awarded for the paper *"Contextual Learning with Online Convex Optimization: Theory and Applications to Chronic Diseases"*.

Finalist, INFORMS Healthcare Application Society (HAS) Best Student Paper *2021*
One of the four finalists, Awarded for the paper *"Contextual Learning with Online Convex Optimization: Theory and Applications to Chronic Diseases"*.

Second-place, INFORMS Decision Analysis Society (DAS) Best Student Paper *2020*
Awarded for the paper *"Contextual Learning with Online Convex Optimization: Theory and Applications to Chronic Diseases"*.

Winner of Katta G. Murty Best Student Paper Award *2020*
IOE Department, University of Michigan, Ann Arbor, MI
Awarded for the best student paper dealing with a theoretical research paper on an optimization problem or an applied optimization paper carried out.

Rackham Pre-doctoral Fellowship Award *2019*
Rackham Graduate School, University of Michigan, Ann Arbor, MI
Awarded annually to outstanding doctoral students in the University of Michigan who have achieved candidacy and are actively working on their research that is unusually creative, ambitious and impactful.

Winner of Richard C. Wilson Best Student Paper Award *2019*
IOE Department, University of Michigan, Ann Arbor, MI
Awarded for the best student paper dealing with any application of industrial and operations engineering, including, but not limited to, operations, quality control, finance, logistics, healthcare, etc.

Winner of Bonder Fellowship Award in Applied Operations Research *2017*
IOE Department, University of Michigan, Ann Arbor, MI
Awarded annually to one graduate student deemed to have the potential for making a significant contribution to the field of applied operations research.

INFORMS Doctoral Student Colloquium (Phoenix, Arizona) *2017*

Rackham Graduate School Merit Fellowship Award *2015*
Rackham Graduate School, University of Michigan, Ann Arbor, MI
Awarded selectively to incoming Ph.D. students in their first year of study on the basis of academic merit and potential for research.

TEACHING EXPERIENCE

Sole Instructor, Mays Business School, Texas A&M University *Spring 2022, 2023*
Class: *Operations Management* (SCMT 364)
Outline: This is a *core* undergraduate class, which includes concepts, issues and techniques used to plan, analyze, and control systems of production; operational problems in producing goods and services.

- Spring 2022 (2 Sections): *Evaluations 4.73 out of 5; and 4.57 out of 5.*
- Spring 2023 (3 Sections): *Evaluations 4.62 out of 5; 4.40 out of 5; and 4.79 out of 5.*

Sole Instructor, University of Michigan, Ann Arbor, MI *Fall 2018*
Class: *Operations Analysis and Management* (IOE 440)
Enrollment: 69 undergraduate and master students.
Outline: This is a graduate-undergraduate class, which includes data analytics, capacity management, inventory control, supply chain management systems, queueing models and systems, and the mathematics and physics of service enterprises.
Instructor Evaluation: **4.6 out of 5** (The UMICH College-wide Median is 4.48 out of 5).

Teaching Assistant, University of Michigan, Ann Arbor, MI *Fall 2020*
Class: *Stochastic Processes* (IOE 515)
Enrollment: 51 Ph.D. and master students.
Outline: This is a core Ph.D. class, which includes probability theory, Poisson processes, renewal processes, martingales, and discrete and continuous time Markov chains.

Teaching Assistant, Iowa State University, Ames, IA *Fall 2013-Winter 2015*
I have been a teaching assistant for the following courses:

- *Probability Theory & Statistics.*
- *Inventory Control & Production Planning.*
- *Linear Programming & Optimization.*
- *Data Analytics.*

ACADEMIC SERVICE

Referee for Journals: I have been a referee for the following journals:

- Management Science (MS) (4 papers).
- Operations Research (OR) (2 papers).
- Manufacturing & Service Operations Management (M&SOM) (2 papers).
- Production and Operations Management (POM) (13 papers).
- Journal of Operations Management (JOM) (1 paper).
- Naval Research Logistics (2 papers).
- IISE Transactions (2 papers).
- Healthcare Management Science (2 papers).
- Optimization Letters (1 paper).
- European Journal of Operational Research (EJOR) (12 papers).
- International Journal of Management Science (Omega) (3 papers).
- International Journal of Production Research (3 papers).
- Computers and Operations Research (2 papers).

Judge for Competitions and Awards:

- MSOM Service Operations SIG Conference, 2021, 2022, and 2023.
- MSOM Healthcare Operations SIG Conference, 2022 and 2023.

Academic Panelist for Societies:

- POMS Ph.D. Job Search Workshop Series, POMS Society, 2021.
- Academic Job Search Workshop, Minority Issues Forum, INFORMS 2021.

Session Organizer & Chair for INFORMS & POMS Annual Meetings:

- INFORMS 2023: Emerging Topics in Personalized Medicine
  (Invited Speakers: Susan Murphy, Pengyi Shi, Lina Montoya).
- INFORMS Healthcare 2023: Emerging Topics in Healthcare and Personalized Medicine
  (Invited Speakers: Carri Chan, Dan Adelman, Jing Dong).

- INFORMS 2019: Predictive Analytics & Decision-Making in Healthcare
  (Invited Speakers: Rakesh Nagi, Anil Aswani, Timothy Chan).
- INFORMS Healthcare 2019: Multi-armed Bandit & Online Learning in Healthcare
  (Invited Speakers: Yonatan Mintz, Mike Mingcheng Wei).
- POMS 2019: Personalized Treatment & Care Delivery
  (Invited Speakers: Rachna Shah, Cong Shi).
- INFORMS 2018: New Advances in Appointment Scheduling & Online Resource Allocation
  (Invited Speakers: Turgay Ayer, Nan Liu).

IOE INFORMS Student Chapter:

- I have been served as the *Professional Development Chair* for 2018-19 and 2019-20.
- Received INFORMS Student Chapter Award at Summa Cum Laude level (2019-2020).

ACADEMIC ADVISING

Ph.D. Research Advisses:

- Mohammad Zhalechian at Uni of Michigan (2017-2022): Co-authored job market papers.
- Jingwen Tang at Uni of Michigan (2021-current): Co-authored paper.

Primary Supervisor of Undergraduate Research:

- Chun Hu (2017-2018) and Xiaofeng Zou (2018-2019): undergraduate students at Uni of Michigan.

PROPOSAL WRITING EXPERIENCE

I have gained experience in developing and writing the following grant proposals for different funding agencies. My contribution included (i) developing the new ideas, (ii) writing the initial draft of these proposals, and (iii) preparing preliminary results.

Michigan Institute for Data Science (MIDAS), Data Science Proposal for COVID-19:
Data-Driven Epidemic Prediction and Key Resource Optimization to Combat COVID-19, Fall 2020.

National Science Foundation, Operations Engineering (OE) Program:
Uncertainty-Sensitive Real-Time Appointment Scheduling for Healthcare Services Delivery, Winter 2018.

Glaucoma Research Foundation, Proposal for Shaffer Grant:
Using Machine Learning Methods to Forecast Glaucoma Development, Fall 2017.

MEMBERSHIPS

- Institute for the Operations Research and the Management Sciences (INFORMS)
  - Manufacturing and Service Operations Management (MSOM)
  - Health Applications Society (HAS)
  - Applied Probability Society (APS)
  - Public Sector Operations Research (PSOR)
  - Decision Analysis Society (DAS)
  - Optimization Society
- Production and Operation Management Society (POMS)

INVITED TALKS AT PEER INSTITUTIONS

[T1] Personalized Predictive and Prescriptive Analytics: Theory & Applications to Healthcare", Kenan-Flagler Business School, University of North Carolina at Chapel Hill, 2021.

[T2] 'Personalized Predictive and Prescriptive Analytics: Theory & Applications to Healthcare", Department of Information Systems and Operations Management, Warrington College of Business, University of Florida, 2021.

[T3]"Personalized Predictive and Prescriptive Analytics: Theory & Applications to Healthcare", Information and Operations Management, Mays Business School, Texas A&M University, 2021.

[T4]"Personalized Predictive and Prescriptive Analytics: Theory & Applications to Healthcare", Analytics & Operations Department, Imperial College Business School, 2021.

[T5]"Personalized Predictive and Prescriptive Analytics: Theory & Applications to Healthcare", Operations & Supply Chain Department, Haskayne School of Business, University of Calgary, 2021.

[T6] "Personalized Data-Driven Learning and Optimization: Theory & Applications to Healthcare", Supply Chain Management Department, Eli Broad College of Business, Michigan State University, 2020.

[T7] "Personalized Predictive and Prescriptive Analytics: Theory & Applications to Healthcare", Wisconsin School of Business, University of Wisconsin-Madison, 2020.

[T8] "Personalized Data-Driven Learning and Optimization: Theory & Applications to Healthcare", Department of Industrial & Systems Engineering, University of Minnesota, 2020.

[T9] "Personalized Online Learning and Optimization: Theory and Practice in Healthcare", Industrial & Operations Engineering Department, University of Michigan, Lunch & Learn Seminar, 2020.

[T10] "Contextual Learning with Online Convex Optimization: Applications to Chronic Diseases", Industrial & Operations Engineering Department, University of Michigan, Lunch & Learn Seminar, 2019.

INVITED CONFERENCE PRESENTATIONS

[P1] E. Keyvanshokooh, J. Cao, Contextual Reinforcement Learning under Safe Exploration with Application to Personalized Multimorbidity Management, POMS 2023 (Orlando, FL), INFORMS Healthcare 2023 (Toronto, Canada), INFORMS 2023 (Phoenix, AZ).

[P2] E. Keyvanshokooh, K. Gan, Contextual Bandits with Budgeted Information Reveal, INFORMS Healthcare 2023 (Toronto, Canada).

[P3] E. Keyvanshokooh, M. Zhalechian, C. Shi, and MP. Van Oyen, Contextual Learning with Online Convex Optimization, INFORMS 2021, INFORMS 2022 (Indianapolis, IN).

[P4] E. Keyvanshokooh, M. Zhalechian, C. Shi, and MP. Van Oyen, Online Advance Scheduling with Personalized Learning: A Primal-Dual Approach, INFORMS 2020.

[P5] E. Keyvanshokooh, C. Shi, MP. Van Oyen, Advance Online Scheduling with Overtime: a Primal-Dual Approach, presented at INFORMS 2018 (Phoenix, AZ), MSOM 2018 (Dallas, TX), POMS 2019 (Washington DC), INFORMS Healthcare 2019 (Cambridge, MA), and INFORMS 2019 (Seattle, WA).

[P6] E. Keyvanshokooh, M. Zhalechian, C. Shi, and MP. Van Oyen, Online Personalized Care Framework to Reduce Readmission Risk, presented at POMS 2019 (Washington DC) and INFORMS Healthcare 2019 (Cambridge, MA).

[P7] E. Keyvanshokooh, P. Kazemian, M. Fattahi, and MP. Van Oyen, Managing Coordinated and Priority-based Care in Clinical and Surgical Suites under Integrated Uncertainty, presented at INFORMS 2018 (Phoenix, AZ), POMS 2019 (Washington DC), and INFORMS Healthcare 2019 (Cambridge, MA).

[P8] E. Keyvanshokooh, C. Shi, and MP. Van Oyen, Online Appointment Scheduling with a Rolling Horizon Approach: Primal-Dual Competitive Analysis, presented at INFORMS 2017 (Houston, TX).

[P9] E. Keyvanshokooh, P. Kazemian, M. Fattahi, and MP. Van Oyen, Coordinated Clinic Surgery Appointment Scheduling: A Multi-stage Stochastic and Distributionally Robust Approach, presented at INFORMS 2016 (Nashville, TN), and POMS 2017 (Seattle, WA).

[P10] E. Keyvanshokooh, MP. Van Oyen, MS. Lavieri, C. Andrews, and J. Stein, Dynamic Learning of Personalized Patient Progression in Chronic Diseases, presented at INFORMS Healthcare 2019 (Cambridge, MA) and INFORMS 2019 (Seattle, WA).

[P11] E. Keyvanshokooh, MP. Van Oyen, MS. Lavieri, C. Andrews, and J. Stein, Dynamic Online Learning of Personalized Patient Progression in Chronic Diseases: Application to Glaucoma, presented at INFORMS 2018 (Phoenix, AZ) and POMS 2019 (Washington DC).

[P12] E. Keyvanshokooh, MP. Van Oyen, MS. Lavieri, C. Andrews, and J. Stein, Dynamic Classification Approach for Classifying Patients in Chronic Disease: Application to Glaucoma, presented at INFORMS 2017 (Houston, TX).

[P13] MP. Van Oyen, E. Keyvanshokooh, B. Denton, and P. Kazemian, Improving Access Delays from Request to Surgery with Multiple Patient Types, INFORMS Healthcare 2017 (Rotterdam, Netherlands).

[P14] J. Stein, P. Kazemian, E. Keyvanshokooh, MS. Lavieri, and MP. Van Oyen, Using Kalman Filtering to Personalize Prediction of Open-angle Glaucoma Progression under Different Target IOP Levels, American Glaucoma Society Annual Meeting 2017 (Coronado, CA).

TECHNICAL SKILLS

Programming Languages & Software: Python, R, Julia, SQL, Apache Hadoop, Gurobi, and CPLEX.

SOCIETAL IMPACT STATEMENT

My research and teaching have a critically crucial impact on society in the areas of healthcare, medical decision-making, and service operations.

The massive advances in artificial intelligence (AI), machine learning (ML), and optimization over the recent decade has increased the opportunity to automate operational decisions for a wide range of real-world problems. However, such advances still do not propagate to most operations management problems due to their nuance structures such as being restricted to *the need for accounting for multiple sources of uncertainty, limited resources, delay in observing feedback, and the need for making nested and personalized decisions*. This brings forward several challenges and opportunities that have been the primary motivation for my research contributions in both theoretical and practical aspects. Generally speaking, my research thus far has focused on (i) identifying *practical and societal problems* arising in the area of operations management, (ii) prescribing *easy to implement, efficient and effective methodologies and algorithms* with provable theoretical performance guarantees, and (iii) deriving *managerial insights* for dealing with these practical problems.

My teaching impacts how the next generation of business leaders understand and manage the operations, planning, control, and supply chains of different organizations and companies. I engage my students to learn operations management concepts through exploiting real-world cases, experiments, and simulation activities. I also share *my academic research and industry experiences in business analytic, operations research and machine learning* with my students, to show them how operations management can have a profound impact in addressing societal challenges in healthcare and operations management cases.