Mohammad Khalafi

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Summary — I am a senior **PhD candidate** at **Southern Methodist University (SMU)** and a graduate research assistant in the Operations Research and Engineering Management (OREM) department. I am actively seeking an internship position as a Research Scientist, preferably for the summer or fall of 2025. My research primarily focuses on the foundations of optimization and machine learning. My work largely falls into the following categories.

- Theoretical Optimization and Algorithm Design: Developing algorithms and conducting complexity analysis for various types of optimization problems, including convex optimization, bilevel optimization, minimax games, and variational inequality (VI) problems.
- Mathematical Modeling: Formulating and solving real-world problems, such as pricing problems and decision-making in supply chains, using machine learning algorithms.

Experience

Graduate Research Assistant **Jan 2022 – Present**
Southern Methodist University *Dallas, TX*

Selected Research Projects

- Developed an **optimal primal-dual (PD) algorithm** for a class of **minimax problems**.
- Developed **optimal algorithms** for **stochastic constrained variational inequalities (VI)** with application in **Nash equilibrium (NE) problems**.
- Developed **last-iterate optimal algorithms** for **stochastic convex optimization problems** with application in **sparse optimization**.
- Developed **simple and optimal regularized first-order methods** for stochastic bilevel variational inequality problems.

Sabanci University *Istanbul, Turkey*

Selected Research Projects

- Developed a **dynamic electricity pricing model** in collaboration with a Turkish electricity provider (Technix).

Graduate Teaching Assistant **Sep 2019 – Aug 2021**
Sabanci Unviersity *Istanbul, Turkey*

- Delivered class lectures in **Discrete-Event Simulation (DES)**. Undergraduate course
- Delivered class lectures in **statistical Modeling**. Undergraduate course
- Delivered class lectures in **Introduction to Probability**. Undergraduate course

Education

Southern Methodist University **Dallas, TX**
Ph.D. in Operations Research *Jan 2022 – May 2026 (Expected)*

- Total Cumulative GPA: $4/4$
- Advisor: Digvijay Boob
- Dissertation Title (tentative): First-order Methods in Modern Optimization Problems: Algorithms and Applications

Sabanci University **Istanbul, Turkey**
M.Sc.in Industrial Engineering *Sep 2019 – Aug 2021*

- Total Cumulative GPA: $3.75/4$
- Advisor: Sinan Yildirim
- Thesis Title: Predicting Supply Curve of Electricity in an Intra-day Market Using State-Space Models and Sequential Markov Chain Monte Carlo Methods

Amirkabir University of Technology (Tehran Polytechnic) **Tehran, Iran**
B.Sc.in Industrial Engineering *Oct 2015 – Aug 2019*

- Total Cumulative GPA: $3.43/4$
- Advisor: Abbas Ahmadi
- Thesis Title: Developing Social Robots with Personalized Behavior for Elder Care

Publications

1. **M. Khalafi**, D. Boob, *Proceedings of the 40th International Conference on Machine Learning **(ICML)***, Proceedings of Machine Learning Research **202**, **byeditor** A. Krause **andothers**, 16250–16270, (https://proceedings.mlr.press/v202/khalafi23a.html) (**july** 2023).
2. S. Yıldırım, **M. Khalafi**, T. Güzel, H. Satık, M. Yılmaz, *IEEE Transactions on Power Systems* **38**, 3056–3069 (2023).
3. D. Boob, Q. Deng, **M. Khalafi**, *arXiv preprint arXiv:2304.04778*, (https://arxiv.org/abs/2304.04778) (2023).
4. D. Boob, **M. Khalafi**, *Optimal Primal-Dual Algorithm with Last iterate Convergence Guarantees for Stochastic Convex Optimization Problems*, 2024, arXiv: 2410.18513 [math.OC], (https://arxiv.org/abs/2410.18513).
5. **M. Khalafi**, *Predicting supply curve of electricity in an intra-day market using state-space models and sequential markov chain monte carlo methods*.

Technical Skills

Coding MATLAB, Python, C/C++, R
Solvers Gurobi, GAMS, CVX, CPLEX
Writing LaTeX
Libraries TensorFlow, Scikit-learn, NumPy, pandas
Simulation Arena

Awards and Achievements

Best Graduate Poster Presentation, Southern Methodist University **2024**
Winner of the OREM department's Outstanding Graduate Award, Southern Methodist University **2024**
Winner OR and Advanced Analytics Hack-a-thon Contest among 13 Teams, American Airlines **2024**
Recipient of Templeton Fellowship, Southern Methodist University **2022**
Recipient of a full scholarship, Sabanci University **2019**
Honor Student and Eligible for M.Sc Program without entrance exam, AmirKabir University **2019**
Ranked 33th in the Nationwide Universities entrance exam for the.M.Sc. degree **2019**
Ranked 727th among more than 180,000 participants in the Nationwide Universities entrance exam. **2015**

Workshops and Confrences

International Conference of Machine learning (ICML), Hawaii USA **Jul 2023**
– Presentation Title: Accelerated primal-dual methods for convex-strongly-concave saddle point problems

INFORMS Annual Meeting, Phoenix USA **Oct 2023**
– Presentation Title: Accelerated primal-dual methods for convex-strongly-concave saddle point problems

INFORMS Optimization Society (IOS), Houston USA **Mar 2024**
– Presentation Title: Stochastic algorithms for convex function constrained optimization with last iterate convergence guarantees

INFORMS Annual Meeting, Seattle USA **Oct 2024**
– Presentation Title: First-order Methods for Stochastic Variational Inequality Problems with Function Constraints

INFORMS Annual Meeting, Seattle USA **Oct 2024**
– Presentation Title: Optimal Primal-Dual Algorithm with Last-iterate Convergence Guarantees for Stochastic Convex Optimization Problems

Selected Graduate Courses

OR
– Nonlinear Programming – Integer Programming – Stochastic Processes
Statistics
– Advanced Statistics – Bayesian Statistics
Applications
– Supply Chain Operations & Cntrl – Advanced Logistics Networks – Network Flows
Machine learning
– Machine Learning in Python – Multi-armed Bandit – Data Mining

References

Available upon request