ZEINAB ALIZADEH

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Department of System and Industrial Engineering, University of Arizona, Tucson, AZ, 85721

EDUCATION

University of Arizona, Tucson, Arizona *August 2021-present*
Ph.D. in Industrial Engineering
Minor in Information Science
Dissertation title: "Iterative Methods for Stochastic Nash Games and Quasi Variational Inequality Problems"
Advisor: Afrooz Jalilzadeh, Ph.D.

University of Arizona, Tucson, Arizona *August 2021-2023*
MS in Industrial Engineering

University of Tehran, Tehran, Iran *2016-2021*
B.S. in Applied Mathematics

RESEARCH INTERESTS

- Stochastic and simulation optimization
- Large-scale optimization, saddle point and variational inequality problems
- Structuring machine learning and prediction models
- Data analytics

FELLOWSHIPS AND AWARDS

- 2 Tier Herbold Fellowship, University of Arizona, Awarded for contributions to computational and advanced analyses in engineering, Fall 2024-Spring 2025
- 2023 INFORMS annual scholarship to attend the conference. Oct 2023
- Stipend for Invited Panelist, Women in Science and Engineering (WISE), University of Arizona, November 2023.
- SIE Wildcat Scholarship, Systems and Industrial Engineering, University of Arizona, Dec 2021

PUBLICATIONS

- **Journal Papers (Published/Under Review)**
  - Z. Alizadeh., A. Jalilzadeh, and F. Yousefian, "Randomized Lagrangian Stochastic Approximation for Large-Scale Constrained Stochastic Nash Games". 2023 Optimization Letters, doi: 10.1007/s11590-023-02079-5.
  - Z. Alizadeh, and A. Jalilzadeh, "Convergence Analysis of Non-Strongly-Monotone Stochastic Quasi-Variational Inequalities". (under review)
  - Z. Alizadeh, E.Y. Hamedani, and A. Jalilzadeh, "Variance-reduction for Variational Inequality Problems with Bregman Distance Function". (under review)
- **Peer-Reviewed Conference Papers**
  - Z. Alizadeh, F. Polanco, and A. Jalilzadeh, "A Projection-Based Algorithm for Solving Stochastic Inverse Variational Inequality Problems", Winter Simulation Conference (WSC), 2023.
  - M. Boroun, Z. Alizadeh, and A. Jalilzadeh, "Accelerated Primal-dual Scheme for a Class of Stochastic Nonconvex-concave Saddle Point Problems," American Control Conference (ACC), 2023.
  - Z. Alizadeh, B. M. Otero, and A. Jalilzadeh, "An Inexact Variance-Reduced Method for Stochastic Quasi-Variational Inequality Problems with an Application in Healthcare," Winter Simulation Conference (WSC), 2022.

- **Working Papers**
  - C. Melcher, Z. Alizadeh, E.Y. Hamedani, and A. Jalilzadeh, "Semi-infinite Nonconvex Constrained Min-Max Optimization".
  - A. Farsi, Z. Alizadeh, and A. Jalilzadeh, "A Variational Inequality Approach to Risk-Averse and Distributionally Robust Nash Equilibria".

RESEARCH EXPERIENCE

Research Assistant at University of Arizona, Tucson, AZ, USA *August 2021- present*

- **Developed stochastic quasi-variational inequality (SQVI) algorithms:** Proposed an inexact variance-reduced stochastic scheme to solve strongly monotone SQVI problems with challenging projection constraints. Analyzed convergence rate and oracle complexity, achieving linear convergence via increasing sample sizes and approximated projections.
- **Designed algorithms for stochastic Nash games:** Developed algorithms for stochastic monotone Nash games with multiple convex constraint inequalities, addressing the challenges of generalized Nash equilibrium problems (GNEP) with interdependent player constraints. We obtain a convergence rate of $\mathcal{O}\left(\frac{\log(k)}{\sqrt{k}}\right)$ for both suboptimality and infeasibility.
- **Advanced nonconvex-concave saddle point methods:** Proposed a novel single-loop accelerated primal-dual algorithm to solve nonconvex-concave min-max saddle point problems, satisfying the Polyak-Łojasiewicz condition. Achieved convergence with new rate results, applied to machine learning and control problems like distributionally robust optimization and adversarial learning.
- **Developed methods for inverse variational inequalities (IVI):** Addressed stochastic IVI problems characterized by a continuous and cocoercive map by introducing a variance-reduced projection-based gradient method. This approach ensures the almost sure convergence of the iterates to the solution. Additionally, we established a theoretical convergence rate for the method. To validate our approach, we applied the algorithm to a network equilibrium control problem, demonstrating its practical effectiveness.
- **Explored stochastic variational inequality (VI) problems:** Introduced a single-loop variance-reduced algorithm capable of adapting the Bregman distance function to solve finite-sum structured monotone VIs. Demonstrated optimal convergence and extended to non-monotone problems with weak Minty assumption. The proposed algorithm is implemented on a distributionally robust optimization (DRO) problem and a matrix game.

Optimization Scientist at University of Arizona, Tucson, AZ, USA *August 2024- May 2025*

- As an Optimization Scientist and Data Analytics Team Member in Trusted Artificial Intelligence Systems Engineering Challenge, contributed to a national defense initiative focused on enhancing the trustworthiness of AI systems under uncertainty. Developed systems engineering and optimization techniques to ensure reliable and responsible AI decision-making in safety-critical environments.

PRESENTATIONS

- Z. Alizadeh, selected to present thesis speech "Iterative Methods for Stochastic Nash Games and QVI Problems" at the Doctoral Colloquium, IISE Annual Conference 2025, Atlanta, GA.
- Z. Alizadeh, E.Y. Hamedani, and A. Jalilzadeh, "Variance-reduction for Variational Inequality Problems with Bregman Distance Function". NFORMS Annual Meeting 2024, Seattle, WA
- Z. Alizadeh, F. Polanco, and A. Jalilzadeh, "A Projection-Based Algorithm for Solving Stochastic Inverse Variational Inequality Problems". Winter Simulation Conference (WSC), San Antonio, TX.
- Z. Alizadeh and A. Jalilzadeh, "Randomized Lagrangian Stochastic Approximation for Large-Scale Constrained Stochastic Nash Games", INFORMS Annual Meeting 2023, Phoenix, AZ.
- Presenting in the Diamond Dollars Case Competition as a team leader, my team contains five students (two masters and two undergrads), 2023 SABR Analytics Conference. Phoenix, AZ.
- Z. Alizadeh and A. Jalilzadeh, "An Inexact Variance-Reduced Method For Stochastic Quasi-Variational Inequality Problems With An Application In Healthcare", Winter Simulation Conference (WSC).

- Z. Alizadeh and A. Jalilzadeh, "An Inexact Variance-Reduced Method For Stochastic Quasi-Variational Inequality Problems With An Application In Healthcare", INFORMS Annual Meeting 2022, Indianapolis, IN.

TEACHING EXPERIENCE

Teaching Assistant at University of Arizona, Tucson, USA *Summer-Spring 2023*
SIE270: Mathematical Foundation of SIE.
SIE340: Deterministic Operations Research.
Teaching Assistant at University of Tehran, Tehran, Iran *Fall 2017- Spring 2020*
courses: Linear optimization, Nonlinear optimization, Nonlinear Algebra and Linear Algebra.
Responsibilities included presenting lectures, as well as designing, grading, and helping students with projects.

SERVICES

- Reviewer Transactions on Automatic Control (TAC) IEEE Journal
- Team leader in the Diamond Dollars Case Competition, 2023, Phoenix
- Volunteer Member of Data Cats, University of Arizona
- Volunteer Member of Women in WISE (Woman in Science and Engineering), University of Arizona
- Member of Institute of Operations Research and Management Science (INFORMS) since 2021

SKILLS AND COURSES

Simulation/Optimization:
Experienced in developing optimization models, Linear, Non-linear, Large scale, and mixed integer programming
Statistics/Machine Learning:
Experienced in supervised predictional models, such as Regression, Classification, and support vector machines
Programming Experience: Experienced in MATLAB, Python, and R
Optimization and Machine learning Solvers: Gurobi, CPLEX, MOSEK, CVX