SINA BAHARLOUEI

Ph.D. Candidate, Machine Learning Researcher

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EDUCATION

Doctor of Philosophy
Operations Research
University of Southern California
August 2017 - current

Thesis: Minimax Stochastic Optimization for Responsible and Safe AI

Master of Science
Applied Math & Statistics
University of Southern California
Aug 2021 - May 2023
GPA: 3.97/4

Relevant courses

- Analysis of Time Series
- Mathematics of Machine Learning
- Advanced Hypothesis Testing
- Advanced Topics in Game Theory

Bachelor's of Science
Computer Engineering
Amirkabir University of Technology
Sep 2012 - Sep 2016
GPA: 3.81/4

SKILLS

- **Programming**: Python, C++, R
- **Machine Learning**: Pandas, Numpy
- **Deep Learning**: PyTorch, Tensorflow
- **Database:** SQL, MongoDB, Redis
- **Big Data**: Spark, OpenMPI, HPC
- **Optimization**: Gurobi, CVX, AMPL
- **Visualization**: Tableau, Matplotlib
- **Generative AI**: GANs, Diffusion Models
- **Language Models**: GloVe, BERT, GPT2

RESEARCH INTERESTS

- Robust Deep Learning
- Stochastic and Scalable Optimization
- Responsible AI
- Fair Language Models

INTRODUCTION

6+ years of academic and industry experience in **scalable optimization** algorithms for large-scale machine learning applications, including **Responsible AI** (fair & robust ML), **vision**, and **language learning** under uncertainty, domain shifts, and adversarial settings.

WORK EXPERIENCE

Machine Learning Research Intern

Bosch Center for Artificial Intelligence
May 2021 - Oct 2021 Pittsburgh, PA

- **Implementing and improving robust** and **verifiable** deep Neural Network Classifiers/Verifiers against **adversarial attacks** in vision and object detection tasks.
- Beating **SOTA verifiers** up to **7%** in less than **2× runtime**.
- **Publication**: Baharlouei et al., "Improving Adversarial Robustness via Joint Classification and Multiple Explicit Detection Classes", **AISTATS 2023** [paper] [code]

Research Assistant

University of Southern California
August 2017 - current Los Angeles, CA

- **Algorithmic Fairness:** Designing **high-performance** and **scalable** fair learning optimization algorithms
- Lowy, **Baharlouei**, et al., "A Stochastic Optimization Framework for Fair Risk Minimization", **NeurIPS TSRML Workshop 2022**, **TMLR 2023.** [paper] [code]
- Baharlouei et al., "Renyi Fair Inference", **ICLR 2020.** [paper] [code]
- Up to **12%** improvement in demographic parity and equality of opportunity violations
- Preserves performance for **every batch size, including 1 (memory efficient)**
- **Robust Machine Learning:** Training **robust** models against **adversarial attacks**, **missing values**, **spurious correlations**, and **distribution shifts**.
- **Baharlouei** et al., "RIFLE: Robust Imputation and Inference from Low Order Marginals", **Top 3 papers** in **ICML DP4ML Workshop 2023**, **TMLR 2023** [paper] [code]
- Dai, **Baharlouei**, et al., "Feature Selection in the Presence of Monotone Batch Effects" **ICML** Spurious Correlations, Invariance and Stability **workshop 2023**. [paper] [code]
- **Baharlouei** and Razaviyan "Dr. FERMI: A Stochastic Distributionally Robust Fair Empirical Risk Minimization Framework" **NeurIPS** AFT **workshop 2023**. [paper] [code]
- Significant improvement of (**0.14** on average) Residual Mean Squared Error (**RMSE**) for Imputation of datasets containing up to **80% missing values**.
- **+15% F1 score** enhancement in **gene discovery** tasks.
- **Session Chair at INFORMS 2023:** "Robust and Fair Machine Learning in the Presence of Distribution Shifts," Phoenix, Arizona.
- **Editorial Board**: International Journal of Data Science (IJDS)
- **Paper Review**: NeurIPS 2023, ICML 2023, UAI 2023, ICLR 2022, AISTATS 2022, JMLR.

Academic Mentor

IUSSTF USC Program
June 2023 - August 2023 Los Angeles, CA

- **Mentoring Shivam Patel** (**40 hours** per week): Research on **transferable large-scale fair** models: first **provably convergent jointly robust** & **fair** stochastic algorithm
- **Resulting Paper**: Baharlouei, **Patel**, and Razaviyayn, "f-FERM: A Scalable Framework for Robust Fair ERN." **NeurIPS** 16th **OPT** Workshop 2023 & ICLR 2024. [paper] [code]
- Improving fairness generalizability on the **New Adult** Dataset by more than **25%**

Server Side Software Engineer

Quiz of Kings
July 2013 - Sep 2015 Tehran, Iran

- Implementing a ranking system for **active players** (> **3 million**) of Quiz of Kings via **Redis**. Led to **30x** faster response compared to **SQL** solutions.