Alisina Bayati

Ph.D. Candidate — Control, Optimization & Data-Driven Decision Making

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Citizenship: United States | Iran

Profile

Applied mathematics & control/optimization researcher specializing in scalable algorithms for constrained optimization, safety-aware coordination, and sparse learning under evolving data. Proficient in Python, C, statistical modeling, control theory, and high-dimensional numerical methods.

Education

University of Illinois at Urbana–Champaign *2020–2027 (expected)*
Ph.D. in Mechanical Science & Engineering
Advisor: Prof. Srinivasa Salapaka

University of Illinois at Urbana–Champaign *2023–2025 (expected)*
M.S. in Mathematics GPA 3.90/4.00

Sharif University of Technology *2015–2019*
B.S. in Mechanical Engineering GPA 18.10/20 (3.89/4.00)
Advisor: Prof. Hamed Moradi

Publications

Peer-Reviewed

[1] A. Srivastava†, **A. Bayati**†. "Sparse linear regression with constraints: A flexible entropy-based framework." *IEEE ECC 2024*. [IEEE Xplore]

[2] **A. Bayati**, A. Srivastava, A. Malvandi, H. Feng, S. Salapaka. "Towards efficient modularity in industrial drying: A combinatorial optimization viewpoint." *IEEE ACC 2023*. [IEEE Xplore]

Preprints / Under Review

[3] **A. Bayati**†, D. Tiwary†, S. Salapaka. "A Control Barrier Function Approach to Constrained Resource Allocation Problems in a Maximum Entropy Principle Framework." *submitted CDC 2025*. [arXiv], Code

[4] S. Basiri, **A. Bayati**, S. Salapaka. "Orthogonal non-negative matrix factorization with sparsity constraints." *submitted CDC 2025*. [arXiv], Code

[5] **A. Bayati**, A. Srivastava, V. Mundada, S. Salapaka, H. Feng, A. Malvandi. "Enhancing energy efficiency in industrial drying via ultrasonic waves and dynamic optimization." *Energy Conversion & Management* (under review).

In Preparation

[6] **A. Bayati**, A. Srivastava, S. Salapaka. "Dynamic Resource Allocation under Safety and Mobility Constraints: A Maximum Entropy Framework for Multi-Agent Systems."

Experience & Projects

Graduate Research Assistant, SENSIC Lab, UIUC *Sep 2020 – Present*

- **Control-Theoretic Approaches to Combinatorial Optimization** *Oct 2024 – Present*
  - Designed a dynamic feedback strategy for general constrained optimization problems that provably drives decision variables toward KKT stationarity, with guarantees on asymptotic convergence and feasibility.
  - Applied to capacitated facility location problems, achieving up to 20× and 240× speedups over Safe Gradient Flow (Cortés et al.) and `SciPy`'s SLSQP. Paper Code
  - Also applied to orthogonal non-negative matrix factorization with feature sparsity. Paper Code

  - Ongoing work extends to dynamic settings, where the objective and constraints evolve over time (e.g., collision-avoidance constraints in multi-agent systems), and the goal is to continuously track the moving optimizer in real time.

- **Energy-Efficient Optimization for Hybrid Drying Systems** *Sep 2020 – Present*
  - Developed a mixed-integer, multi-stage optimization framework for ultrasonic/convective drying, reducing energy consumption by 13% relative to the static single-stage baseline while satisfying key product quality constraints (e.g., color, moisture). Results under review at the *Journal of Energy Conversion and Management*.
  - Currently extending to a smart drying setup involving multiple drying technologies, jointly optimizing the sequence of operations and their conditions.
  - Also integrating mesh-based GNNs trained offline to replace CFD/statistical models and support fast, differentiable inference.
- **Routing Optimization in Residential Wi-Fi Mesh Networks** *Sep 2021 – Sep 2023*
  - Built a real-time digital twin for Wi-Fi mesh networks using permutation-invariant DNNs; solved large-scale placement and routing problems.
  - Achieved latency in the lowest 3rd percentile across 50,000 uniformly sampled brute-force configurations.
  - *Funded by Foxconn Interconnect Technology (FIT).*

Graduate Teaching Assistant, UIUC *Spring 2023, 2024*

- **Courses: ME 340 (Dynamics), TAM 210/211 (Statics and Intro to Dynamics)**
  - Ranked as "*Excellent Teaching Assistant*" based on campus-wide student evaluations for Spring 2024.

Undergraduate Researcher, Sharif University of Technology *Sep 2018 – Jun 2019*

- **Optimal Control of Drug Delivery in Nonlinear Cancer Models**
  - Designed optimal PID controllers for nonlinear cancer-tumor drug-delivery models in MATLAB/Simulink, minimizing side effects while reaching the target tumor volume.
  - Conducted as part of the Process Control Lab under Prof. Hamed Moradi

Selected Academic Projects

- **Statistical Reinforcement Learning (CS 542)**, UIUC *Fall 2024*
  - Reconstructed and analyzed the theoretical foundations of adaptive control in LQ systems, following Abbasi-Yadkori & Szepesvári (2011). Derived key lemmas and implemented the $\widetilde{O}(\sqrt{T})$ regret algorithm in Python. [Report]
- **Computer Vision (CS 543)**, UIUC *Fall 2022*
  - Developed a CNN pipeline for facial keypoint detection under occlusion and noise; applied data augmentation for robustness and evaluated performance on corrupted datasets. [Report]

Selected Graduate Coursework

Mathematics
- Real Analysis
- Functional Analysis
- Random Processes
- Vector-Space Optimization

Machine Learning & Statistics
- Statistical RL
- Machine Learning
- Computer Vision
- Statistics & Probability

Control & Systems
- Optimal Control Theory
- Nonlinear Systems
- Linear Control Systems
- Dynamic Programming

Honors & Awards

- Teachers Ranked as Excellent, UIUC *Spring 2024*
- ACC Student Travel Award *2023*
- MechSE First-Year Fellowship, UIUC MechSE *2020*
- Top 0.2% of 182,000 entrants, Iran's National University Entrance Exam (Math & Physics) *2015*

Technical Skills

Programming	Python (NumPy, pandas, PyTorch, SciPy, CVXPY, scikit-learn), MATLAB, C/C++, Git, LaTeX
Quantitative	Stochastic processes, Optimal control, Convex/non-convex optimization, Monte Carlo simulation, Time-series analysis
Tools	Jupyter, Simulink, OpenCV
Languages	Persian (native), English (fluent), Arabic (elementary)

Service

- Peer Reviewer, ACC, ECC, CDC *2023–Present*

References

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Additional references available upon request.