Asal Mehradfar

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Education

University of Southern California — Los Angeles, CA
Ph.D., Electrical Engineering (Advisor: Prof. Salman Avestimehr) — 2023 – Present

University of Southern California — Los Angeles, CA
M.Sc., Electrical Engineering — 2023 – 2025

Sharif University of Technology — Tehran, Iran
B.Sc., Electrical Engineering — 2017 – 2022
B.Sc., Computer Science — 2019 – 2022

Research Experience

AI-Driven Analog and RF Circuit Design (Fall 2023 – Present)

- Developed **AICircuit**, a multi-topology benchmark for AI-driven analog and RF circuit design. [6], [9]
- Introduced **FALCON**, a layout-aware ML framework for automated analog circuit inverse design. [5]
- Designed graph-based circuit representations enabling GNN generalization across unseen topologies. [5]
- Developed EM-aware physical synthesis and inductor modeling techniques for RF circuits. [1]
- (Ongoing) Advancing toward frequency-aware optimization, automated layout generation, and LLM-based expert design systems.

AI-Driven Lipid Nanoparticle Design for Drug Delivery (Fall 2023 – Present)

- Developed **LANTERN**, an ML framework for predicting LNP transfection efficiency. [3]
- Developed an interpretable ML framework for predicting LNP biodistribution and guiding extrahepatic LNP design. [2]
- (Ongoing) Developing generative models for LNP design toward improved functional and physicochemical properties.

AI for Financial Systems (Fall 2024 – Present)

- Developed **CryptoMamba**, an SSM-based framework for cryptocurrency time-series forecasting. [7]
- (Ongoing) Authoring a survey on AI-driven cryptocurrency trading and financial modeling.

Additional Research Experience

- Developed **ATHENA**, a test-time steering framework for improving count fidelity in text-to-image diffusion models. [4]
- Developed uncertainty-aware routing methods for LLMs to optimize cost–accuracy trade-offs. [8]
- Designed an action recognition and multi-camera tracking system for resource-constrained edge devices.

Honors and Awards

- Qualcomm Innovation Fellowship Finalist 2025
- Reproducibility Award at Machine Learning and the Physical Sciences Workshop @ NeurIPS 2024
- Annenberg Graduate Fellowship @ USC 2023

Publications

[1] Y. Huang, **A. Mehradfar**, S. Avestimehr, and H. Aghasi, "EM-Aware Physical Synthesis: Neural Inductor Modeling and Intelligent Placement & Routing for RF Circuits", *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2026.

[2] **A. Mehradfar***, M. S. Sepehri*, O. Antholine, V. Shankar, G. S. Kwon, S. Avestimehr, and M. Rasoulianboroujeni, "Decoding Extrahepatic Targeting of Lipid Nanoparticles with Interpretable Machine Learning", 2026.

[3] **A. Mehradfar***, M. S. Sepehri*, J. M. Hernandez-Lobato, G. S. Kwon, M. Soltanolkotabi, S. Avestimehr, and M. Rasoulianboroujeni, "A Machine Learning Benchmarking Framework for Lipid Nanoparticle Transfection Efficiency Prediction", *Communications AI & Computing (Nature Portfolio)*, 2026.

[4] M. S. Sepehri*, **A. Mehradfar***, B. Tinaz, S. Avestimehr, and M. Soltanolkotabi, "ATHENA: Adaptive Test-Time Steering for Improving Count Fidelity in Diffusion Models", *Test-Time Scaling for Computer Vision (ViSCALE) Workshop @ CVPR*, 2026.

[5] **A. Mehradfar**, X. Zhao, Y. Huang, E. Ceyani, Y. Yang, S. Han, H. Aghasi, and S. Avestimehr, "FALCON: An ML Framework for Fully Automated Layout-Constrained Analog Circuit Design", *The Thirty-ninth Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2025.

[6] **A. Mehradfar**, X. Zhao, Y. Niu, S. Babakniya, M. Alesheikh, H. Aghasi, and S. Avestimehr, "Supervised Learning for Analog and RF Circuit Design: Benchmarks and Comparative Insights", *arXiv preprint arXiv:2501.11839*, 2025.

[7] M. S. Sepehri*, **A. Mehradfar***, M. Soltanolkotabi, and S. Avestimehr, "CryptoMamba: Leveraging State Space Models for Accurate Bitcoin Price Prediction", *IEEE International Conference on Blockchain and Cryptocurrency (ICBC)*, 2025.

[8] T. Zhang*, **A. Mehradfar***, D. Dimitriadis, and S. Avestimehr, "Leveraging Uncertainty Estimation for Efficient LLM Routing", *Collaborative and Federated Agentic Workflows Workshop @ ICML*, 2025.

[9] **A. Mehradfar**, X. Zhao, Y. Niu, S. Babakniya, M. Alesheikh, H. Aghasi, and S. Avestimehr, "AICircuit: A Multi-Level Dataset and Benchmark for AI-Driven Analog Integrated Circuit Design", *Machine Learning and the Physical Sciences Workshop @ NeurIPS*, 2024.

Academic Service

- Reviewer, NeurIPS 2026
- Reviewer, IEEE Transactions on VLSI Systems 2026
- Reviewer, AI for Science Workshop @ NeurIPS 2025
- Reviewer, ML4PS Workshop @ NeurIPS 2025, 2024

Skills

- **Programming**: Python, MATLAB, C/C++, Java
- **Machine Learning**: PyTorch, PyTorch Geometric, TensorFlow, scikit-learn
- **Tools**: LaTeX, Git