

# Herlock Rahimi

New Haven, CT, USA | [herlock.rahimi@yale.edu](mailto:herlock.rahimi@yale.edu) | Website  
Google Scholar | LinkedIn | GitHub

## Education

---

**Ph.D., Electrical & Computer Engineering** — Yale University

Advisors: Dionysis Kalogerias, Amin Karbasi

**M.Sc., Electrical & Computer Engineering** — Yale University

Conferred en route to the Ph.D. in recognition of completed graduate-level research and coursework. Awarded the **\$2,500 Graduate Excellence Fellowship** for ranking among the top graduate students at Yale (2023 and 2024).

**B.Sc., Mathematics and Applications** — Sharif University of Technology

GPA: 19.34/20 | Graduated in the **top 10 %** of the Mathematics Department.

**B.Sc., Computer Engineering** — Sharif University of Technology

GPA: 19.01/20 | Graduated in the **top 10 %** of the Computer Engineering Department.

**Iran National Summer Camp for Mathematics Olympiad** | **Silver Medalist**

## Research Interests

---

Learning Theory | Information Geometry | Geometric and Statistical Machine Learning | Optimal Transport | Robust & Distributionally-Aware Learning | Fairness in ML | Reasoning and Generalization in LLMs |

## Publications & Preprints

---

- **Rahimi, H.**, Kalogerias, D. (2025). *Convergence of Agnostic Federated Averaging*. In **Proc. IEEE CAMSAP 2025** — Student Paper Contest Finalist (Top 5). doi:10.48550/arXiv.2507.10325. *Contribution*: Provided the first rigorous convergence proof of *Agnostic FedAvg* under random, non-uniform client availability. Established convex convergence at rate  $\mathcal{O}(1/\sqrt{T})$  without assuming known participation distributions, bridging theoretical and practical FL deployment regimes.
- **Rahimi, H.**, Kalogerias, D. (2025). *FedAVOT: Exact Distribution Alignment in Federated Learning via Masked Optimal Transport*. **ICASSP 2026 (to appear)**; arXiv:2509.14444 [cs.LG]. doi:10.48550/arXiv.2509.14444. *Contribution*: Formulated federated aggregation as a masked optimal transport alignment between availability and importance distributions. Developed a Sinkhorn-based transport weighting scheme achieving  $\mathcal{O}(1/\sqrt{T})$  convergence and enhanced robustness across heterogeneous, fairness-sensitive, and low-availability regimes.
- Amirhossein Zare, Amirhessam Zare, Parmida Sadat Pezeshki, **Rahimi, H.**, Ali Ebrahimi, Ignacio Vázquez-García, Leo Anthony Celi (2025). *Uncertainty-Aware Generative Oversampling Using an Entropy-Guided Conditional Variational Autoencoder (LEO-CVAE)*. arXiv:2509.25334 [cs.LG]. doi:10.48550/arXiv.2509.25334. *Contribution*: Introduced a local-entropy weighted loss and uncertainty-guided sampling strategy for CVAEs to address class imbalance in high-dimensional biomedical data. Demonstrated superior generalization on ADNI and TCGA datasets compared to traditional and generative oversampling baselines.

## Selected Research Experience

---

**Reasoning for LLMs** — Yale University (with Amin Karbasi & Zhouan Yang)

Investigating formal models of reasoning in large language models through chain-of-thought reliability, search-augmented inference, and curriculum-based alignment. Developing evaluation protocols for structured reasoning and compositional generalization.

**Risk-Averse Federated Learning** — Yale University (with Dionysis Kalogerias)

Designed and analyzed availability-aware FL algorithms under coherent and distributionally robust risk measures. Established finite-time convergence bounds; implemented PyTorch and cvxpy simulations on heterogeneous federated environments.

**Supersymmetry in Machine Learning (B.Sc. Thesis)** — Sharif University of Technology (with M. H. Rohban)

Explored symmetry-invariant formulations in representation learning inspired by supersymmetric transformations; investigated analogies between Lagrangian mechanics and optimization dynamics in neural networks.

### **Attention-RL for Visual Question Answering** — Sharif University of Technology (with H. Rabiee)

Developed patch-based attention reinforcement learning agents for multimodal reasoning in VQA; introduced attention-guided exploration policy to improve grounding and compositionality.

### **Histopathology Classification & Explainability via GNNs** — Sharif University of Technology (with M. H. Rohban)

Applied geometric deep learning and risk-aware optimization to cancer detection; integrated adversarial robustness and explainability constraints within graph neural architectures.

## **Teaching Experience**

---

### **Instructor**, Information Geometry — Yale University

Designed and taught a graduate-level mini-course on the differential-geometric foundations of statistical learning, divergence minimization, and dual connections.

Attendance: 50+ participants. Materials available at YouTube.

### **Instructor**, Machine Learning — Sharif University of Technology (Online)

Developed and delivered a comprehensive introductory ML course (theory and applications) for 100+ students. Recorded lectures available at: YouTube.

## **Teaching Assistance**

### **S&DS 6690: Statistical Learning Theory** — Yale University

### **S&DS 317/517: Applied Machine Learning and Causal Inference** — Yale University

### **CPSC 483/683: Deep Learning on Graph-Structured Data** — Yale University — Course website

### **Teaching Assistant**, Sharif University of Technology

Assisted instruction in multiple undergraduate and graduate-level courses across machine learning, optimization, and applied mathematics, including: *Machine Learning Theory (Spring 2023)*, *High-Dimensional Probability (Spring 2022)*, *Artificial Intelligence (Head TA, Spring 2022)*, *Compiler Design*, *Game Theory*, *Design of Algorithms*, *Linear Algebra*, *Bioinformatics*, and *General Mathematics I (2020 – 2021)*.

## **Honors & Awards**

---

- **Graduate Top-up Fellowship**, Yale University (2023, 2024) — \$2,500 award recognizing top graduate performance among all graduate students.
- **Top 10 % Graduate**, Mathematics & Computer Engineering, Sharif University of Technology (2023).
- **Top-3 Finalist**, Iranian National Mathematics Olympiad for College Students (2022).
- **Top-3 Finalist**, Iranian National Statistics Olympiad for College Students (2021).
- **Rank 9**, Iranian National Math & Physics University Entrance Exam (2018) — nationwide.
- **Silver Medal**, Iranian National Mathematics Olympiad (2017).

## **Technical Skills**

---

**Mathematical & Theoretical Expertise:** Convex and Non-Convex Optimization, Learning Theory, Information Geometry, Riemannian Optimization, Distributionally-Robust & Risk-Averse Learning, Probabilistic Modeling, Reinforcement Learning, Statistical Inference, and Stochastic Approximation Methods.

**Data & Computational Tools:** Bloomberg Terminal (Equity & Macro Data Retrieval, Screening, and Analytics), WRDS/CRSP/Compustat integration, API-based data pipelines, High-Performance Computing (Slurm), and Reproducible Research Environments (Docker, Conda).

## **Professional Experience**

---

### **Research Intern**, AI Med — Tehran, Iran

Developed and evaluated deep learning models for breast cancer detection from histopathology images; implemented attention-based CNN classifiers with explainability metrics.

### **Mathematics & Informatics Olympiad Instructor**, Irysc Co. — Tehran, Iran

Taught combinatorics, graph theory, geometry, and number theory; designed competition problems and coached national teams.