Nahal Mirzaie

| | | |

Summary

Researcher motivated by the question "why?", uncovering the mechanisms of complex systems through data, learning, and a touch of theory.

Research Experience

Rohban Lab, Sharif University of Technology, Tehran, Iran Sep 2022 - present

Studying how implicit inductive biases affect training dynamics and Gradient Flow, enhancing Group Robustness by mitigating Shortcut Learning and reducing reliance on Spurious Correlations.

Vikas Lab, Aalto University, Espoo, Finland June 2022 - Sep 2022

We study the theoretical foundations of Graph Neural Networks (GNNs), exploring asynchronous message-passing mechanisms that may extend their expressivity beyond the classical 1-Weisfeiler–Lehman (1-WL) limit.

Rohban Lab, Sharif University of Technology, Tehran, Iran Sep 2019 - Feb 2022

We used the RxRx19a dataset, which contains high-throughput five-channel fluorescent microscopy images of compounds tested as prophylactic treatments against SARS-CoV-2. Our goal was to estimate the hit score of each drug–dose combination in combating COVID-19. To achieve this, we extracted cellular morphological features at the single-cell level and aggregated them into treatment-level profiles. We then developed an algorithm to score these profiles, reflecting each treatment's antiviral efficacy.(Github).

Faghih Lab, University of Tehran, Tehran, Iran Aug 2016 - Feb 2018

We designed a parameterized synthesis technique for self-stabilizing algorithms in symmetric networks, developing tight cutoffs that guarantee closure within legitimate states and deadlock-freedom outside them.

Work Experience

Data Scientist at Tapsi Oct 2020 - Apr 2022

- **Fraud Detection:** Developed and maintained machine learning pipelines for automatic detection of fraudulent drivers, identifying commission evasion and fake rides generated through GPS spoofing.
- **Passenger Campaign Optimization:** Built and deployed tools to optimize passenger marketing campaigns, maximizing return on investment (ROI) as a key performance indicator (KPI).

Bioinformatician at Pardis Gene Dec 2018 - Aug 2020

- **Rare Disease Genomics:** Designed and implemented algorithms to identify causal genetic variations (SNVs, CNVs, and structural variants) using parent–child whole genome and exome sequencing data integrated with clinical phenotypes and physician diagnoses.
- **Precision Oncology:** Developed automated pipelines for detecting somatic variants (SNPs, indels, CNAs, fusions, and MSI) from paired tumor–normal sequencing data, and generated personalized drug recommendations based on actionable alterations.

Education

2022 – present **Ph.D. in Artificial Intelligence**, *Sharif University of Technology*, Tehran, Iran
2019 – 2022 **M.Sc. in Bioinformatics**, *Sharif University of Technology*, Tehran, Iran
2013 – 2018 **B.Sc. in Computer Engineering**, *University of Tehran*, Tehran, Iran

Awards

2023 **RISE-MICCAI Travel Award**, MICCAI 2023, Vancouver, Canada, *(Fully funded USD 3,000)*

Academic Activities

2024 **Co-instructor, Bioinformatics Algorithms**, Sharif University of Technology — Course inspired by Bioinformatics Algorithms by Compeau and Pevzner.
2025 **ICLR Workshop Organizer**, Spurious Correlation and Shortcut Learning Workshop.

Publications

Selected Publications

- **N. Mirzaie**, A. Alipanah, A. Abbasi, A. Farzane, H. Jafarinia, E. Sobhaei, M. Ghaznavi, A. Najafi, M. Soleymani Baghshah, M. H. Rohban (2026). *On the Role of Implicit Regularization of Stochastic Gradient Descent in Group Robustness.* **International Conference on Learning Representations (ICLR) 2026**. [OpenReview]
- **N. Mirzaie**, M. Ghaznavi, H. Oyarhoseini, A. Alipanah, *et al.* (2025). *The Silent Helper: How Implicit Regularization Enhances Group Robustness.* **High-dimensional Learning Dynamics (ICML Workshop) 2025**. [OpenReview]
- **N. Mirzaie**, M.V. Sanian, M.H. Rohban (2023). *Weakly-Supervised Drug Efficiency Estimation with Confidence Score: Application to COVID-19 Drug Discovery.* **MICCAI 2023**. Springer, LNCS 14244, pp. 676–685.
- H. Jafarinia, A. Alipanah, S. Razavi, **N. Mirzaie**, M.H. Rohban (2025). *Snuffy: Efficient Whole Slide Image Classifier.* **ECCV 2024**.

Other Publications (Chronological Order)

Mirzaie, Nahal et al. (2019). "Parameterized synthesis of self-stabilizing protocols in symmetric rings". In: *22nd International Conference on Principles of Distributed Systems (OPODIS)*. DOI: 10.4230/LIPIcs.OPODIS.2018.29.

– (Apr. 2020). "Parameterized synthesis of self-stabilizing protocols in symmetric networks". In: *Acta Informatica*. DOI: 10.1007/s00236-019-00361-7.

Jafarinia, Hossein, Danial Hamdi, Alireza Alipanah, et al. (Aug. 2024). "MILFORMER: Weighted Dual Stream Class Centered Random Attention Multiple Instance Learning for Whole Slide Image Classification". In: *AI for Health Equity and Fairness: Leveraging AI to Address Social Determinants of Health*. Springer Nature Switzerland, pp. 65–81. DOI: 10.1007/978-3-031-70653-7_5.

Jafarinia, Hossein, Danial Hamdi, Amirhossein Alamdar, et al. (2025). "Navigating the MIL Trade-Off: Flexible Pooling for Whole Slide Image Classification". In: *The Thirty-ninth Annual Conference on Neural Information Processing Systems (NeurIPS)*. URL: https://openreview.net/forum?id=RIL1vOuZOC.

Last updated: February 2, 2026