Mahdi Morafah

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Summary

ML Ph.D. Candidate at **UC San Diego**. Former machine learning research intern at **Qualcomm** and **TESLA**. Published 6 papers at top-tier conferences and journals in federated learning, machine learning and optimization. Strong mathematical, analytical, and programming skills with the GPA 4.0/4.0. Awarded UCSD Dean's Powell Focht Fellowship for 2021-2022 academic year.

Research Interest

- Federated Learning
- Generative AI
- LLM & Fine-Tuning
- Efficient & Sparse Neural Network

Education

University of California San Diego — San Diego, CA
- ***Ph.D.*** *in Electrical and Computer Engineering* — *Sep 2021 - Sep 2026*
  Majoring *in Machine Learning and Data Science* ***(GPA: 4/4)***

University of California San Diego — San Diego, CA
- ***M.Sc.*** *in Electrical and Computer Engineering* — *Sep 2019 - Sep 2021*
  Majoring *in Machine Learning and Data Science* ***(GPA: 4/4)***

Amirkabir University of Technology — Tehran
- ***B.Sc.*** *in Electrical and Computer Engineering* — *Sep 2015 - Jul 2019*
  Majoring *in Signal and Image Processing* ***(Ranked 1st)***

Publications

- **M. Morafah**, and B. Lin, "From Small to Large: Embracing Clusters of Heterogeneous Devices in Federated Learning with Heterogeneous Ensemble Distillation", (submitted to CVPR 2024).
- **M. Morafah**, M. Reisser, C. Louizos, and B. Lin, "Generative Prompt-Based Data Augmentation for Non-IID Federated Learning with Stable Diffusion", (pre-print).
- **M. Morafah**, H. Chang, and B. Lin, "Federated Learning Client Pruning", (in preparation).
- S. Vahidian*, **M. Morafah***, W. Wang, C. Chen, M. Shah and B. Lin, "Efficient Distribution Similarity Identification in Clustered Federated Learning via Principal Angles Between Client Data Subspaces", *Published in AAAI 2023* (**acceptance rate=19.6%**), Nov 2022. [paper | code]
- V. Kungurtsev, **M. Morafah**, T. Javidi and G. Scutari, "Decentralized Asynchronous Non-convex Stochastic Optimization on Directed Graphs", *Published in IEEE Transactions on Control of Network Systems (TCNS)*, Oct 2022. [paper]
- **M. Morafah***, S. Vahidian*, C. Chen, M. Shah and B. Lin, "Rethinking Data Heterogeneity in Federated Learning: Introducing a New Notion and Standard Benchmarks", *Published in NeurIPS Federated Learning Workshop'22 & IEEE Transactions on AI*, Oct 2022 & Jul 2023. [paper | code]
- **M. Morafah***, S. Vahidian*, W. Wang* and B. Lin, "FLIS: Clustered Federated Learning via Inference Similarity for Non-IID Data Distribution", *Published in NeurIPS Federated Learning Workshop'22 & IEEE Open Journal of the Computer Society*, Oct 2022 & Mar 2023. [paper | code]
- S. Vahidian*, **M. Morafah*** and B. Lin, "Personalized Federated Learning by Structured and Unstructured Pruning under Data Heterogeneity", *Published in IEEE 41st International Conference on Distributed Computing Systems (ICDCSW)*, Jul 2021. [paper | video | code]
- **M. Morafah**, W. Wang and B. Lin, "FedZoo: A Practical Recipe to Federated Learning With Non-IID Data Experimental Design", *Published in IEEE Transactions on AI*, Jul 2023. [paper | code]

** denotes equal contribution*

Skills

- **Programming Languages**: Python, C/C++, MATLAB, Java
- **Cloud Computing**: AWS, Docker, Kubernetes
- **Analytical**: Statistics, Optimization, Linear Algebra, Variational Inference

Scripting: Bash, Vim, Nano, Git
ML Libraries: PyTorch, TensorFlow
Parallel Computing: MPI

Working Experience/Employment

- **Qualcomm** — San Diego, CA
  Machine Learning Research Intern — *Jun 2023 - Sep 2023*
  - **Federated Learning:** conducted research on large pre-trained language and vision models in federated learning.
- **TESLA** — Palo Alto, CA
  Machine Learning Research Intern — *Jan 2021 - May 2021*
  - **Self-driving cars:** conducted research on tracking and detection algorithms to improve the performance and solve the problems for the next generation of self-driving cars.
- **OPAL AI INC** — Los Angeles, CA
  Machine Learning Research Intern — *Aug 2020 - Sep 2020*
  - **Generating floor-plan:** conducted research on DNNs and algorithms to generate floor-plans using combined RGB camera images and depth point cloud data.
- **Statistical Visual Computing Laboratory** — UC San Diego
  Summer Research Intern — *Mar 2020 - Sep 2020*
  - **3D object detection:** conducted research in autonomous driving 3D object detection using NuScenes dataset. Our approach was using RGB camera images and Radar sensor (instead of Lidar) to achieve state-of-the-art results. Proposed a method for fusing Radar and RGB data.

Teaching Assistance

- **Teaching Assistant** — San Diego, CA
  - **ECE 109** Engineering Probability & Statistics - UC San Diego — *Spring 2023*
  - **ECE 251B** Digital Signal Processing I - UC San Diego — *Winter 2023*
  - **CSE 151B** Deep Learning - UC San Diego — *Spring 2021*
  - **ECE 109** Engineering Probability & Statistics - UC San Diego — *Fall 2020*
  - **ECE 101** Linear Systems Fundamentals (aka Signal & Systems) - UC San Diego — *Winter 2020*
  - **ECE 161A** Introduction to Discrete-Time Signal Processing - UC San Diego — *Fall 2019*
  - **Discrete-Time Signal Processing** - Amirkabir U of T — *Spring 2019*

Relevant Courses

- Deep Learning & Apps
- Prob & Stats for Data Science
- Statistical Learning (I, II)
- Convex Optimization & Apps
- Applied Linear Algebra (I)
- Linear Algebra & Apps

Professional Services

- **Reviewer** 62nd IEEE Conference on Decision and Control (CDC) — *2023*
- **Reviewer** IEEE Transactions on Control of Network Systems — *2023*

Fundings

- **CISCO** Research on Federated Learning [news]
- **NSF** Research on Machine Learning

Awards

- **Awarded** AAAI 2023 Student Travel Scholarship — *Jan 2023*
- **Awarded** Dean's Powell Focht Fellowship ($54k) — *2021-2022*
- **Semi-Finalist** Qualcomm Innovation Fellowship (Federated Bayesian Learning Framework) — *Mar 2020*
- **Recipient** of EE Departmental Award for Ranking 1st in Bachelor's Program at Tehran Polytechnic University — *2019*