Mahdi Morafah

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SUMMARY

Third-year ML Ph.D. Candidate at **UC San Diego**, interested in Federated Learning, Generative AI and Foundation Models with 6+ publications. Former machine learning research intern at **TESLA** and **Qualcomm AI**. 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 - Jun 2025
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**, P. Gangwar, H. Chang, Y. Turakhia, and B. Lin, "Ultrafast Sampling Using Coordinated Acceleration Strategies for On-Device Generative AI", (on-going).

- **M. Morafah**, A. Roy, Y. Ma, and B. Lin, "Clusters of Heterogeneous Devices in Federated Learning with Multi-Objective Optimization", (on-goging).

- **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

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 Experience

- **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*

Professional Services

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

Skills

- **Programming Languages**: Python, C/C++, MATLAB, Java   **Scripting**: Bash, Vim, Nano, Git
- **Cloud Computing**: AWS, Docker, Kubernetes   **ML Libraries**: PyTorch, TensorFlow
- **Analytical**: Statistics, Optimization, Linear Algebra, Variational Inference   **Parallel Computing**: MPI

Selected Courses

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

Fundings

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

Mentorship

- **UCSD** Hojin Chang – 4th-year BS   2023 – Present

Invited Talks

- **AUT CE** Federated Learning 2.0: From the Classics to Generative AI's Vision   Dec 2023

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*