

Sara Babakniya

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RESEARCH INTERESTS

Federated Learning, Privacy and Fairness, Differential Privacy, Continual Learning, Natural Language Processing

EDUCATION

University of Southern California

Doctor of Philosophy, Computer Science

- Advisor: Prof. Salman Avestimehr
- GPA: 3.94/4

CA, USA

Aug 2019 – Present

Sharif University of Technology

Bachelor of Science, Electrical Engineering

1st university in Engineering across Iran

Tehran, Iran

Aug 2014 – May 2019

EXPERIENCE

Information Theory and Machine Learning (vITAL) Research Lab

Graduate Research Assistant

Jan 2022 – Present

University of Southern California

- **Communication-Efficient Federated Learning**

Proposed a model compression method for federated learning that reduces communication costs by more than 10× while improving the accuracy by more than 10% compared to existing alternatives.

- **Federated Continual Learning for Clients without Episodic Memory**

Proposed a method based on data-free generative replay to overcome catastrophic forgetting in federated learning. Our method improves the accuracy by up to 20% compared to other alternatives.

- **Efficient Federated NLP** (under submission)

Quantitative Evaluation & Design Laboratory

Graduate Research Assistant

Aug 2019 – Dec 2021

University of Southern California

- **Backdoor Attack in Federated Meta-Learning**

Explored different backdoor attack scenarios in federated meta-learning and possible defense mechanisms.

- **Neural Network Architecture Search**

Proposed a more general NAS method on various tasks and datasets in image classification and NLP.

Cloud-native Telecommunication Networks Laboratory

Undergraduate Research Assistant

Sep 2017 – May 2019

Sharif University of Technology

- Developed and designed E2E Cloud-based 5G Network Platform

- Implemented an E2E Software-Defined Networks for Cloud Communication

- Built an SDN-based backward compatible platform to emulate data centers inter-connection networks

PUBLICATIONS

1. *Mitigating Catastrophic Forgetting in Federated Class Incremental Learning using Data-free Generative Models*

Sara Babakniya, Zalan Fabian, Chaoyang He, Mahdi Soltanolkotabi and Salman Avestimehr

NeurIPS 2023

2. *Revisiting Sparsity Hunting in Federated Learning: Why the Sparsity Consensus Matters?*

Sara Babakniya, Souvik Kundu, Saurav Prakash, Yue Niu and Salman Avestimehr

Transactions on Machine Learning Research

3. *SLoRA: Federated Parameter Efficient Fine-Tuning of Language Models*

Sara Babakniya, Ahmed Roushdy Elkordy, Yahya H. Ezzeldin, Qingfeng Liu, Kee-Bong Song, Mostafa El-Khamy, Salman Avestimehr

Under Submission

4. *Don't Memorize; Mimic The Past: Federated Class Incremental Learning Without Episodic Memory*

Sara Babakniya, Zalan Fabian, Chaoyang He, Mahdi Soltanolkotabi and Salman Avestimehr

Federated Learning and Analytics in Practice Workshop at ICML (FL-ICML'23)

5. *Lottery Aware Sparsity Hunting: Enabling Federated Learning on Resource-Limited Edge*

Sara Babakniya, Souvik Kundu, Saurav Prakash, Yue Niu and Salman Avestimehr

International Workshop on Federated Learning at NeurIPS (FL-NeurIPS'22)

6. *Defending Against Poisoning Backdoor Attacks on Federated Meta-Learning*

Chien-Lun Chen, **Sara Babakniya**, Marco Paolieri and Leana Golubchik

ACM Transactions on Intelligent Systems and Technology, 2022

7. *Deep-n-Cheap: An Automated Search Framework for Low Complexity Deep Learning*

Sourya Dey, **Sara Babakniya**, Saikrishna C. Kanala, Marco Paolieri, Leana Golubchik, Peter A. Beerel and Keith M. Chugg

Springer Nature Computer Science, 2021

SKILLS

Languages: Python, Java, C, C++, SQL, MATLAB

Machine Learning: ML Models and Algorithms, Language Models, Transformers, Model Compression, Quantization

Machine Learning libraries: Pytorch, Tensorflow, Opacus, Huggingface

Software engineering fundamentals: Data structure, Algorithm design, Object Oriented Programming

PROFESSIONAL SERVICE

Reviewer NeurIPS, MLSys

2023

Reviewer Elsevier Journal, Performance Evaluation

2020

HONORS, AWARDS & CERTIFICATES

ICML Travel Grant, In Person

2023

ICLR Travel Grant, Virtual

2023

Best Poster Presentation Award in UCS-Meta workshop

2022

GHC Scholarship from USC

2022

Grad Cohort Travel Grant, CRA-W

2022

WiSE Qualcomm Top-Off Fellowship

2021 – 2022

GHC Scholarship from AnitaB

2021

Grad Cohort Travel Grant.

2021

Ranked 27th (less than 0.1%) in Nation-wide University Entrance Exam, Iran

2014

Iran's National Elites Foundation Fellowship

2014 – 2019

Admitted to National Organization for Development of Exceptional Talents (NODET)

2007 – 2014

ICT Professional Foundation Program Certification, Ericsson, Iran

2017

TEACHING & MENTORING

Teaching Assistant

• Teaching Assistant, Applied Natural Language Processing, University of Southern California

Spring 2022

• Teaching Assistant, Data Networks, Sharif University of Technology

Fall 2018

• Teaching Assistant, Introduction to Machine Learning, Sharif University of Technology

Fall 2018

• Laboratory Assistant, EE principles Laboratory, Sharif University of Technology

Fall 2016

Mentoring

• Meiyu Zhong (Master's), USC

May 2020 – Mar 2021

- Women in Engineering (WIE), USC
- Women in Engineering (WIE), USC

Fall 2021
Spring 2022

SELECTED COURSEWORK

During Ph.D.: Privacy in the World of Big Data (Prof. Aleksandra Korolova), Deep Learning for Engineering, Applied Natural Language Processing, Advanced Analysis of Algorithms, Advanced Computer Networking

During B.Sc.: Data Networks (Grad level), Mobile & Wireless Communications (Grad level), Network Coding & Information Theory (Grad level), Theoretical Machine Learning (Grad level), Machine Learning (Grad level), Database Design, Theory of Language & Automata, Digital Communications, Communication Systems

SELECTED COURSE PROJECT

- **Improving performance of Differentially Private Federated Learning**
CS631: Privacy in the World of Big Data, University of Southern California
- **Spoken Language Classification with DNNs in Tensorflow**
EE599: Deep Learning for Engineers, University of Southern California
- **Set up a category classifier and fashion compatibility classifier on the "Polyvore" dataset**
EE599: Deep Learning for Engineers, University of Southern California
- **Survey on Private Information Retrieval (PIR)**
Network Coding & Information Theory, Sharif University of Technology
- **Survey on Graphical Models**
Theoretical Machine Learning, Sharif University of Technology
- **Implementation of BBR on a compact version of TCP (cTCP) to increase throughput**
CS651: Advanced Computer Networking, University of Southern California

EXTRACURRICULAR ACTIVITIES

- 2nd Conference on Modern Wireless Telecommunication Systems(5G), Student Committee 2017
- Core member of IEEE, Sharif student branch 2016
- Main member of "RESANA" Cultural and Scientific club of EE Dept. 2015 – 2016