

Mohammadreza Alimohammadi

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Research Interests

- Distributed Machine Learning
- Information Theory
- Privacy and Fairness
- High Dimensional Statistics
- Theory of Machine Learning
- Optimization

Education

Sharif University of Technology, Tehran, Iran

Sep. 2018 - Expected Aug. 2023

B.Sc. in Electrical Engineering

B.Sc. in Mathematics and Applications

- GPA: 18.99/20 (US scale: 4.0/4), ranked 10th among 170+ students

(as of September 2022)

- GPA in Major Subjects: EE: 18.97/20, Math: 19.30/20

(as of September 2022)

Allameh Helli High School, Affiliated with National Organization for Development of Exceptional Talents (NODET), Tehran, Iran

Sep. 2014 - May 2018

Diploma degree in Mathematics and Physics

Publications

◇ A. Yadav[†], M. Alimohammadi[†], Y. Zhang, A. Budkuley, S. Jaggi, **New Results on AVCs With Omniscient and Myopic Adversaries**. In *IEEE International Symposium on Information Theory (ISIT)*, 2022. [Presentation](#) - [Slides](#)

◇ M. Alimohammadi[†], I. Markov[†], D. Alistarh, **L-GreCo: A Framework for Layerwise Adaptive Gradient Compression**, To be submitted to *Conference on Machine Learning and Systems (MLSys)*, 2023. (Working paper)

[†]: Equal Contribution

Selected Research Experiences

Distributed Algorithms and Systems Laboratory, IST Austria

Klosterneuburg - Austria

Research Intern - Supervisor: Prof. Dan Alistarh

Feb 2022 – Present

◇ **L-GreCo: A Framework for Layerwise Adaptive Gradient Compression**

I am worked on optimal gradient compression in distributed training of neural networks. Our proposed algorithm, called L-GreCo, uses dynamic programming to find the optimal layer-wise compression. L-GreCo preserves the model accuracy while providing training-time speed-ups under different compression schemes on multiple tasks and architectures. I am currently working towards submission to *MISys* 2023.

◇ **LRSPDY: Low-Rank Decomposition with Speedup Guarantees**

I am working on combining various low-rank decomposition techniques with an algorithm that automatically determines layer-wise compression levels in neural networks to achieve a target inference speed-up on a given system.

◇ **Lossless Adaptive Gradient Compression**

I am working on a real-time adaptive algorithm that determines the lossless compression based on a composite loss resulting from combining layer-wise compression errors and the number of parameters of the model.

CAN-DO-IT research group, University of Bristol

Bristol - England

Research Intern - Supervisor: Prof. Sidharth Jaggi

Jul 2021 – Feb 2022

◇ **New Results on AVCs With Omniscient and Myopic Adversaries**

I worked on communication channels in the presence of myopic adversaries. We extended the well-known Elias-Bassalygo upper bound to this regime, resulting in a paper accepted for presentation at ISIT 2022. Here are links to my [presentation](#), and [slides](#) at ISIT 2022.

Bachelor Thesis, Sharif University of Technology

Tehran - Iran

Bachelor Thesis - Supervisor: Prof. Mohammad Hossein Yassaee

Jul 2022 – present

◇ **Understanding The Interplay between Privacy, Communication, and Utility in Federated Learning**

Edge Machine Learning Research Group, Sharif University of Technology

Tehran - Iran

Research Assistant - Supervisor: Prof. Mohammad Ali Maddah-Ali

Dec 2020 – Sep 2021

◇ **Learning at The Edge**

To make models runnable on edge devices with limited resources, I used low-rank representation techniques to reduce the neural network's inference time and memory requirement.

Honors and Awards

Mathematical Olympiad	Silver Medal in Iran National Mathematical Olympiad	Sep. 2017
Iranian University Entrance Exam (Konkur)	Ranked 123 th among 144000 participants	Jul. 2018

Selected Courses and Course Projects

Graduate Courses

- High Dimensional Statistics [19.9/20]
- Project: [Differential Privacy & Learning Relationship](#).
- Information Theory Methods in ML and Stats [18.6/20]
- Project: [Differential Privacy & IT Relationship](#).
- [Deep Learning](#) [18.5/20]
- Project: [Joint Depth Estimation & Object Detection](#).
- [Convex Optimization](#) [20.0/20]
- Project: [Linear Programming Solver in MATLAB](#).
- [Blockchain Technology](#) [20.0/20]
- Project: [A Study on Gasper protocol](#).
- [Algorithmic Game Theory](#) [18.6/20]
- Project: [Reinforcement Mechanism Design](#).
- Stochastic Analysis [19.5/20]
- Real Analysis [19.0/20]
- Advanced Theory of Statistics [in progress]
- [Data Communication Networks](#) [in progress]

Undergraduate Courses

- Combinatorial Optimization
- Foundations of Neuroscience
- Machine Learning
- Algorithm Design
- Graph Theory
- Analytic Number Theory
- Applied Linear Algebra
- Abstract Algebra
- Advanced Programming
- Signals and Systems
- Cryptography
- Stochastic Processes

Selected Teaching Experiences

Teaching Assistant, Sharif University of Technology

- High Dimensional Statistics[†]
- Convex Optimization
- Linear Algebra
- IT Methods in ML and Stats[†]
- Algorithm Design
- Probability and Statistics
- Deep Learning[†]
- Machine Learning
- C Programming

[†]: Graduate Course

Selected Working Experience

Intern @ NamaKav : Working on Efficient Methods to Search for a Video in a Database.	Sep. 2022 – Present
Scientific Advisor @ Resana : Sharif EE Department Cultural and Scientific Student Organization	Jun. 2020 – Jun. 2021

Skills

Programming Skills: Python | Julia | Java | C/C++ | MATLAB | Git | bash
Machine Learning Frameworks: Pytorch (*Advanced*) | TensorFlow
Language Skills: Persian (*mother tongue*) | English (*full professional proficiency, TOEFL Score 102*)

References

Prof. Dan Alistarh <i>Professor, CS Department, Institute of Science and Technology Austria (IST Austria)</i>	dan.alistarh@ist.ac.at
Prof. Sidharth Jaggi <i>Associate Professor, School of Mathematics, University of Bristol</i>	sid.jaggi@bristol.ac.uk
Prof. Mohammad Hossein Yassaee <i>Assistant Professor, EE Department, Sharif University of Technology</i>	yassaee@sharif.edu
Prof. Mohammad Ali Maddah-Ali <i>Associate Professor, ECE Department, University of Minnesota Twin Cities</i>	maddah@umn.edu

Please refer to my personal website for more information