Shahrzad Kianidehkordi

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Summary

- PhD graduate (2025) in Electrical & Computer Engineering from the University of Toronto with 4+ years of research in **scalable distributed optimization**, **reliable machine learning**, and **data privacy**.
- Published **9 first-authored** papers in high-impact journals and top-tier venues (e.g., **ICLR** 💎).
- **Math Olympiad Gold medalist** 🏆 with theoretical foundations in *probability*, *optimization*, *differential privacy*, *approximated polynomial interpolation*, *error-correction codes*, and *floating point arithmetic*.
- Skilled in building **privacy-preserving** and **straggler-resilient** algorithms under **real-word** distributed system constraints (e.g., *heterogeneous data* & *privacy needs*, *speed variability*, and *numerical instability*).
- **3+** years of practical implementation experience through **applied research** and **industrial internship** in **Python** and **PyTorch**, in training and evaluating **supervised ML** models, and in running **MPI-based** experiments on **Amazon EC2** and Compute Canada's **SciNet HPC** cluster.

Industrial and Research Institute Work Experiences

SprintML, CISPA Helmholtz Center for Information Security — Saarbrücken, Germany
Research Scientist, Intern | Advisors: Profs. Franziska Boenisch, Adam Dziedzic — Apr-Sep 2024

- Designed a **time-adaptive** strategy for spending **differential privacy** budgets in **federated learning**, boosting fine-grained **feature learning** & preserving privacy. Tested using PyTorch and Opacus libraries.
- Published as **first author** at **ICLR 2025**; **mentored** MASc student on a **collaborative** project.

Accelerated Neural Technology Team, Huawei Noah's Ark Lab — Montreal, Canada
Machine Learning Researcher, Intern | Advisor: Prof. Vahid Partovi Nia — Summer 2021

- Analyzed **quantization error bounds** in **deep learning** models (e.g., ResNet-18) to address floating-point vulnerabilities; offered theoretical design guidance for **HW-aware** model training.
- Used PyTorch hooks for bound validations; contributed to the HW team's **code implementations**.
- Delivered a **60+ page technical report** summarizing findings for cross-team communication/integration.

Selective Academic Research Experiences

Dept. Electrical & Computer Engineering, University of Toronto — Toronto, Canada
Graduate Research and Teaching Assistant | Supervisor: Prof. Stark C. Draper — 2017 - 2025

- Ph.D. and MASc. Research Contributions:
  - Designed **differentially private federated learning** methods that handle **heterogeneous** privacy constraints and data statistics, achieving $\sim 10\%$ improved model accuracy while maintaining privacy.
  - **Pioneered** extensions to **overlapping group-structured federated learning** with controlled **privacy leakage propagation** to out-of-group nodes (e.g., leak of business data to external companies).
  - **Engineered** novel **error-correction-coded redundancy** techniques to accelerate distributed matrix multiplication by $\sim 66\%$, enabling **fault-tolerance** against stragglers and failures through **sequential computation recovery** and enhanced **load balancing**.
  - Proposed **approximated, randomized successive** recovery strategies for coded distributed computing to trade off accuracy for speed in ML applications where approximate solutions are sufficient.
  - Developed a **unified geometric model** for coded matrix multiplication as a **cuboid partitioning** problem. **Tested** coded computing methods on **Amazon EC2** and **SciNet HPC** cluster.
- Collaborated with **interdisciplinary** research teams (privacy, ML, information theory, optimization), **mentoring** junior researchers, and coordinated **cross-functional**, **deadline-driven** research projects.
- Scientific communication skills in **grant proposal writing** (securing **15+** scholarships/grants), **reviewing** for **6+** journals/Confs, **publishing 9 first**-author articles, and **presenting** at **9+** workshops/Confs.

ICASSP-IEEE Signal Processing Cup, Sharif University of Technology — Tehran
Undergraduate Research Assistant | Advisor: Prof. Farokh Marvasti — 2015-2017

- Developed a novel signal processing algorithm for **motion artifact removal** in biomedical PPG data, contributing to trust in health applications and improving heart rate tracking resolution.
- Competed in the Signal Processing Cup 2015 as part of a 5-member team. Achieved **1st** place nationally and **8th** place internationally among **60** teams. Co-authored an **IEEE letter** and a **journal** article.

Dept. of Information Engineering, Chinese University of Hong Kong — Hong Kong
Undergraduate Research Intern | Advisor: Prof. Chandra Nair — Jul-Sep 2015

- Explored foundational problems in **network information theory**, studying groundwork for understanding and modeling achievable capacity regions and reliability trade-offs in communication channels.

Selective Publications and Presentations

- Google scholar. ≥**340** citations, **9 first-authored peer-reviewed** articles in ML, Inf. Theory, Signal Proc.

1 **Kiani**,Kulkarni,Dziedzic,Draper,Boenisch. *Differentially private federated learning with time-adaptive privacy spending.* ICLR 2025 (**A* Conference**).
2 **Kiani**,Boenisch,Draper. *Controlled privacy leakage propagation throughout differentially private overlapping grouped learning.* IEEE J. Sel. Areas Inf. Theory 2024 (**Journal**).
3 **Kiani**,Draper. *Successive approximated coded matrix multiplication.* IEEE J. Sel. Areas Inf. Theory 2022 (**Journal**).
4 **Kiani**,Ferdinand,Draper. *Hierarchical coded matrix multiplication.* IEEE Trans. Inf. Theory 2020 (**Journal**).
5 **Kiani**,Ferdinand,Draper. *Cuboid partitioning for hierarchical coded matrix multiplication.* ICML-WS 2019 (**A* WS**).
6 **Kiani**,Adikari,Draper. *Hierarchical coded elastic computing.* IEEE ICASSP 2021 (**Signal Processing Top Conf).**
7 **Kiani**,Ferdinand,Draper. *Exploitation of stragglers in coded computing.* IEEE ISIT 2018 (**Inf. Theory Top Conf).**

Selective Technical Skills and Certifications

- **Languages:** Python, Matlab, C++, Java, Julia, Verilog. **VCS:** Git, Mercurial. **Docs:** LaTeX, MS Office.
- **Libraries and Deep Learning Frameworks:** PyTorch, Opacus (differential privacy-enabled PyTorch Lib.), mpi4py (Python interface to MPI for parallel prog.), NumPy, Matplotlib, Scikit-learn, TensorFlow.
- **HPC clusters (supercomputer, cloud computing):** Compute Canada, AWS EC2, Google Cloud.
- Certified in **Generative AI with LLMs** & **Deep Learning** (Coursera, 2025), at the International **High-Performance Computing** Summer School (RIKEN Center for Computational Science, Kobe University, Japan, 2019), and at the North American School of **Information Theory** (UPenn, USA, 2023).
- **ML-related** Graduate Courses: System Modeling (A+). Statistical Methods for ML & Data Mining (A+). Learning to Search: Current ML Algs. (A+). Intro to Statistical Learning (A). Convex Optimization (A-).

Education

University of Toronto, Toronto, Canada — 2017-2025
Ph.D. and MASc. in Electrical and Computer Engineering — GPA: **3.94/4**

- Ph.D. Thesis: *"Distributed optimization algorithms with improved efficiency, reliability, and privacy preservation"*
- MASc. Thesis: *"Exploitation of stragglers in hierarchical coded matrix multiplication"*

Sharif University of Technology, Tehran — 2012-2017
B.Sc. in Electrical Engineering and **Minor** in Economics — GPA: **17.4/20**

- B.Sc. Thesis: *"Developed Android App for hand motion classification using accelerometer data"*

Selective Honors and Awards

- **Gold** medalist, National **Mathematical Olympiad**, Iran — 2011
- Accepted into the competitive summer internship at CUHK, granted with full scholarship — 2015
- *1st* place nationally and *8th* place in IEEE Signal Processing Cup 2015 among 60 teams — 2015
- Accepted into the competitive summer school IHPCSS in Japan, granted with full scholarship — 2019
- **Ontario Graduate Scholarship** (2×, $15K/year) — 2019-2021
- **DiDi Graduate Award** (4×, $10K/year) — 2020-2024
- **NSERC** Alexander Graham Bell Graduate Scholarship-Doctoral **(CGS D3)** ($103K) — 2021-2024
- **Mitacs Globalink Research Award**, Funded research internship in Germany — Apr 2024
- **UofT Student and Research Fellowships** and **Doctoral Completion Awards** — 2017-2025