# Mehrdad Khani

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2019 – present
2016 - 2019
2011 - 2016
2011 - 2016
September 2016 – present
June 2021 – August 2021
May 2016 – August 2016
October 2014 – April 2016
June 2014 – September 2014
May 2011 – June 2012

# Awards and Honors

•	Silver medal in $42^{nd}$ International Physics Olympiad (IPhO)	2011
•	Gold medal in Iranian National Physics Olympiad	2010

# **Publications**

1. **RECL: Responsive Resource-Efficient Continuous Learning for Video Analytics** USENIX NSDI 2023

Mehrdad Khani, Ganesh Ananthanarayanan, Kevin Hsieh, Junchen Jiang, Ravi Netravali, Yuanchao Shu, Mohammad Alizadeh, and Victor Bahl

- Gemino: Practical and Robust Neural Compression for Video Conferencing arxiv preprint Vibhaalakshmi Sivaraman, Pantea Karimi, Vedantha Venkatapathy, <u>Mehrdad Khani</u>, Sadjad Fouladi, Mohammad Alizadeh, Frédo Durand, Vivienne Sze
- 3. Efficient Video Compression via Content-Adaptive Super-Resolution IEEE/CVF ICCV 2021 Mehrdad Khani, Vibhaalakshmi Sivaraman, Mohammad Alizadeh
- Real-Time Video Inference on Edge Devices via Adaptive Model Streaming IEEE/CVF ICCV 2021 Mehrdad Khani, Pouya Hamadanian, Arash Nasr-Esfahany, Mohammad Alizadeh
- SiP-ML: High-Bandwidth Optical Network Interconnects for Machine Learning Training ACM SIGCOMM 2021 Mehrdad Khani, Manya Ghobadi, Mohammad Alizadeh, Ziyi Zhu, Madeleine Glick, Keren Bergman, Amin Vahdat, Benjamin Klenk, Eiman Ebrahimi
- 6. Adaptive Neural Signal Detection for Massive MIMO IEEE Transactions on Wireless Communications 2020 Mehrdad Khani, Mohammad Alizadeh, Jakob Hoydis, Phil Fleming
- Exploiting Channel Locality for Adaptive Neural Signal Detection for Massive MIMO IEEE ICASSP 2020 Mehrdad Khani, Mohammad Alizadeh, Jakob Hoydis, Phil Fleming
- End-to-End Transport for Video QoE Fairness ACM SIGCOMM 2019 Vikram Nathan, Vibhaalakshmi Sivaraman, Ravichandra Addanki, <u>Mehrdad Khani</u>, Prateesh Goyal, Mohammad Alizadeh
- 9. Park: An Open Platform for Learning Augmented Computer Systems NeurIPS 2019
  Hongzi Mao, Akshay Narayan, Parimarjan Negi, Hanrui Wang, Jiacheng Yang, Haonan Wang, <u>Mehrdad Khani</u>, Songtao He, Ravichandra Addanki, Ryan Marcus, Frank Cangialosi, Wei-Hung Weng, Song Han, Tim Kraska, Mohammad Alizadeh

ICML Workshop Best Paper Award

 Temporal Dynamics of Connectivity and Epidemic Properties of Growing Networks *Physical Review E 2016* Babak Fotouhi, <u>Mehrdad Khani</u>

American Physical Society (APS) Selected Publication for COVID-19

# **Professional Service**

- Reviewer of journal articles in IEEE Transactions on Signal Processing, IEEE Transactions on Wireless Communications, and IEEE Systems Journal.
- Reviewer for conferences: ICML 2021, NeurIPS 2021, ISIT 2021, ICLR 2022, NeurIPS 2022, ICLR 2023.

### Presentations

- RECL: Responsive Resource-Efficient Continuous Learning for Video Analytics *NSDI Conference*, April 2023, Boston, MA.
- SiP-ML: high-bandwidth optical network interconnects for machine learning training, *NVDIA*, October 2022, Online.
- Real-Time Video Inference on Edge Devices via Adaptive Model Streaming , *MLA@CSAIL public conference*, October 2022, MIT, MA.
- Efficient Video Compression via Content-Adaptive Super-Resolution, *ICCV Conference*, October 2021, Online.
- Real-TimeVideo Inference on Edge Devices via Adaptive Model Streaming, *ICCV Conference*, October 2021, Online.
- SiP-ML: High-Bandwidth Optical Network Interconnects for Machine Learning Training, *SIGCOMM Conference*, Auguest 2021, Online.
- SiP-ML: High-Bandwidth Optical Network Interconnects for Machine Learning Training, *Industry-Academia Partnership Workshop*, June 2021, Online.
- Adaptive Model Streaming, *ML×MIT Seminar Series*, August 2020, Online.
- Adaptive Neural Signal Detection for Massive MIMO, *ICASSP Conference*, May 2020, Online.
- Network Design for Machine Learning Workloads, MIT Quest Workshop on Intelligent Hardware Technologies 10 Years Out, May 2019, Cambridge, MA.
- Network Design for Machine Learning Workloads, *New England Network and Systems Day*, April 2019, Cambridge, MA.

### **Teaching Experience**

• Sharif University of Technology

<ul> <li>Teaching Assistant for Signals and Systems</li> </ul>	Spring 2016 & Spring 2015
– Teaching Assistant for <i>Electromagnetism</i>	Spring 2015 & Fall 2014
- Teaching Assistant for Analog Circuits	Spring 2014
Physics Olympiad Instructor	2010 - 2014

Prepared high school students for participation in the National Physics Olympiad; taught more than four weekly classes in advanced *Calculus*, *Electromagnetism*, and *Mechanics* for five years.

# **Implementation Highlights**

#### • RECL

A continuous learning system for scalable responsive video analytics at the edge implemented in Python. The server uses Pytorch for the ML tasks with TensorRT optimizations enabled for inferences, and gRPC remote procedure calls for communication between the microservices. RECL provides instant lightweight model suggestions as well as continuous training for each device at the edge.

#### • AMS

An end-to-end prototype developed for real-time video inference on edge devices via Adaptive Model Streaming (see publications). The server implemented in python uses Tensorflow in the backend for DNN training and can serve multiple simultaneous clients. Clients are implemented with real-time performance (30 frames-per-second, less than 100ms latency) both in Android for mobile GPU/CPUs and in python for VMs.

2021 - 2022

2019 - 2020

#### • Rostam

An op-level simulator to study the impact of the network design on distributed DNN training completion time developed in C++ (github.com/MLNetwork/rostam). Rostam supports a range of optical and electrical interconnect architectures.

#### • RL4AQM

2016 - 2017An Actor-Critique Reinforcement Learning implementation for controlling the TCP connections rates via packet drop signals at the router (active queue management) in real-time. The prototype is open-sourced as a part of the Park project now (github.com/park-project/park).

## **Community Service**

•	MIT EECS Resource for Easing Friction and Stress (REFS) Member	2020 - 2022
•	MIT Persian Students Association (PSA) Board Member	2018 - 2022
•	MIT Persian Students Association (PSA) Treasurer	2017 - 2018

#### 2018 - 2020