Batool Salehi

Computer Engineer Specialized in Machine Learning and Wireless Communication

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EMPLOYMENT

Software Intern, NVIDIA INC, Santa Clara, CA, USA *Sep 2021-Dec 2021*

- Designed a pruning algorithm tailored to the distributed federated learning systems. My proposed algorithm minimizes the communication overhead and maintains the accuracy. My works led to an academic publication [4] and a technical patent.

Research Assistant, GENESYS Lab, Northeastern University, Boston, MA, USA *Sep 2019-present*

- Worked on designing deep learning algorithms for wireless physical layer. The main keywords in my research are: digital twin [3,6], federated learning [1,4], multimodal beamforming [1,2,5,8,9], pruning [4,5], mmWave band, and vehicular networks. A selection of my projects is available on my website here.

Research Assistant, Signal Processing Lab, University of Tehran, Iran *Sep 2016-Jan 2018*

- Studied resource allocation and performance analysis of NOMA based cooperative networks.

EDUCATION

Northeastern University Boston, MA, USA *Sep 2019-Feb 2024 (expected)*
Ph.D. in Computer Engineering

- **Advisor:** Prof. Kaushik Chowdhury
- **Thesis:** "Leveraging Deep Learning on Multimodal Sensor Data for Wireless Communication: From mmWave Beamforming to Digital Twins"

University of Tehran, Tehran, Iran *Sep 2016-Feb 2019*
M.Sc. in Electrical Engineering, Telecommunication Minor

- **Thesis:** "Resource Allocation and Performance Analysis of NOMA based Cooperative Networks"

K.N.Toosi University Of Technology, Tehran, Iran
B.Sc. in Electrical Engineering, Telecommunication, Systems Minor *Sep 2011-Sep 2015*

- **Thesis:** "Investigation and Simulation of Energy Harvesting Methods in Wireless Communication"

COMPUTER AND TECHNICAL SKILLS

- **Programming Languages:** Python, C/C++, Java, Bash
- **Deep Learning:** TensorFlow/Keras, PyTorch (Skilled in implementing advanced DL algorithms)
- **Simulation Software:** MATLAB, ROS, Apache Spark

HONORS AND PATENTS

- US patent No. (17/716,820), **B. Salehi**, C. Dick, "Neural Network Based Resource Selection to Perform Wireless Communications", NVIDIA INC, *April 2022*.
- Student Travel Grant Award and Best Paper Candidate, IEEE INFOCOM 2022, *May 2022*.
- Ranked as 3rd in the ITU AI/ML in 5G Challenge, "Beam Selection", *October 2020*.

RESEARCH EXPERIENCES

- Interacting Real World and Digital Twins for Wireless Communication **[3,6]**
- Federated Learning over Distributed IoT Devices **[1, 4]**
- Model Pruning for Communication Efficient Federated Learning **[4]** and Lifelong Learning **[5]**
- Multimodal Deep Learning with Fusion for mmWave Beam Selection **[1,2,5,8,9]**
- Open-world Class Discovery for Generalizing Deep Learning Models to Unseen Classes **[7]**
- RF Fingerprinting using Convolutional Neural Networks **[10]**

SELECTED PUBLICATIONS

[1] B. Salehi, J. Gu, D. Roy, and K. Chowdhury, "FLASH: Federated Learning for Automated Selection of High-band mmWave Sectors", IEEE International Conference on Computer Communication (Best paper candidate, INFOCOM 2022).

[2] B. Salehi, G. Reus-Muns, D. Roy, Z. Wang, T. Jian, J. Dy, S. Ioannidis, and K. Chowdhury, "Deep Learning on Multimodal Sensor Data at the Wireless Edge for Vehicular Network", IEEE Transactions on Vehicular Technology (2022).

[3] B. Salehi, U. Demir, D. Roy, S. Pradhan, J. Dy, S. Ioannidis, and K. Chowdhury, "Multiverse at the Edge: Interacting Real World and Digital Twins for Wireless Beamforming", IEEE Transactions on Networking (under review, revision submitted in January 2024).

[4] B. Salehi, J. Gu, D. Roy, C. Dick, and K. Chowdhury, "FLASH-and-Prune: Federated Learning for Automated Selection of High-band mmWave Sectors using Model Pruning", IEEE Transactions on Mobile Computing (under review, revision submitted in October 2023, collaboration with NVIDIA INC).

[5] B. Salehi, D. Roy, T. Jian, C. Dick, S. Ioannidis, and K. Chowdhury, "Omi-CNN: A Modality-agnostic Neural Network for mmWave Beam Selection", IEEE Transactions on Vehicular Technology 2024 (Accepted, collaboration with NVIDIA INC).

[6] B. Salehi, D. Roy, M. Eisen, A. Baxi, D. Cavalcanti, and K. Chowdhury, "DARWIN: Digital Twin Assisted Robot Navigation and WIreless Network Management", IEEE Transactions on Mobile Computing (under review, collaboration with Intel Corporation).

[7] Z. Wang, **B. Salehi**, A. Gritsenko, K. Chowdhury, S. Ioannidis, and J. Dy, "Open-World Class Discovery with Kernel Networks", IEEE International Conference on Data Mining (ICDM 2020).

[8] D. Roy, **B. Salehi**, S. Banou, S. Mohanti, G. Reus-Muns, M. Belgiovine, P. Ganesh, C. Dick, and K. Chowdhury, "Going beyond RF: A survey on how AI-enabled multimodal beamforming will shape the NextG standard", Computer Networks (2023).

[9] B. Salehi, M. Belgiovine, S. Garcia Sanchez, J. Dy, S. Ioannidis, and K. Chowdhury, "Machine Learning on Camera Images for Fast mmWave Beamforming", IEEE International Conference of Mobile Ad-Hoc and Smart Systems (MASS 2020).

[10] N. Soltani, G. Reus-Muns, **B. Salehi**, J. Dy, S. Ioannidis, K. Chowdhury, "RF Fingerprinting Unmanned Aerial Vehicles with Non-standard Transmitter Waveforms", IEEE Transactions on Vehicular Technology.

REFERENCES

1. Prof. Kaushik Chowdhury, Northeastern University, Boston, MA, Email: krc@ece.neu.edu
2. Prof. Stratis Ioannidis, Northeastern University, Boston, MA, Email: ioannidis@ece.neu.edu