Seyed Mohammad Sheikholeslami

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Professional summary

I am currently a PhD student in the Multimedia Laboratory of the Dept. of Electrical and Computer Engineering at the University of Toronto. I have an extensive background in *probabilities, machine learning, communications, and signal processing*. My current research interests include *Multi-Modal Distributed Machine Learning* in the next generation of communication networks (5G and 6G). I enjoy working with probabilities and mathematics, and I have full proficiency in Python and MATLAB.

Selected courses

- **Probabilities & Random Variables**
- **Stochastic Processes**
- **Intro. to Machine Learning – ECE1513 (A+)**
- **Image Processing & Apps. - ECE1512 (A+)**
- **Detection & Estimation - ECE1521 (A)**
- **Advanced Communication Systems**
- **Statistical Inference**
- **Signals and Systems**
- **Adaptive Filters**
- **Digital Signal Processing**
- **Algorithms and Data Structure**

Publications

[JR5] **S. M. Sheikholeslami**, A. Rasti-Meymandi, SJ. Seyed-Mohammadi, J. Abouei, and K. N. Plataniotis, "*Communication-Efficient Federated Learning for Hybrid VLC/RF Indoor Systems*," in IEEE Access, vol. 10, Nov. 2022.

[JR4] A. Rasti-Meymandi, **S. M. Sheikholeslami**, J. Abouei and K. N. Plataniotis, "*Graph Federated Learning for CIoT Devices in Smart Home Applications*," IEEE Internet of Things Journal, vol. 10, no. 8, pp. 7062-7079, April, 2023.

[JR3] A. Alinezhadi, **S. M. Sheikholeslami**, Kaveh Atapour, J. Abouei, and K. N. Plataniotis, "*Intelligent Privacy-Preserving Demand Response for Green Data Centers*," Electric Power Systems Research, 2023.

[JR2] **S. M. Sheikholeslami**, A. M. Rabiei, M. Mohammad-Taheri, J. Abouei, "*Cloud Data Center Participation in Smart Demand Response Programs for Energy Cost Minimization*," *IET Smart Grid.* Vol. 5, pp.380-394, July 2022.

[JR1] **S. M. Sheikholeslami**, F. Fazel, J. Abouei, and K. N. Plataniotis, "*Sub-Decimeter VLC 3D indoor localization with handover probability analysis*," *IEEE Access*, vol. 9, pp. 122236-122253, Aug. 2021.

Educations

PhD in Electrical (Communications) Engineering, University of Toronto, Canada (www.utoronto.ca).

- **Supervisor**: Professor Konstantinos N. Plataniotis
- **Thesis title**: Distributed Edge Learning with Multi-Modal Data in 6G

2022 - 2026

Master of communication systems, University of Tehran, Tehran, Iran (https://ut.ac.ir/en).

- The University of Tehran is ranked first among Iranian universities.
- **Supervisors:** Dr. Amirmasoud Rabiei, Assistant Professor
  Dr. Mahmoud Mohammad-Taheri, Associate Professor
- **Advisor:** Dr. Jamshid Abouei, Associate Professor
- **Thesis title**: *Smart grid data center energy cost reduction with workload management.*
- **Thesis summary**: We were able to reduce the energy cost of the cloud service provider by

26% by optimizing the regional-temporal workload allocation among data centers and applying utility company selection. Additionally, the proposed algorithm reduced the peak-to-average ratio of the smart grid by 13%.

- I utilized deep learning to predict renewable energy generation in data centers.
- The paper of my thesis is submitted to IEEE transactions on Cloud Computing (First author).
- My average GPA was 15.92 out of 20 (3.3/4) and my thesis defense ranked Excellent.

2017 - 2020

Bachelor of Electrical Power Engineering, Bu-Ali Sina University, Hamedan Iran (http://basu.ac.ir/en**).**

- **Supervisor**: Professor Mohammad Hassan Moradi
- **Final project title:** *Introduction to image processing and segmentation for Multiple Sclerosis diagnosis.*
- **Final project summary:** Our algorithm was able to successfully reduce the noise of MR images and extract the brain tissue from the images by applying edge detection and image segmentation.
- My average GPA was 16.51 out of 20 (3.5/4).

2013 - 2017

Diploma of Mathematics and Physics, **Daneshyar School, Marivan, Kurdistan.**

- Ranked 2nd in the school with an average GPA of 19.28 out of 20 (3.9/4).

2009-2013

Working experience

Teaching Assistant at the University of Tehran (during Master's):

- Digital Communications (Feb. 2020 - July 2020)
- Stochastic Processes (Sep. 2019 – Feb. 2020)

Teaching Assistant at Bu-Ali Sina University (during Bachelor's):

- Electromagnetics (Feb. 2015 – July 2016)

Personal Tutor (2020-2022):

- Mathematics
- MATLAB & Simulink
- Machine Learning

Research Interest

- **Distributed Learning**
- **Communication Systems**
- **Signal Processing**
- **Machine/Deep Learning**
- **Visible Light Communication**
- **Indoor Localization**
- **Smart Grid**

Computer skills

- **Python**
- **MATLAB**
- **R programming**
- **C/C++ programming**
- **JAVA**
- **LaTeX**
- **DIALux**

Language skills

- **English:** IELTS overall **7** (Listening 7.5, Speaking 7, Reading/Writing:6.5)
- **Kurdish:** Mother's tongue
- **Persian:** Native

Honor and Awards

- Ranked 84th among about 30,000 participants in the Nationwide University Entrance Exam for Graduate degree in Electrical Telecommunication Engineering (2017).
- Top 3% (among more than 251,000 participants) in the Nationwide University Entrance Exam among all Iranian Students in Math. & Physics (2013).
- Tuition waiver in high school, B.Sc., and M.Sc. studies.

Notable projects

- **Context-driven Human Activity Recognition:** I am currently working on designing a distributed learning framework for smart environments to train robust and efficient multi-modal deep learning models for HAR that are applicable in real life to smart devices. I am working with real data (multi-modal) we have collected within our team. I am working with auto-encoders, transformers, and deep neural networks. We use federated learning to train a global model that can reach high accuracy for out-of-distribution data.
- **Hybrid VLC/RF Indoor Systems for Federated Learning:** The aim of this paper is designing a hybrid VLC/RF system for an indoor environment where federated learning is being used to train a machine learning model. We formulated two optimization problems for user selection and bandwidth allocation. Simulation results show that employing VLC in downlink transmission no only reduces the latency and the energy consumption in each communication round but also increases the accuracy and speed of the learning process.
- **Sub-decimeter VLC 3D Indoor Localization with Handover Probability Analysis**: We considered an indoor environment with multiple LEDs placed on the ceiling and a user holding a smartphone. We proposed a CNN-based fingerprinting algorithm for the 3D localization of the users. In addition, we proposed a handover process according to the coordinated multiple point transmission. The simulation results showed that the proposed algorithm reaches a mean positioning error of 4.31 centimeters for a $5 \times 4 \times 3$ room, while more than 95% of test samples had sub-decimeter accuracy. Also, the average effective throughput is improved compared to the other handover techniques.
- **Green Data Center Demand Response: A Federated Reinforcement Learning Approach:** This work uses federated reinforcement learning to design an online demand response program for data centers in a Smart Grid. The proposed algorithm schedules the workload execution in data centers to reduce their energy cost. Additionally, the privacy of data centers is maintained by applying federated learning.

References

Ph.D. Supervisor:

- **Professor Konstantinos N. Plataniotis,** full Professor, Dept. of Electrical & Computer Engineering, University of Toronto, Email: kostas@ece.utoronto.ca
  Website: https://www.ece.utoronto.ca/people/plataniotis-k-n/

M.Sc. Supervisors:

- **Dr. Amirmasoud Rabiei**, Ph.D. Assistant Professor, Dept. of Electrical & Computer Engineering, University of Tehran, Tehran, Iran. Tel: +98 (21) 820 84156, Email: rabiei@ut.ac.ir, Website: https://ece.ut.ac.ir/en/~rabiei

M.Sc. Advisor

- **Professor Jamshid Abouei**, Ph.D., full Professor, Dept. of Electrical & Computer Engineering, Yazd University, Yazd, Iran. Tel: +98 (353) 123 2615, Email: abouei@yazd.ac.ir, Website: http://ee.yazd.ac.ir/abouei/