Zahra Atashgahi

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Research Interests

• Machine Learning • Sparse Neural Networks • Deep Learning • Cost-efficient Neural Networks
• Self-supervised Learning • Healthcare • Continual Learning • Time Series Analysis • Anomaly Detection

Education

Ph.D. in Artificial Intelligence , University of Twente — Oct. 2019 – Apr. 2024 (Expected)
- Faculty of Electrical Engineering, Mathematics and Computer Science, Data Management & Biometrics Group

M.Sc. in Computer Science (Artificial Intelligence), Amirkabir University of Technology — Sep. 2017 – Sep. 2019
- **Thesis:** Abnormal Activity Detection for the Elderly People Living in Smart Homes

B.Sc. in Computer Engineering, Amirkabir University of Technology (Tehran Polytechnic) — Sep. 2013 – Aug. 2017
- **Thesis:** Design and Implementing IoT-Based Health Monitoring System

Work Experience

PhD Candidate in Artificial Intelligence — Oct. 2019 – Apr. 2024 (Expected)

University of Twente, The Netherlands (May. 2020 – Present)

Eindhoven University of Technology, The Netherlands (Oct. 2019 – Apr. 2020)

- **Topic:** Cost-effective artificial neural networks. In my Ph.D. research, I seek to develop algorithms for artificial neural networks to solve various machine learning tasks efficiently while considering the optimal trade-off between computational costs, data requirements, and performance.
- **Supervisors:** Dr. Decebal Mocanu (University of Twente/ Eindhoven University of Technology), Prof. Dr. Raymond Veldhuis (University of Twente), and Prof. Dr. Mykola Pechenizkiy (Eindhoven University of Technology).
- **Project.** As a part of my PhD, I collaborate in the EDIC (Exceptional and Deep Intelligent Coach) project; we aim to develop an intelligent coach to support users in maintaining a healthy lifestyle. In this project, I mainly focus on: Feature Selection from high-dimensional data, Event detection from multi-dimensional time series, and Learning from heterogeneous data of diabetes patients

Student Visitor, University of Cambridge — Jan. 2023 – Apr. 2023

Department of Applied Mathematics and Theoretical Physics, van der Schaar Lab

- **Supervisor:** Prof. Dr. Mihaela van der Schaar (University of Cambridge)

Honors & Awards

Accepted as a student volunteer | *IJCAI 2022*	2022
Accepted at the Oxford Machine Learning Summer School (acceptance rate: 15%) | *OxML2021*	2021
Accepted as a student volunteer | *IJCAI 2021*	2021
Scholarship recipient for the 8th ACM Celebration of Women in Computing | *womENcourage 2021*	2021
Ranked **3rd** out of 45 in Artificial Intelligence Students | *Amirkabir University of Technology*	2019
Direct admission to Graduate Program (M.Sc.) in Artificial Intelligence | *Amirkabir University of Technology*	2017
Ranked **4th** out of 25 in Computer Hardware Engineering Students | *Amirkabir University of Technology*	2017
Ranked in top 0.8% in the National Entrance Exam among approximately 230k students | *Iran*	2012
Semi-finalist at Student National Mathematics Olympiad among high school Iranian students | *Iran*	2011
Semi-finalist at Student National Computer Olympiad among high school Iranian students | *Iran*	2011

Technical Skills

Programming Languages: Python, Matlab, R, C/C++, Java
Machine Learning Libraries: Tensorflow, Keras, Scikit-Learn, Pandas, NumPy
Database Systems: MySQL, SQL Server
Hardware Design Languages: Verilog, VHDL, 8086 Assembly, AVR Assembly
Web Development: HTML5, CSS, XML, XSLT, JavaScript, Jqueri, AJAX, PHP

Activities

Project Management within *EDIC* (Exceptional and Deep Intelligent Coach) Project	Apr. 2022 – Present
Program committee member at *NeurIPS 2022*, *ICML 2022*, AAAI 2023, *SNN 2022*	2022
Program committee member at *ICBINB @NeurIPS 2021*, *SNN 2021*, *CLEATED @ICDM 2021*	2021
Co-organizing *Sparse Neural Networks* discussion group | *University of Twente*	Dec. 2020 – June 2022
Organizing study group on *Mathematics for Machine Learning* book | *University of Twente*	Nov. 2020 – June 2022
Neural Networks and Deep Learning | *Coursera*	Aug. 2018

Personal and professional development

AI and Machine Learning in Healthcare Summer School | *Virtual* Sep. 2022
Science writing | *University of Twente* Nov. 2021
Oxford Machine Learning Summer School (OxML2021) | *Virtual* Aug. 2021
Academic presentations bootcamp | *University of Twente* Aug. 2021
Scientific information bootcamp | *University of Twente* Apr. 2021
Academic publishing bootcamp | *University of Twente* Feb. 2021
Neural Networks and Deep Learning | *Coursera* Aug. 2018

Teaching & Supervision

M.Sc. Student Supervision (Together with Dr. Decebal Mocanu) | *Eindhoven University of Technology* Dec. 2022 – Jul. 2023

- Matthijs Keep, "Supervised feature selection"
- Kaiting Liu, "Supervised sparse training"

B.Sc. Student Supervision (Together with Dr. Decebal Mocanu) | *University of Twente* Apr. 2021 – Jul. 2021

- Neil Kichler, "Robustness of sparse MLPs for supervised feature selection" (*best thesis award)*
- Xuhao Zhang, "Supervised feature selection using sparse neural networks"
- Karolis Girdziunas, "Supervised Feature Selection using Sparse Evolutionary Training and Neuron Strength"

Teaching Assistant | *Amirkabir University of Technology* 2017

- Internet Engineering (Fall 2017)
- Computer Networks (Spring 2017)
- Electrical Circuits (Spring 2017)

Organization

1. (Workshop) ICLR 2023 Workshop on Sparsity in Neural Networks On practical limitations and tradeoffs between sustainability and efficiency *(Kigali, Rwanda)* [Website]

2. (Tutorial) Liu, S., Sokar, G., **Atashgahi**, **Z.**, Mocanu, D. C., & Mocanu, E. (2022). Sparse neural networks training. *ECML-PKDD 2022 (Grenoble, France)* [Website]

Language Skills

English (*Working proficiency*), Persian (*Native*), Dutch (*Elementary*), Arabic (*Elementary*)

Publications

1. **Atashgahi**, **Z.**, Zhang, X., Kichler, N., Liu, S., Yin, L., Pechenizkiy, M., Veldhuis, R., & Mocanu, D. C. (2022). Feature selection with neuron evolution in sparse neural networks. *Transactions on Machine Learning Research (TMLR)*

2. Sokar, G., **Atashgahi**, **Z.**, Pechenizkiy, M., & Mocanu, D. C. (2022). Where to pay attention in sparse training for feature selection? *Advances in Neural Information Processing Systems (NeurIPS 2022)*

3. **Atashgahi**, **Z.**, Pieterse, J., Liu, S., Mocanu, D. C., Veldhuis, R., & Pechenizkiy, M. (2022a). A brain-inspired algorithm for training highly sparse neural networks. *Accepted at Machine Learning (ECML-PKDD journal track), arXiv preprint arXiv:1903.07138.* [code]

4. **Atashgahi**, **Z.**, Sokar, G., van der Lee, T., Mocanu, E., Mocanu, D. C., Veldhuis, R., & Pechenizkiy, M. (2022). Quick and robust feature selection: The strength of energy-efficient sparse training for autoencoders. *Machine Learning (ECML-PKDD Journal track)*, *111*(1), 377–414. [code]

5. Liu, S., Chen, T., **Atashgahi**, **Z.**, Chen, X., Sokar, G., Mocanu, E., Pechenizkiy, M., Wang, Z., & Mocanu, D. C. (2022). Deep ensembling with no overhead for either training or testing: The all-round blessings of dynamic sparsity. *International Conference on Learning Representations (ICLR 2022).* [code]

6. Liu, S., Chen, T., Chen, X., **Atashgahi**, **Z.**, Yin, L., Kou, H., Shen, L., Pechenizkiy, M., Wang, Z., & Mocanu, D. C. (2021). Sparse training via boosting pruning plasticity with neuroregeneration. *Advances in Neural Information Processing Systems (NeurIPS 2021).* [code]

7. **Atashgahi**, **Z.**, Mocanu, D. C., Veldhuis, R., & Pechenizkiy, M. (2021). Unsupervised online memory-free change-point detection using an ensemble of lstm-autoencoder-based neural networks (extended abstract). *8th ACM Celebration of Women in Computing womENcourage.*

8. **Atashgahi**, **Z.**, Sokar, G., van der Lee, T., Mocanu, E., Mocanu, D. C., Veldhuis, R., & Pechenizkiy, M. (2021a). Quick and robust feature selection: The strength of energy-efficient sparse training for autoencoders [extended abstract]. *Proceedings of BNAIC/BENELEARN 2021.*

9. Liu, S., van der Lee, T., Yaman, A., **Atashgahi**, **Z.**, Ferraro, D., Sokar, G., Pechenizkiy, M., & Mocanu, D. C. (2020). Topological insights into sparse neural networks. *Proceedings of ECML-PKDD.* [code]

Preprints

1. (Under review at TNNLS) **Atashgahi**, **Z.**, Mocanu, D. C., Veldhuis, R., & Pechenizkiy, M. (2022). Memory-free online change-point detection: A novel neural network approach. *arXiv preprint arXiv:2207.03932* [code]

2. (Under review) Nazerfard, E., **Atashgahi**, **Z.**, & Nadali, A. (2021). Abnormal activity detection for the elderly people using convlstm autoencoder

Posters and Presentations

1. (poster and oral presentation), "Quick and robust feature selection: The strength of energy-efficient sparse training for autoencoders", ECML-PKDD 2022, Grenoble, France.

2. (poster and oral presentation) "A brain-inspired algorithm for training highly sparse neural networks", ECML-PKDD 2022, Grenoble, France.

3. (oral presentation) "A Brain-inspired Algorithm for Training Highly Sparse Neural Networks", Eindhoven University of Technology (TU/e), Eindhoven, The Netherlands.

4. (poster) **Atashgahi**, **Z.**, Pieterse, J., Liu, S., Mocanu, D. C., Veldhuis, R., & Pechenizkiy, M. (2022b). A brain-inspired algorithm for training highly sparse neural networks [Sparsity in Neural Networks: Advancing Understanding and Practice 2022, SNN Workshop 2022] [Link]

5. (poster) **Atashgahi**, **Z.** (2021). Cost-effective artificial neural networks [IJCAI 2021 (virtual), doctoral consortium workshop]

6. (poster) **Atashgahi**, **Z.**, Sokar, G., van der Lee, T., Mocanu, E., Mocanu, D., Veldhuis, R., & Pechenizkiy, M. (2021b). Quick and robust feature selection: The strength of energy-efficient sparse training for autoencoders [Sparsity in Neural Networks: Advancing Understanding and Practice 2021, SNN Workshop 2021]

7. (poster) Kichler, N., **Atashgahi**, **Z.**, & Mocanu, D. (2021). Robustness of sparse mlps for supervised feature selection [Sparsity in Neural Networks: Advancing Understanding and Practice 2021, SNN Workshop 2021]

8. (poster) Liu, S., Chen, T., **Atashgahi**, **Z.**, Chen, X., Sokar, G., Mocanu, E., Pechenizkiy, M., Wang, Z., & Mocanu, D. (2021). Freetickets: Accurate, robust and efficient deep ensemble by training with dynamic sparsity [Sparsity in Neural Networks: Advancing Understanding and Practice 2021, SNN Workshop 2021]