Mostafa Karami

371 Fairfield Way, Room 229, Storrs, CT 06268, USA
+1 (959) 208 0722 Mostafa.Karami@uconn.edu
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Biography

During my undergraduate studies, I focused on electrical engineering, with a particular emphasis on optimization and control theory. After that, I completed my master's degree in Information and Communication Technology (ICT), where I learned about smart network optimization, machine learning, deep learning, and the Internet of Things (IoT). My thesis was on image processing to improve tumor detection using 3D mpMRI imaging. This experience showed me the importance of learning methods in medical diagnosis and treatment. As a Ph.D. student, I work on 3D data and microscopic images, aiming to find complex data patterns and turn them into useful insights.

Education

Ph.D in Computer Science & Engineering — Storrs, USA
University of Connecticut — *Sep. 2023 – Present*

M.Sc in Information & Communication Technology — Turin, Italy
Polytechnic University of Turin — *Sep. 2019 – Oct. 2022*

Thesis: Prediction of the MGMT promoter methylation status in mpMRI scans with machine learning algorithms ***(collaboration with Cologne University)***

B.Sc in Electrical Engineering — Tehran, Iran
Shahid Beheshti University — *Sep. 2013 – May 2018*

Thesis: Tuning PID Controller for frequency control using the Cuckoo optimization algorithm in an independent grid with distributed generation sources

Research Experience

University of Connecticut — Connecticut, USA
Graduate Research Assistant (Advisors: Dr. Nabavi and Dr. Ostroff) — 2023 - Current

- Developed and implemented a cell tracking algorithm to improve 3D reconstruction for ultraplex imaging.
- Enhanced SIFT feature extraction by integrating ResNet50-derived features, improving accuracy and robustness in biological image registration tasks.
- CAPTURE, an innovative method for distortion analysis in biological imaging, was introduced, enabling the isolation of distortion artifacts between image pairs.
- Reliable image registration through feature-based linear algorithms tailored for high-precision biological applications.

University of Cologne — Cologne, Germany
Research Assistant (Advisors: Dr. Visintin and Dr. Caldeira) — 2022 - 2023

- Applied machine learning to analyze magnetic resonance-based radiomic features to predict MGMT promoter methylation in patients with glioblastoma.
- Extracted and processed 1153 features using Pyradiomics, enhancing details with Laplacian of Gaussian and Wavelet filters.
- XGBoost implemented feature selection and classified data using Logistic Regression, SVM, and MLP with nested cross-validation.
- Evaluated model performance across MRI sequences (FLAIR, T1w, T1Gd, T2) using accuracy, F1 score, and confusion matrices.
- Managed data processing, curation, documentation, and GitHub repository for reproducibility and collaboration.

Polytechnic University of Turin — Turin, Italy
Graduate Research Assistant (Advisors: Dr. Visintin, Dr. Pagana, and Dr. Dovis) — 2021 - 2022

- Conducted an analysis of air pollution particles in young brains to explore their potential links to neurodegenerative diseases such as Alzheimer's and Parkinson's.
- Developed a data-driven machine learning model to assess the correlation between PM values and neurodegenerative pathologies.
- Processed and visualized large-scale environmental and epidemiological datasets to identify patterns in CNS disease mortality rates across different regions.
- Implemented regression techniques to predict future mortality rates based on pollution exposure, providing information on potential health risks.
- Designed an interactive dashboard to communicate findings, enabling researchers and healthcare professionals to explore the impact of air pollution on neurodegenerative diseases.

Selected Projects

- Developed a Graph Neural Network Transformer for representation learning in 3D mammograms, enhancing feature extraction and improving breast cancer detection through deep geometric learning.
- Developed a Bayesian Transformer-based approach for cell tracking in serial tissue sections, integrating uncertainty-aware feature embeddings and higher-order graph matching.
- Melanoma Detection Using Image Processing Algorithms: A Study on Mole Asymmetry and Border Irregularities.
- Hidden Markov Machines for classification of Parkinson's disease.
- Analysis of transport traffic and applying the ARIMA model.
- Simulating a charging station for Electric Vehicles in a Car Sharing scenario.
- Finding a correlation between Particulate Matter (PM values) and neurodegenerative pathologies.

Teaching Experience

- **Shahid Beheshti University, Tehran, Iran** — Spring 2018
  Electromagnetic
  - This course covers the fundamental principles of electromagnetics, including Maxwell's equations, wave propagation, and electromagnetic fields, with a focus on their physical foundations and applications.

- **Shahid Beheshti University, Tehran, Iran** — Fall 2017
  Introduction to C++
  - This course covers the fundamental principles of C++ programming, including syntax, data structures, object-oriented programming, and algorithm design, with a focus on practical applications in software development.

Publications

C=Conference, J=Journal, W=Workshop, S=In Submission, T=Thesis

[W.1] J Martínez-Martínez, O Brown, **M Karami**, and S Nabavi, "Robust Training with Data Augmentation for Medical Imaging Classification." International Workshop on Health Intelligence (W3PHIAI-25), the 39th AAAI Conference on Artificial Intelligence (AAAI-25), 2025.
https://aaai.org/conference/aaai/aaai-25/workshop-list/#ws49

[C.10] A Ahsan Jeny, S Hamzehei, **M Karami**, S A Baker, T Van Rathe, C Yang, S Nabavi. "Longitudinal Tumor Generation in Mammograms via Dual Encoder GAN and Learnable Blending." *Proceedings of the 16th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM BCB)*, 2025.

[C.9] A A Jeny, S Hamzehei, **M Karami**, S A Baker, T V Rathe, C Yang, S Nabavi. "Segmentation for Early Tumor Detection in Mammograms via Temporal Discrepancy Analysis and Dynamic Loss Weighting." *Proceedings of the IEEE International Conference on Image Processing (ICIP)*, 2025.

[C.8] **M Karami**, S Hamzehei, D Arce, G Raimondi, L Ostroff, S Nabavi. "Bayesian Transformers and Higher-Order Graph Matching for Cell Tracking in Serial Tissue Sections." *Proceedings of the 28th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2025.
https://link.springer.com/chapter/10.1007/978-3-032-05162-2_9

[C.7] B Li, **M Karami**, MS Junayed, S Nabavi, "Multi-modal Spatial Clustering for Spatial Transcriptomics Utilizing High-resolution Histology Images." 2024 IEEE International Conference on Bioinformatics and Biomedicine (BIBM). IEEE Computer Society, 2024.
https://www.computer.org/csdl/proceedings-article/bibm/2024

[C.6] **M Karami**, B Li, S Weiner, S Hamzehei, S Nabavi, "DCCNV: Enhanced CNV Detection in Single-Cell Sequencing Using Diffusion Process and Contrastive Learning." Proceedings of the 15th ACM International Conference on Bioinformatics, Computational Biology and Health Informatics. 2024.
https://dl.acm.org/doi/abs/10.1145/3698587.3701395

[C.5] S Hamzehei, G Raimondi, **M Karami**, L Ostroff, S Nabavi, "CAPTURE: A Clustered Adaptive Patchwork Technique for Unified Registration Enhancement in Biological Imaging." Proceedings of the

15th ACM International Conference on Bioinformatics, Computational Biology and Health Informatics. 2024.
https://dl.acm.org/doi/abs/10.1145/3698587.3701369

[**C.4**] **M Karami**, S Hamzehei, F Rastegari, O Akbarzadeh, "Exploring the Relationship Between Air Pollution and CNS Disease Mortality in Italy: A Forecasting Study with ARIMA and XGBoost." 2023 Congress in Computer Science, Computer Engineering, & Applied Computing (CSCE). IEEE, 2023.
https://ieeexplore.ieee.org/abstract/document/10487237

[**C.3**] A Mohammadigilani, H Attar, HE Chimeh, **M Karami**, "Enhanced LSTM by Attention Mechanism for Early Detection of Parkinson's Disease Through Voice Signals." 2023 International Engineering Conference on Electrical, Energy, and Artificial Intelligence (EICEEAI). IEEE, 2023.
https://ieeexplore.ieee.org/abstract/document/10590358

[**C.2**] O Akbarzadeh, S Hamzehei, A Amer, N Fasihihour, **M Karami**, "Analyzing the Network System Performance Based on the Queuing Theory Concept." 2022 International Engineering Conference on Electrical, Energy, and Artificial Intelligence (EICEEAI). IEEE, 2022.
https://ieeexplore.ieee.org/abstract/document/10050495

[**C.1**] O Akbarzadeh, **M Karami**, N Fasihihour, M Alghanim, S Hamzehei, "Multicast Optimization: Operational Research Theory and Applications." 2022 International Engineering Conference on Electrical, Energy, and Artificial Intelligence (EICEEAI). IEEE, 2022.
https://ieeexplore.ieee.org/abstract/document/10050486/

[**T.1**] **M Karami**. "Machine Learning Algorithms for Radiogenomics: Application to Prediction of the MGMT promoter methylation status in mpMRI scans." 2022.
https://webthesis.biblio.polito.it/24496/

[**J.1**] H Ehsani Chimeh, **M Karami**. "Spam Detection from Big Data based on Evolutionary Data Mining Systems." Journal of Transactions on Machine Intelligence 1.1 (2018)
https://www.tmachineintelligence.ir/10.47176/TMI.2018.1

[**S.1**] S Hamzehei, **M Karami**. "ImageReg: Modular, Open-Source Toolkit for Image Registration and Alignment." Journal of Bioinformatics (2025)

Honors and Awards

- The Predoctoral Fellowships from School of Computing , University of Connecticut — 2025
- Professor Reda Ammar Fellowship, University of Connecticut — 2024
- Cigna Graduate Scholarship — 2023
- Mobility Scholarship for Master's Thesis Abroad — 2022
- EDISU Piedmont Scholarship, Piedmont region, Italy — 2019 – 2020
- EDISU Piedmont Scholarship, Piedmont region, Italy — 2020 – 2021
- Ranked top 0.5% in Iranian University Entrance Exam among 251,956 applicants — 2012 – 2013

Technical Talks

- **Longitudinal Tumor Generation in Mammograms via Dual Encoder GAN and Learnable Blending**
  Presented at the The 16th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB 2025)
  October 13, 2025, Philadelphia, PA, USA

- **DCCNV: Enhanced CNV Detection in Single-Cell Sequencing Using Diffusion Process and Contrastive Learning**
  Presented at the The 13th International Conference on Computational Advances in Bio and Medical Sciences
  January 12, 2025, Atlanta, GA, USA

- **A Fused Transformer-based Model for Gene Expression Prediction using Histopathology Images**
  Presented at the The 13th International Conference on Computational Advances in Bio and Medical Sciences
  January 12, 2025, Atlanta, GA, USA

- **3D Biomedical Image Registration and Cells Tracking**
  Presented at the 27th Annual Neuroscience 2024
  October 22, 2024, Storrs, CT, USA

- **Exploring the Relationship between Air Pollution and CNS Disease Mortality in Italy: A Forecasting Study with ARIMA and XGBoost**
  Presented at the 25th International Conference on Artificial Intelligence (ICAI'23)
  July 24-27, 2023, Las Vegas, NV, USA

- **Classification for Radiogenomics to Predict the MGMT Promoter Methylation Status in mpMRI Scans**
  Presented at Uniklinik Köln
  November 17, 2022, Department of Diagnostic and Interventional Radiology, University Hospital of Cologne, Cologne, Germany

- **Classification for Radiogenomics to Predict the MGMT Promoter Methylation Status in mpMRI Scans**
  Presented at the EuSoMII Annual Meeting 2022
  October 14-15, 2022, Valencia, Spain

Academic Service

Program Committee Member:

- *SAFE 2026 Workshop on Safety and Security in AI Systems*
- *Ex-ASE 2025 International Workshop on Explainable Automated Software Engineering: Exploring Theory, Adaptation, Needs, Challenges, and Ethics*

Conference Reviewer:

- *2025 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*
- *2024 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*
- *2024 International Joint Conference on Neural Networks (IJCNN)*
- *4th International Workshop on Scientific Knowledge: Representation, Discovery, and Assessment (Sci-K 2024)*

Journal Reviewer:

- *BMC Medical Imaging (2025)*

Skills

Programming Languages: Python, C, C++, MATLAB & Simulink, JavaScript, SQL, R, AVR
Frameworks: TensorFlow, PyTorch, scikit-Learn, Spark ML, Torch, Keras, Google Colab
Database: MySQL, MongoDB, PostgreSQL
Developer Tools: GitHub, GitLab, Anaconda, Visual Studio Code, Studio 3t
Operating Systems: Windows, Linux, Mac OS
Professional Software: Docker, LaTeX, Microsoft Office, Apache Spark, Design Builder, Visual Studio, Atmel Studio, LabVIEW, Arduino, Siemens Logo Soft, Step7
Visual Design: Adobe Photoshop, Adobe Illustrator, Adobe InDesign

Languages

English: Fluent	Italian: Elementary	Spanish:Elementary
Persian: Native Speaker	Azerbaijani: Native Speaker	Arabic: Elementary

References

1. **Dr. Sheida Nabavi**
   Associate Professor - Computer Science and Engineering, University of Connecticut
   Email: sheida.nabavi@uconn.edu
   Relationship: [PhD Supervisor]

2. **Dr. Linnaea Ostroff**
   Assistant Professor, Physiology and Neurobiology, University of Connecticut
   Email: linnaea.ostroff@uconn.edu
   Relationship: [PhD Co-Supervisor]

3. **Dr. Derek Aguiar**
   Associate Professor - Computer Science and Engineering, University of Connecticut
   Email: derek.aguiar@uconn.edu
   Relationship: [Course (Bayesian Machine Learning) Instructor]