Jahanbakhsh Ghasemi

Graduate Student | Computer Science & Engineering | University of Connecticut
Email: jahanbakhsh.ghasemi@uconn.edu | Phone: + 1-4694492985 | USA
Google Scholar | GitHub

Research Profile

Machine learning and computer vision for large-scale biomedical and biomechanical systems, with emphasis on scalable experimentation using high-performance computing (HPC). Core interests include image segmentation, representation learning, semi-supervised learning, and data-driven surrogate modeling for computationally expensive scientific pipelines.

Education

University of Connecticut (UConn)
Graduate Student, Computer Science & Engineering (2024–Present)
Graduate GPA: 3.889/4
Qualifying Examination: Passed successfully
Selected Graduate Coursework: Machine Learning; Architecture of Internet of Things; Big Data Analytics; Computer Vision & Image Analysis; Data Visualization and Communication; Networked embedded Systems

University of Applied Science and Technology, Iran
B. S. in Electronic Engineering, (2010- 2014)

Technical Skills

Programming & Data Science: Python (NumPy, pandas, scikit-learn, PyTorch, matplotlib, seaborn), R (tidyverse, limma, data.table), MATLAB, Bash

Machine Learning & Computer Vision: Regression, SVR, tree-based models, MLPs, CNNs, transfer learning (ResNet, MobileNet), U-Net-based segmentation, semi-supervised learning, probabilistic modeling

Evaluation & Statistics: RMSE, MAE, R^2, Precision, Recall, F1, Dice, Average Precision, ROC/AUC, PCA, NCA, hypothesis testing

High-Performance Computing: SLURM, CPU/GPU workflows, large experimental sweeps, reproducible pipelines on UConn CAM/Mantis clusters

Data Engineering & Visualization: Multi-GB datasets, normalization strategies, automated reporting, publication-quality figures, dashboards

Research Experience

Graduate Research Assistant (2024- present)

A) Selected Research Projects:

1. Machine Learning for Biomechanics

- Built machine learning models (Regression, SVR, Decision Trees, Random Forests, MLPs) to predict knee joint and muscle forces.
- Applied PCA and Neighborhood Component Analysis for dimensionality reduction while preserving predictive performance.
- Evaluated accuracy and generalization across multi-subject datasets using RMSE, MAE, and R^2.
- Studied accuracy–latency–scalability trade-offs to motivate real-time and large-scale inference.
- This project led to a first-author research manuscript under review (npj Digital Medicine) and a review manuscript submitted to communications ai.

2. Microscopy & Probabilistic Segmentation

- Designed and executed large-scale microscopy image segmentation experiments using CPU/GPU HPC clusters.
- Reproduced baseline deterministic models and implemented a validated evaluation framework (Precision, Recall, F1, Dice, AP).
- Developed probabilistic segmentation workflows to quantify robustness, diversity, and stability across runs.
- Automated metric aggregation and generation of multi-panel, publication-quality figures with reproducible CSV outputs.
- This Project resulted in a manuscript currently under preparation.

3. HPC Automation and Scientific Data Post-Processing of trajectories of MD simulations

- Developed Python tools for automated HPC job submission and post-processing of large experimental outputs.
- Performed spatial and statistical analyses across simulation and imaging datasets.
- Organized results into reproducible tables, figures, and summaries for collaborative research dissemination.

B) Software & Data Projects

1. Jahan-BioOmics Analyzer (Personal Project)

Python, Streamlit, Pandas, NumPy, Plotly

- End-to-end interactive analysis platform for proteomics datasets.

- Implemented PCA, normalization, enrichment analysis, and dynamic visualization.
- Designed modular, reproducible pipelines for biological data science workflows.

2. Crime Lighting App (Personal Project)

Python, Tkinter, Pandas, Matplotlib

- Desktop application analyzing crime trends before/after street-lighting interventions.
- Automated ingestion, validation, and comparative visualization of multi-location datasets.

C) Selected Class Projects

1. Networked & IoT Systems Prototyping

- Designed and implemented an ESP32-based IoT sensing and actuation system with real-time dashboards and JSON APIs.
- Integrated DHT22, LDR, PIR sensors, and LED/buzzer actuation; evaluated stability and responsiveness.
- Conducted security-oriented analysis identifying vulnerabilities (plaintext HTTP, hard-coded credentials), motivating future secure deployment strategies.

2. Computer Vision & Semi-Supervised Learning (Image Analysis)

- Implemented transfer-learning pipelines (ResNet50, MobileNetV2) and a custom CNN baseline for multi-class image recognition.
- Built an iterative pseudo-labeling workflow using confidence thresholding to exploit unlabeled data.
- Evaluated models using ROC/AUC and F1; documented generalization behavior in an IEEE-style technical report.

Publications and Conference

In Press

- Sharifi L, **Ghasemi J**, et al. *Impact of Salt on AAV8 Capsid Aggregation with Single-Stranded DNA: Insights from Coarse-Grained Molecular Dynamics Simulations.* International Journal of Pharmaceutics, 2025; 681:125867.

Manuscripts Under Review

- **Ghasemi J, et al.** *Toward Real-Time Knee Joint Force Prediction via Machine Learning: Outpacing Traditional Simulations.* Submitted to npj Digital Medicine.
- **Ghasemi J, et al.** *Machine Learning for Gait Analysis in Rehabilitation: A Scoping Review of Models, Modalities, and Clinical Applications (2020–2025.* Submitted to communications ai.

Conference Presentations

- Sharifi L, **Ghasemi J**, et al. *Coarse-Grained Insights into How Poloxamer 188 Stabilizes AAV8 Capsids Against Aggregation*. AIChE Annual Meeting, 2025.

Grants & Research Proposals

Advanced Bionic Treatment Modality for Osteoarthritis, DARPA (Co-author)

- Co-authored a research proposal, contributing machine learning and computational biomechanics methodology.