

Helya Goharbavang

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EDUCATION

University of Houston - Houston, TX Aug 2022 - Present
Doctor of Philosophy in Electrical Engineering, GPA: 3.83 (**Anticipated Graduation: 01/2027**)

- Relevant Courses: GPU Programming, Adv. Computer Architecture, Computer Vision, Adv. Machine Learning

Tehran Polytechnic - Tehran, Iran Sep 2016 - Sep 2021
Bachelor of Science in Electrical Engineering, GPA: 3.55

WORK EXPERIENCE

University of Houston, Houston, TX Aug 2022 - Present
Research Assistant, Scalable Tissue Imaging and Modeling Lab

- Released an open-source library of 10+ algorithms for 3D microvascular modeling.
- Built OpenGL-based toolkits for medical image and tensor visualization.
- Parallelized complex algorithms with **CUDA** and optimized memory for large-scale datasets.
- Advanced 2D/3D tensor voting research by deriving closed-form solutions, improving accuracy and speed.
- Collaborated via GitHub PRs for version control, implemented unit tests, and code reviews for reliability.

Teaching Assistant, GPU & Heterogeneous Programming course Spring 2024

- Developed sample C++, Python, and MATLAB codes, enabling students to test GPU speedups.
- Authored exam questions and coordinated assessments.

Ronix Tools, Tehran, Iran May 2020 - Jan 2021
Team Lead Intern, Content Production Department

- Directed a 10+ member content team during a 3-month campaign, ensuring quality and on-time delivery.
- Produced and translated 100+ technical documents (English/German).

SKILLS

Programming Languages	C/C++, Python, OpenGL, MATLAB
Software Foundations	Object-Oriented Programming, Data Structures, Algorithms, Operating Systems
Systems Competencies	GPU/CPU Architecture, Parallel Computing , Memory & Power Optimization
Applied Expertise	Performance Optimization, Computer Vision, Deep Learning
Tools & Platforms	CUDA , Git/GitHub, CMake, Nsight System/Compute, GLSL, Blender
Libraries & Frameworks	Eigen, PyTorch, TensorFlow, Numba, OpenCV, matplotlib, NumPy, Pandas
Web Development	HTML, CSS, JavaScript, 3D Model Viewer
Embedded Systems	Arduino, Raspberry Pi, LoRa, ARM STM32, LabVIEW

SELECTED PROJECTS

Tensor Voting (C++/CUDA/Python)

Built a program to repair, refine, and visualize gigavoxel-scale 2D/3D tensor fields. Derived closed-form solutions for both 2D/3D cases, eliminating costly numerical integration. Optimized CPU/GPU kernels with streams, shared-memory tiling, and coalesced global memory access. Cut end-to-end runtime from **~10h (CPU) to <1h (GPU)** with **24%** higher accuracy, enabling scalable experiments on GB-scale data.

Machine Learning and CNNs (Python)

Designed deep learning models (U-Net, vision transformers, autoencoders) for medical image segmentation using TensorFlow/PyTorch. Improved segmentation accuracy by 2–10% across multiple experiments.

3D Segmentation and Skeletonization (C++/Python/MATLAB)

Performed and implemented SOTA vascular segmentation and skeletonization methods on multiple large-scale microvascular datasets and published the results. Released an open-source, scalable pipeline with reproducible results.

3D Visualization Toolkit (C++/CUDA/OpenGL)

Developed a real-time visualization toolkit for gigavoxel-scale data with interactive camera controls and UI widgets. Integrated CUDA–OpenGL interoperability and profiled/debugged with NVIDIA Nsight Systems/Compute, enabling smooth, interactive exploration.

GPU Programming Course Project (C++/CUDA):

Implemented a GPU-accelerated vesselness filter for vascular enhancement and a parallel ray tracer. Designed kernels with tuned grid/block sizing and coalesced access, delivering 10-12× speedups vs. CPU baselines.

Embedded Systems and Hardware Programming (C/C++/MATLAB)

Built IoT systems with Arduino, Raspberry Pi, and multiple sensors/actuators. Programmed LoRa and implemented LabVIEW-based monitoring for long-range data acquisition. Delivered a real-time, web-enabled robotic navigation system, demonstrating cross-platform embedded integration.

SELECTED PUBLICATIONS

Segmentation and Modeling of Large-Scale Microvascular Networks: A Survey, Goharbavang, H., et al., 2025, *Frontiers in Bioinformatics*, 5, 1645520

Closed-Form GPU-Accelerated Tensor Voting with Refinement, Goharbavang H., et al., 2025 *International Symposium on Biomedical Imaging (ISBI)*

GPU-Accelerated RSF Level Set Evolution for Large-Scale Microvascular Segmentation, Niger M., Goharbavang H., et al., 2025 *IEEE TVCG* (Under review). [arXiv:2404.02813v1]

ADDITIONAL

Languages	English, German, Persian (Native)
Honors	Ranked top 0.2% in Iran’s National University Entrance Exam, Awarded \$4K presidential fellowship (1 of 4 recipients in ECE dept.)
Volunteer	Category Judge (Senior Division, TXSEF 2025), Logistics (AIEA 2025 Conference)
Leadership	EE basketball team captain - 1st place in university championship (<i>Tehran Polytechnic</i>)