

Hossein Amiri

Ph.D. Candidate in Computer Science and Informatics

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🏛 Emory University, Atlanta, GA, USA

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Sections	 Research Experience	 Work Experience	 Teaching Experience	 Scholarly Works
	 Research Presentations	 Honors & Awards	 Professional Involvement	 Skills

Research Interest	• Software Engineering	• Software Systems	• High-Performance Computing
	• Large Scale Data Processing	• Health Informatics	• Wastewater Epidemiology
	• Social Contact Tracing	• Human Mobility	• Infectious Disease Simulation

Education

Ph.D. in Computer Science and Informatics Aug 2022 — Present
Emory University, Atlanta, GA, USA

- **Advisor:** Dr. Andreas Züfle
- **Dissertation:** High-Performance Data Generation Software Using Patterns-of-Life Simulation to Improve Understanding of Human Mobility, Human Behavior, and Disease Spread
- **Funding:** NSF #2109647, Data-Driven Modeling to Improve Understanding of Human Behavior, Mobility, and Disease Spread

M.Sc. in Computer Science and Informatics Aug 2022 — Dec 2024
Emory University, Atlanta, GA, USA

- **Degree:** Awarded en route to the Ph.D. after passing the qualifying exam.
- **Courses:** Introduction to Ethical Data Science and Informatics, Biostatistics for Machine Learning, Machine Learning, Information Retrieval, Systems Programming, Algorithms, HPC & Cloud Computing for Data

M.Sc. in Computer Engineering, Software Engineering Sep 2015 — Mar 2018
University of Guilan, Rasht, Iran

- **Class Rank:** 1st
- **Thesis Title:** Performance Improvement of Multimedia Applications Using SIMD Programming
- **Courses:** Advanced Databases, Parallel Processing, Advanced Software Engineering, Multimedia Databases, Data Mining, Distributed Systems, Advanced Information Retrieval, Advanced Computer Networks

B.Sc. in Computer Engineering, Software Engineering Sep 2008 — Aug 2012
Fasa University, Fasa, Iran

Research Experience

Doctoral Researcher Aug 2022 — Present
Department of Computer Science, Emory University, Atlanta, GA, USA

- Published **13 peer-reviewed publications**, with five additional manuscripts under review
- Mentored **four undergraduate students** and **one master's student** in research projects
- Established active collaborations with **12 faculty researchers** across multiple universities
- Designed and implemented simulation and data processing **software for terabyte-scale** spatial and mobility datasets
- Developed a methodology to generate **contact matrices from human mobility data** at the North American population scale
- Generated and released **terabytes of human mobility trajectory datasets** used for epidemiological and spatial analysis
- Created a global POI dataset for **millions of real businesses**, verified from Foursquare and OSM
- Implemented **epidemiological and anomalous behavior models** in a patterns-of-life simulation

Graduate Researcher Jan 2016 — Apr 2020
Department of Computer Engineering, University of Guilan, Rasht, Iran

- Published **six peer-reviewed papers and a teaching textbook** based on this research
- **Mentored five master's students**, guiding their research across diverse computer science and engineering topics
- Collaborated and co-authored with the **Technische Universität Berlin** Embedded Systems Architecture Group
- Developed several **multimedia algorithms** with significant performance gains using SIMD programming

Work Experience

Software Engineer <i>Freelance, Remote</i>	Oct 2018 — Jul 2022
• Developed software for three startup projects, contributing from early-stage design through production deployment • Designed and implemented novel gamification frameworks to enhance user engagement in online platforms • Collaborated with cross-functional teams to define requirements and deliver high-quality software solutions • Coordinated team activities by assigning and reviewing daily and weekly tasks to ensure timely delivery • Conducted code reviews and mentored junior developers	

Teaching Experience

Experiential Learning Fellow <i>Laney Graduate School (LGS), Emory University, Atlanta, GA, USA</i>	Jan 2026 — Present
• Assess experiential learning programs across LGS and develop recommendations for improvement • Collaborate with faculty and staff to integrate experiential learning into graduate curricula • Design workflows that leverage existing resources and infrastructure to support experiential learning initiatives	
TATTO Fellow <i>Laney Graduate School (LGS), Emory University, Atlanta, GA, USA</i>	Sep 2025 — Dec 2025
• Delivered pedagogical training and mentorship to graduate instructors across LGS • Mentored and evaluated 450 graduate instructors and teaching assistants on teaching ethics and best practices • Evaluated teaching assignments and delivered structured feedback to improve TAs' instructional skills • Participated in course design and guided instructors in enhancing course materials	
Teaching Assistant and Lab Instructor <i>Department of Computer Science and Informatics, Emory University, Atlanta, GA, USA</i>	Jan 2023 — Present
• Led lab sessions; held office hours; contributed to course materials; built autograders and educational tools • Teaching Assistant: CS171 (Spring 2023); CS253 (Fall 2024); CS377 (Fall 2023); CS584 (Fall 2024) • Lab Instructor (as TA): CS171 (Summer 2023, Summer 2024); CS170 (Summer 2024, Summer 2025); CS253 (Summer 2025);	
Teaching Co-Instructor, Parallel Processing <i>Department of Computer Engineering, University of Guilan, Rasht, Iran</i>	Sep 2020 — Jan 2021
• Trained 50 graduate students in parallel processing concepts and techniques through lectures, labs, and projects • Produced weekly video tutorials and held regular online teaching sessions totaling 10 hours per week • Assisted students with journal article writing, review, and editing	

Scholarly Works

* indicates equal contribution and order chosen randomly.

Books

[1] Asadollah Shahbahrami and **Hossein Amiri**. *Parallel Processing Using SIMD Technology*. **Teaching Textbook**, In Persian. University of Guilan, University Press, 2020.

Journal Articles

[1] Timothy F. Leslie, **Hossein Amiri**, and Andreas Züfle. "Exploring Economic Sectoral Dynamics Through High-resolution Mobility Data". In: (2025). *IEEE Data Descriptions*.

[2] Masoud Nateghi, Mahdi Rahbar Alam, **Hossein Amiri**, Samaneh Nasiri, and Reza Sameni. "Model-Based Electroencephalogram Instantaneous Frequency Tracking: Application in Automated Sleep-Wake Stage Classification". In: *Sensors* 24.24 (2024), p. 7881.

[3] **Hossein Amiri** and Asadollah Shahbahrami. "SIMD programming using Intel vector extensions". In: *Journal of Parallel and Distributed Computing* 135 (2020), pp. 83–100.

[4] Asadollah Shahbahrami, **Hossein Amiri**, and Maryam Moradifar. "Improve the Performance of Multimedia Kernels Using SIMD Programming". In: *Computing Science Journal* 17 (2020). In Persian, pp. 47–65.

[5] **Hossein Amiri**, Asadollah Shahbahrami, Angela Pohl, and Ben Juurlink. "Performance evaluation of implicit and explicit SIMDization". In: *Microprocessors and Microsystems* 63 (2018), pp. 158–168.

Conference Papers

- [1] **Hossein Amiri**, James Song, Li Xiong, and Andreas Züfle. "Generating and Understanding Large Datasets of Social Contact Patterns from Foot-Traffic Data". In: *Proceedings of the 1st ACM SIGSPATIAL International Workshop on Geospatial Computing for Public Health (GeoHealth '25)*. 2025.
- [2] **Hossein Amiri**, Richard Yang, Shiyang Ruan, Joon-Seok Kim, Hamdi Kavak, Andrew Crooks, Dieter Pfoser, Carola Wenk, and Andreas Züfle. "HD-GEN: A Software System for Large-Scale Human Mobility Data Generation Based on Patterns of Life". In: *Proceedings of the 33rd ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL '25)*. 2025.
- [3] **Hossein Amiri**, Will Kohn, Shiyang Ruan, Joon-Seok Kim, Hamdi Kavak, Andrew Crooks, Dieter Pfoser, Carola Wenk, and Andreas Züfle. "The Patterns of Life Human Mobility Simulation". In: *Proceedings of the 32nd ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL '24)*. 2024, pp. 653–656.
- [4] **Hossein Amiri**, Ruochen Kong, and Andreas Züfle. "Urban Anomalies: A Simulated Human Mobility Dataset with Injected Anomalies". In: *Proceedings of the 1st ACM SIGSPATIAL International Workshop on Geospatial Anomaly Detection (GeoAnomalies '24)*. 2024.
- [5] **Hossein Amiri**, Richard Yang, and Andreas Züfle. "Geolife+: Large-scale Simulated Trajectory Datasets Calibrated to the Geolife Dataset". In: *Proceedings of the 7th ACM SIGSPATIAL International Workshop on GeoSpatial Simulation (GeoSim '24)*. 2024, pp. 25–28.
- [6] Ruochen Kong, **Hossein Amiri**, Yueyang Liu, Lance Kennedy, Misha Gupta, Joon-Seok Kim, and Andreas Züfle. "Human Mobility Challenge: Are Transformers Effective for Human Mobility Prediction?" In: *Proceedings of the 2nd ACM SIGSPATIAL International Workshop on Human Mobility Prediction Challenge (HuMob '24)*. 2024, pp. 60–63.
- [7] Yueyang Liu, Lance Kennedy, **Hossein Amiri**, and Andreas Züfle. "Neural Collaborative Filtering to Detect Anomalies in Human Semantic Trajectories". In: *Proceedings of the 1st ACM SIGSPATIAL International Workshop on Geospatial Anomaly Detection (GeoAnomalies '24)*. 2024, pp. 79–89.
- [8] Zheng Zhang*, **Hossein Amiri***, Zhenke Liu, Liang Zhao, and Andreas Züfle. "Large Language Models for Spatial Trajectory Patterns Mining". In: *Proceedings of the 1st ACM SIGSPATIAL International Workshop on Geospatial Anomaly Detection (GeoAnomalies '24)*. 2024, pp. 52–55.
- [9] Zheng Zhang*, **Hossein Amiri***, Dazhou Yu, Yuntong Hu, Liang Zhao, and Andreas Züfle. "Transferable Unsupervised Outlier Detection Framework for Human Semantic Trajectories". In: *Proceedings of the 32nd ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL '24)*. 2024, pp. 350–360.
- [10] **Hossein Amiri**, Shiyang Ruan, Joon-Seok Kim, Hyunjee Jin, Hamdi Kavak, Andrew Crooks, Dieter Pfoser, Carola Wenk, and Andreas Züfle. "Massive trajectory data based on patterns of life". In: *Proceedings of the 31st ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL '23)*. 2023, pp. 1–4.
- [11] Will Kohn, **Hossein Amiri**, and Andreas Züfle. "EPIPOL: An epidemiological patterns of life simulation (demonstration paper)". In: *Proceedings of the 4th ACM SIGSPATIAL International Workshop on Spatial Computing for Epidemiology (SpatialEpi '23)*. 2023, pp. 13–16.
- [12] Maryam Moradifar, Asadollah Shahbahrami, Mina Nematpour, and **Hossein Amiri**. "Performance improvement of multimedia Kernels using data-and thread-level parallelism on CPU platform". In: *International Congress on High-Performance Computing and Big Data Analysis*. Springer International Publishing Cham. 2019, pp. 459–467.
- [13] **Hossein Amiri** and Asadollah Shahbahrami. "High performance implementation of 2-D convolution using AVX2". In: *2017 19th International Symposium on Computer Architecture and Digital Systems (CADS)*. IEEE. 2017, pp. 1–4.
- [14] **Hossein Amiri** and Asadollah Shahbahrami. "High performance implementation of 2D convolution using Intel's advanced vector extensions". In: *2017 Artificial intelligence and signal processing conference (AISP)*. IEEE. 2017, pp. 25–30.

Research Presentations

Invited Lightning Talk

Oct 2025

CIDMATH, The Department of Epidemiology, Emory University, Atlanta, GA, USA

- Modeling Shedding Contributions to Wastewater Sewersheds from Dynamic Populations using Simulated Human Mobility Data

Invited Lightning Talk

Mar 2025

CIDMATH, The Department of Epidemiology, Emory University, Atlanta, GA, USA

- Social Contact Matrices for All the POIs in the USA Using Large-scale Human Mobility Data

Conference Presentation

Nov 2024

32nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, Atlanta, GA, USA

- Transferable Unsupervised Outlier Detection Framework for Human Semantic Trajectories

Conference Presentation 32nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, Atlanta, GA, USA • GeoLife+: Large-Scale Simulated Trajectory Datasets Calibrated to the GeoLife Dataset	Nov 2024
Conference Presentation 32nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, Atlanta, GA, USA • Large Language Models for Spatial Trajectory Patterns Mining	Nov 2024
Conference Presentation High-Performance Computing and Big Data Analysis: Second International Congress, TopHPC 2019, Tehran, Iran • Performance Improvement of Multimedia Kernels using Data-and Thread-level Parallelism on CPU Platform	Apr 2019
Invited Lightning Talk Department of Engineering, Guilan University, Rasht, Iran • High Performance Medical Image Processing using Parallel Programming Techniques	May 2018
Conference Presentation IEEE Artificial Intelligence and Signal Processing Conference (AISP), Shiraz, Iran • High performance Implementation of 2D Convolution using Intel's Advanced Vector Extensions	Oct 2017
Invited Lightning Talk Department of Engineering, Guilan University, Rasht, Iran • Parallel Implementation of Multimedia Algorithms for Large Scale Matrix Computations	Mar 2017
Invited Lightning Talk Department of Engineering, Guilan University, Rasht, Iran • Advanced Compiler Optimization Techniques for High Performance Computing	Feb 2016

Honors & Awards

• Experiential Learning Fellow, Laney Graduate School, Emory University, Atlanta, GA, USA	2026
• TATTO Fellow, Laney Graduate School, Emory University, Atlanta, GA, USA	2025
• Best Paper Award Candidate, Research Track, ACM Sigspatial, Atlanta, GA, USA	2024
• Best Paper Award, Data and Resources Track, ACM Sigspatial, Hamburg, Germany	2023
• Startup Weekend Award, 40+ Participants, Science and Technology Park, Rasht, Iran	2021
• Best M.Sc. Thesis Award Nomination, IEEE, Iran Section	2020
• Highest GPA, 23 Graduate Students, University of Guilan, Rasht, Iran	2018
• Ranked 1st, SharifCup, Sharif University of Technology, Tehran, Iran	2012
• Ranked 1st, Computer Lab Olympiad, Abadeh, Iran	2007

Professional Involvement

Journals:

• Reviewer, ACM Transactions on Spatial Algorithms and Systems (TSAS)	2026 — Present
• Reviewer, IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)	2026 — Present
• Reviewer, ACM Transactions on Computing for Healthcare (HEALTH)	2025 — Present
• Reviewer, IEEE Access	2023 — Present
• Reviewer, Electronics and Telecommunications Research Institute (ETRI)	2022 — Present
• Reviewer, Advances in Science, Technology and Engineering Systems Journal (ASTESJ)	2022 — Present

Conferences:

• Program Committee, ACM SIGKDD	2025 — Present
• Participant, ACM/IEEE Supercomputing (SC)	2025
• Participant, ACM SIGSPATIAL	2025
• Webchair, ACM SIGSPATIAL	2024, 2025
• Student Volunteer, ACM/IEEE Supercomputing (SC)	2024
• External Reviewer, ACM SIGSPATIAL	2023 — Present
• Program Committee, ACM International Symposium on Spatial and Temporal Data (SSTD)	2023 — Present
• Participant, High-Performance Computing and Big Data Analysis (TopHPC)	2019
• Participant, IEEE Artificial Intelligence and Signal Processing Conference (AISP)	2017

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Skills

Health and Epidemiologic Modeling: SEIR and compartmental models; infectious disease modeling; outbreak forecasting; spatial epidemiology; wastewater-based epidemiology; contact tracing analytics

Data Science and Statistical Computing: Statistical modeling; experimental design; bias analysis; large scale data analysis; feature engineering; scalable machine learning pipelines; scientific visualization

Software Engineering: Agile methodologies; test driven development; software design patterns; version control (Git); unit testing frameworks; modular and concurrent programming

High-Performance and Scalable Systems: Hardware aware system design; parallel and distributed computing (MPI, OpenMP, SIMD); parallel algorithm design; compiler optimization; cluster and HPC workflows

Simulation: Large scale simulation; spatial and spatiotemporal modeling; patterns of life simulation; human mobility modeling

Web Development: full-stack development; API design; Next.js; Node.js

Cloud Systems: Cloud computing; infrastructure design; computer networking

Geospatial and Data Systems: Geospatial analytics; spatial indexing; time series analysis; large scale data processing

Databases: PostgreSQL/PostGIS; MySQL; MongoDB; relational and NoSQL systems

Programming Languages: C, C++, Python, Java, R, SQL, Bash, Assembly, JavaScript, HTML, CSS

Languages: English (fluent); Persian (native)