Ayesh Abu Lehyeh

Ph.D. Candidate in Computer Science · Computer Vision and Multimodal Learning

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Summary

I build machine learning models that help machines understand where things are in the physical world, spanning representation learning across ground and aerial views, flow-based iterative models, vision-language reasoning, and calibrated uncertainty, with applications in visual geo-localization, geospatial understanding, and wireless positioning. First-author papers at **CVPR**, **IEEE IoT Journal**, **IEEE ICC**, and a **NeurIPS 2026 workshop**, plus industry ML experience at **NextNav** and **Orange**.

Research interests: visual representation learning, multimodal learning and vision-language models, generative models (flow matching, diffusion), 3D and geometric vision, spatial intelligence.

Education

University of Vermont Sep 2023 – Expected Aug 2027
Ph.D. in Computer Science, Advisor: Prof. Safwan Wshah *Burlington, VT*

University of Vermont 2023 – 2025
M.S. in Computer Science, GPA: 4.0/4.0 *Burlington, VT*

- Coursework: Machine Learning, Deep Learning, Data Mining, Data Science, Algorithm Design, LLMs.

University of Jordan 2014 – 2019
B.S. in Electrical Engineering *Amman, Jordan*

- Coursework: Digital Signal Processing, Probability and Random Processes, Communication Systems, Linear Algebra.

Research Experience

University of Vermont Sep 2023 – Present
Graduate Research Assistant *Burlington, VT*

Visual localization and geospatial understanding

- **GeoFlow (CVPR 2026):** reframed fine-grained ground-to-satellite localization as iterative, flow-inspired refinement, where many pose hypotheses converge to a consensus, with an inference scheme that trades accuracy for speed at test time without retraining. Delivered real-time fine-grained localization with an efficient architecture (page).
- **GeoSync (under review, ICLR 2027):** showed that cross-view retrieval and fine-grained localization can be learned from one shared representation instead of a two-model cascade, with localization evidence re-ranking retrieval and built-in confidence signals for failure-aware geo-localization. Achieved state-of-the-art end-to-end accuracy at lower inference cost than cascaded pipelines.
- **Vision-language reasoning (NeurIPS 2026 workshop):** studied what spatial information survives when images become language, using a training-free VLM pipeline for retrieval, LLM judging, and reranking. Found that scene structure transfers into language while the fine detail needed to separate nearby places does not (code).
- **Weather robustness:** benchmarked state-of-the-art cross-view retrieval under severe weather and seasonal shifts, and proposed a model that is robust to these conditions (code).

RF and wireless localization

- **Conformal indoor localization (IEEE ICC 2026):** made conformal prediction spatially adaptive inside a graph transformer, giving location-aware uncertainty with statistical coverage guarantees for Wi-Fi localization.
- **UBiGTLoc (IEEE IoT Journal 2025):** unified anchor-free and anchor-based sensor localization by modeling RSSI over time (BiLSTM) and node relations in space (GNN), outperforming existing methods using only low-cost RSSI.

Industry project with GlobalFoundries

- Framed chip quality prediction from thousands of RF and DC tests across production lots as a learning problem, showed the test space is highly redundant, and built models that predict RF pass/fail from cheap DC tests, opening a path to cutting costly high-frequency RF testing in semiconductor manufacturing.

Industry Experience

NextNav Jun 2026 – Aug 2026
AI/ML Intern, Positioning, Navigation, and Timing *Remote, USA*

- Replaced the fixed lookup table that sets measurement trust in 5G positioning with probabilistic ML models that learn a full error distribution for each measurement from raw channel responses, so the position solver can down-weight multipath-corrupted signals.
- Trained these models end-to-end through a differentiable position solver, so learning targets final position accuracy rather than a proxy loss, cutting tail position error by up to **25%** in field tests.

Orange Jordan May 2019 – Aug 2023
Senior Data Analyst (2021 – 2023); RF Engineer (2019 – 2021) *Amman, Jordan*

- **Senior Data Analyst:** built ML models and Python/SQL pipelines for anomaly detection on large-scale network data.
- **RF Engineer:** optimized radio network coverage, performance, and reliability across 3G, 4G, and 5G networks.

Publications

Conference and journal papers

[1] **Ayesh Abu Lehyeh**, Xiaohan Zhang, Ahmad Arrabi, Waqas Sultani, Chen Chen, Safwan Wshah. **GeoFlow: Real-Time Fine-Grained Cross-View Geolocalization via Iterative Flow Prediction.** *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2026. [project] [arXiv]

[2] **Ayesh Abu Lehyeh**, Anastassia Gharib, Safwan Wshah. **Spatially-Adaptive Conformal Graph Transformer for Indoor Localization in Wi-Fi Driven Networks.** *IEEE International Conference on Communications (ICC)*, 2026. [paper] [arXiv]

[3] **Ayesh Abu Lehyeh**, Anastassia Gharib, Tian Xia, Dryver Huston, Safwan Wshah. **UBiGTLoc: A Unified BiLSTM-Graph Transformer Localization Framework for IoT Sensor Networks.** *IEEE Internet of Things Journal*, 2025. [paper] [arXiv]

[4] Hakan Unveren, **Ayesh Abu Lehyeh**, Duygu Pamukcu, Christopher W. Zobel. **Strategies for Crisis-Responsive Governance: Automated Anomaly Identification in Public Services.** *International ISCRAM Conference*, 2024. [paper]

Workshop papers

[5] **Ayesh Abu Lehyeh**, Jay Hwasung Jung, Safwan Wshah. **What Words Keep of a Place: Zero-Shot Language Reasoning for Cross-View Geo-Localization.** *NeurIPS 2026 Workshop on Physical World AI*. [arXiv] [code]

Under review

[6] **Ayesh Abu Lehyeh**, et al. **GeoSync: Unified Representation Learning for End-to-End Cross-View Geolocalization.** Under review at ICLR 2027.

Technical Skills

Computer Vision	Image retrieval and matching, visual localization and pose estimation, SLAM, camera geometry and BEV projection, feature matching (MASt3R), feed-forward 3D models (VGGT), fine-tuning vision foundation models (DINOv3, ViT)
Generative AI	Flow matching, vision-language models (VLM reasoning, LLM-as-judge, reranking)
Machine Learning	Representation and contrastive learning, transformers, graph neural networks, probabilistic modeling, uncertainty quantification, conformal prediction
Wireless and PNT	5G and RF positioning, trilateration and multilateration, Wi-Fi localization, radio network optimization
Programming	Python, PyTorch, PyTorch Geometric, C++, SQL, MATLAB, Linux, Git, Slurm/HPC

Teaching and Service

Tutorial	Co-organizer, WACV 2027 tutorial *From Image Geolocation to Spatial Intelligence*
Teaching	Graduate Teaching Program, University of Vermont (in progress)
Reviewer	NeurIPS 2026, ICLR 2027, IEEE TPAMI, IEEE TNSE, ECAI 2025, ISPRS Journal
Sub-reviewer	CVPR 2025, CVPR 2026, ECCV 2026, AAAI 2027, IEEE TGRS