Enguang Fan

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Education

University of Illinois, Urbana-Champaign, IL, USA — Aug 2024 – May 2028 (expected)
Ph.D. Candidate in Computer Science — *Advisor: Prof. Klara Nahrstedt*
Research: Spatial Intelligence, On-Device ML, Wireless and Mobile Systems

University of Illinois, Urbana-Champaign, IL, USA — Aug 2022 – May 2024
Master of Computer Science

University of Illinois, Urbana-Champaign, IL, USA — Aug 2019 – Aug 2022
B.S. in Statistics & Computer Science, **Highest Distinction**

Experience

Student Researcher (Intern), Google — May 2026 – Aug 2026, Mountain View, CA
Android Location Team — the team behind indoor positioning in Google Maps and Android Location Services.
Supervised by Dr. Roy Want

- Advanced the integration of Wi-Fi Round Trip Time (RTT) indoor localization into Android's *Fused Location Provider (FLP)* and scaled evaluation across numerous Google offices in Mountain View.
- Achieved **sub-second localization latency** with **1 m 90th-percentile error** on Google Wi-Fi access points and **2 m** on enterprise-grade HPE Aruba, Cisco, and Arista wireless access points.
- Developed and evaluated tightly coupled particle-filter and Bayesian-grid methods for fusing Wi-Fi RTT measurements with motion sensors across varied motion and ranging conditions.
- Designed and implemented *APSelector*, a geometry-aware AP selection algorithm that prioritizes access points providing strong geometric constraints to mitigate NLOS and positive ranging biases.
- Used IMDF walkable-path maps, when available, as probabilistic priors to reject infeasible trajectories.

Student Researcher (Intern), Google — May 2025 – Aug 2025, Mountain View, CA
Android Location Team

- Built an indoor localization prototype combining Wi-Fi Round Trip Time (RTT) and motion sensor fusion on Pixel phones, achieving substantially lower latency and higher accuracy than Google's production *Fused Location Provider (FLP)* under challenging indoor environments (DFS channels, multipath-heavy areas).
- Designed a passive Wi-Fi listening framework that reuses FLP's cached scan results for continuous RTT-based ranging without active scans, cutting location update **latency by 57%** and eliminating scan blackouts.
- Built a high-precision pedestrian dead reckoning (PDR) module leveraging Android's step detector and orientation sensors, and fused it with Wi-Fi RTT measurements through a multi-state Kalman filter, achieving **0.8 meter indoor localization accuracy** at 90% CDF using existing commercial Wi-Fi infrastructure.

Research Experience

On-Device Multimodal GUI Agent for Android — Sep 2026 – Present

- Built a multimodal Android GUI agent that executes natural-language, cross-app tasks with a vision-language model (VLM) run fully on-device (Qwen2.5-VL-3B-Instruct, W4A8, on a Snapdragon 8 Gen 3 phone) or in the cloud (Gemini Flash), behind one shared agent, tool, and recovery interface.
- Designed an observe-reason-act loop on Android AccessibilityService that turns the UI tree into indexed observations, grounds JSON-schema-constrained actions (tap, swipe, type, launch, navigate), falls back to screenshot perception for inaccessible UI, and re-validates actions against the live UI to recover from stale targets.

- Benchmarked on-device execution on real cross-app workflows, measuring median **12.1 tokens/s decode**, 2.9 s vision encoding, and **10.8 s end-to-end action latency** (vs. 4.1 s in the cloud) at 3.6 GB peak memory; evaluated Hexagon NPU offload via Qualcomm QAIRT/QNN and kept the ARM CPU as the stable full-model path.

Learning Latent RF Landmarks from Unlabeled Mobile Trajectories Feb 2026 – Present

- Developed a self-supervised Radio Frequency (RF) place-recognition framework that learns discriminative spatial embeddings from sparse Wi-Fi RTT/RSS trajectory segments, enabling mobile devices to discover repeatable latent landmarks without labeled locations or known access-point coordinates.
- Introduced RF-based loop closure for crowdsourced mobile SLAM, matching independently collected trajectory segments and incorporating high-confidence RF correspondences as constraints in pose-graph optimization to correct accumulated pedestrian dead-reckoning drift.
- Designed an end-to-end mapping pipeline that jointly reconstructs mobile trajectories and reusable RF landmarks from unlabeled walks, with robustness to missing AP observations, multipath, trajectory direction, and cross-device measurement variation.
- Built and released a synchronized Wi-Fi RTT/RSS/IMU trajectory dataset and reproducible SLAM benchmark with ground-truth poses for evaluating RF place recognition, loop-closure detection, and crowdsourced spatial mapping.

Publications

[1] **Enguang Fan** et al. *"RTT-MOTION: Scan-Aware Real-Time Indoor Localization with Commodity Wi-Fi RTT."* Under submission to *ACM MobiCom 2027*.

[2] **Enguang Fan** et al. *"Learning Latent RF Landmarks from Unlabeled Mobile Trajectories."* Under submission to *NeurIPS 2026*.

[3] **Enguang Fan**, Yifan Chen, Zihan Shan, Matthew Caesar, Jae Kim. *"Communication-Aware Multi-Agent Reinforcement Learning for Decentralized Cooperative UAV Deployment."* Accepted to *IEEE GLOBECOM 2026*.

[4] **Enguang Fan**, Anfeng Peng, Matthew Caesar, Jae H Kim, Josh Eckhardt, Greg Kimberly, Denis Osipychev. *"Towards Effective Swarm-Based GPS Spoofing Detection in Disadvantaged Platforms."* In *IEEE MILCOM 2023*.

[5] Emerson Sie*, **Enguang Fan***, Federico Cifuentes-Urtubey, Deepak Vasisht. *"Crowdsourcing Ubiquitous Indoor Localization with Non-Cooperative Wi-Fi Ranging." arXiv preprint*, 2025.

[6] **Enguang Fan***, Emerson Sie*, Federico Cifuentes-Urtubey, Deepak Vasisht. *"Scalable Indoor Localization with Non-Cooperative Wi-Fi Ranging."* Poster at *ACM MobiCom 2025*. **Best Poster Runner-Up**.

[7] **Enguang Fan***, Binh Minh Tran*, Klara Nahrstedt. *"Meter-Level Wi-Fi RTT Localization on a Production Enterprise WLAN."* In *ACM MobiCom 2026* (short paper).

[8] **Enguang Fan**. *"Real-Time Loop Closure Detection in Visual SLAM via NetVLAD and Faiss." arXiv preprint*, 2026.

Honors

- MobiCom 2025 Best Poster Runner-Up
- UIUC Fall 2022 Teachers (TA) Ranked as Excellent by Their Students [Link]

Skills

- Languages: Python, C, C++, Java, MATLAB
- Machine Learning, Deep Learning & Computer Vision: PyTorch, TensorFlow, Transformers, LLMs/VLMs, on-device inference, quantization, LSTMs, Reinforcement Learning, OpenCV
- Robotics & State Estimation: SLAM, visual-inertial odometry, factor graphs, Kalman/particle filters, sensor fusion, PDR, ROS/ROS2
- Wireless & Mobile Systems: Wi-Fi RTT, Android, Linux, CMake