GAURAV SHINDE

Homepage ◇ Google Scholar ◇ Github ◇ LinkedIn

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RESEARCH INTERESTS

Multi-Robot Autonomy: Embodied AI, Collaborative Perception, Multimodal Sensor Fusion, Multi-Agent Reinforcement Learning, Digital Twins, Sim-to-Real Transfer
Foundation Models for Robotics: Vision-Language Models, LLM-Based Reasoning and Planning
Systems: Efficient Edge AI, Collaborative Edge Inference

EDUCATION

University of Maryland, Baltimore County (UMBC) Spring 2028 (expected)
PhD in Information Systems (AI/ML Track)

San Jose State University (SJSU) May 2024
M.S. in Engineering (AI/ML Track)

MIT World Peace University (MIT WPU) Apr 2021
B.S. in Computer Science

EXPERIENCE

Mobile, Pervasive and Sensor Computing Lab Aug 2024–Present
Graduate Research Assistant Maryland

Collaborative Perception and Reasoning for Robot Teams

- Proposed task- and channel-aware image compression and quality-aware vision–radio fusion for bandwidth-efficient information sharing and GPS-free inter-robot range estimation, respectively.
- Developed a multi-robot framework that estimates object dimensions and their reliability from multi-view RGB images. It then combines LLM-based compatibility scoring with constrained optimization to assign robots to valid cover objects.
- Developed a multi-robot object-goal navigation framework in which a VLM assigns frontiers using retrieved visual evidence and object-level spatial relations, then verifies and revises its assignments before execution.

Center for Research in Use-Inspired Cyber-Physical Systems Aug 2024–Present
Infrastructure and Systems Administrator Maryland

- Developed and maintained code execution environment across several servers using containerization.
- Implemented optimized multi-node training scripts across heterogeneous GPU architectures.

InterPARES Trust AI Aug 2023 - May 2024
Graduate Research Assistant California

- Collaborated with archivists to conduct a large-scale systematic review of AI techniques in archival science, highlighting practical applications and open research gaps.

Machine Intelligence and Complex Systems Lab Feb 2023 - May 2024
Graduate Research Assistant California

- Developed a denoising self-attention transformer architecture that accurately predicts the remaining useful life of Li-ion batteries under heterogenous noise in battery operational data.

Tech Mahindra Jun 2023 - Aug 2023
Machine Learning Engineer Intern California

- Detected and masked personally identifiable information (PII) for 60,000 records using Google Data Loss Prevention API, Presidio, and custom Transformer models.
- Spearheaded the development of a web application using Flask, generating custom alerts based on PII sensitivity.

Insta ICT Solutions Pvt Ltd Sep 2021 - Jul 2022
Software Engineer India

- Implemented Redux architecture in a React application for efficient state management across components, achieving a 15% reduction in rendering time and improving the user experience.
- Developed a robust middleware logger, resulting in 20% decrease in issue resolution time.
- Achieved 30% reduction in unauthorized access attempts by deploying JWT-based token authentication.

Data Glove Inc. Dec 2020 - Mar 2021
Software Engineer Intern India

- Integrated PySpark with Azure Synapse to orchestrate efficient data extraction, transformation, and visualization, resulting in a 15% reduction in data processing time.
- Built scalable data pipelines on Azure (Data Factory, Databricks, Data Lake Storage) to extract data from multiple sources for visualization in Power BI.

PUBLICATIONS

C - Conference, J - Journal, W - Workshop

Peer-Reviewed

- [C] **Gaurav Shinde**, Anuradha Ravi, Jared Lewis, Andre Harrison, Henry Gardiner, MS Anwar, Shadman Sakib, Jade Freeman, Nirmalya Roy, "CAViAR: Quality-Aware Vision-and-Radio Fusion for Relative Range Estimation among Collaborative Autonomous Agents", IEEE WoWMoM, 2026. [Paper]
- [J] **Gaurav Shinde**, Anuradha Ravi, Emon Dey, Shadman Sakib, Milind Rampure, Nirmalya Roy, "A Survey on Efficient Vision-Language Models", WIREs DMKD, 2025 **(IF 11.7)**. [Paper]
- [W] **Gaurav Shinde**, Anuradha Ravi, Emon Dey, Nirmalya Roy, "TAVIC-DAS: Task and Channel-Aware Variable-Rate Image Compression for Distributed Autonomous System", IEEE PerCom Workshop, 2025. [Paper]
- [C] **Gaurav Shinde**, Tiana Kirstein, Souvick Ghosh, Patricia Franks, "Tracing the Past, Predicting the Future: A Systematic Review of AI in Archival Science", ASIS&T, 2025 **(CORE rank A)**. [Paper]
- [C] **Gaurav Shinde**, Rohan Mohapatra, Pooja Krishan, Saptarshi Sengupta, "De-SaTE: Denoising Self-attention Transformer Encoders for Li-ion Battery Health Prognostics", IEEE BigData, 2023. [Paper]
- [C] Shadman Sakib, **Gaurav Shinde**, Nirmalya Roy, "CALIBRA: Calibration-Aware Multi-Agent Verification for Contactless Physiological Monitoring", CVPR Workshop, 2026. [Paper]
- [C] Shadman Sakib, **Gaurav Shinde**, Nirmalya Roy, "Decoupling Perception and Reasoning for Contactless Respiratory Rate with Vision Language and Small Language Models", IEEE/ACM CHASE, 2026. [Paper]
- [C] Shadman Sakib, **Gaurav Shinde**, Emon Dey, Nirmalya Roy, "E2RespUNet: End-to-End Respiratory Signal Reconstruction and Rate Prediction Using a Unified Attention-Enhanced U-Net", IEEE SmartComp, 2025. [Paper]
- [C] Shadman Sakib, **Gaurav Shinde**, Snehalraj Chugh, Nirmalya Roy, "RespFormer: A Motion-Guided Temporal-Frequency Multimodal Fusion Transformer for Contactless Respiratory Monitoring," IEEE ICMLA, 2025. [Paper]
- [C] Emon Dey, Anuradha Ravi, **Gaurav Shinde**, Garvit Chugh, Indrajeet Ghosh, Archan Misra, Nirmalya Roy, "FedCASQ: Enhancing Class-Wise Accuracy in Pervasive Federated Learning with Class-Aware Scaling and Quantization", IEEE PerCom, 2026 **(CORE rank A*)**. [Paper]
- [C] MS Anwar, Anuradha Ravi, Indrajeet Ghosh, **Gaurav Shinde**, Carl Busart, Nirmalya Roy, "COHORT: Hybrid RL for Collaborative Large DNN Inference on Multi-Robot Systems Under Real-Time Constraints", IEEE WoWMoM, 2026. [Paper]
- [C] MS Anwar, Anuradha Ravi, Emon Dey, **Gaurav Shinde**, Indrajeet Ghosh, Jade Freeman, Carl Busart, Andre Harrison, Nirmalya Roy, "CoOpTex: Multimodal Cooperative Perception and Task Execution in Time-Critical Distributed Autonomous System", IEEE DCOSS-IoT, 2025. [Paper]

Under Review

- [C] **Gaurav Shinde**, Anuradha Ravi, Andre Harrison, Milind Rampure, MS Anwar, Jade Freeman, Nirmalya Roy, "COVER: Collaborative Object Perception for Semantic-Geometry-Aware Robot Deployment", HSCC + ICCPS 2027.

- [C] **Gaurav Shinde**, Anuradha Ravi, Milind Rampure, Andre Harrison, Nirmalya Roy, "SPERE-Nav: Spatial and Perceptual Evidence Guided Reflective Reasoning for Zero-Shot Multi-Robot Object-Goal Navigation", IEEE ICRA 2027.
- [C] MS Anwar, Anuradha Ravi, **Gaurav Shinde**, Nirmalya Roy, "RippleGuard: Defending Cross-Layer Cascading Attacks in Cooperative Perception for Multi-Agent Systems", HSCC + ICCPS 2027.

RESEARCH DEMONSTRATIONS & FIELD VALIDATION

Collaborative Remote Robotics Experiment using the Distributed Virtual Proving Ground Aug 2025
DEVCOM ARL Maryland

- Demonstrated an agentic multi-robot system for visual-target navigation in contested environments. [Experiment Details]

NSF AI Ready TRACE Test Bed Workshop and Field Experiment Demonstration Apr 2026
UMBC Maryland

- Developed photorealistic digital twins of indoor environments in NVIDIA Isaac Sim using structure-from-motion and Gaussian-based neural reconstruction, and integrated collision geometry and physics to support virtual–physical co-simulation with real robots. [Gallery] | [Workshop Page]

SKILLS

Robotics & Simulation	ROS/ROS2, Isaac Sim, Habitat, Gymnasium, Gazebo, Webots
Programming	Python, Java, TypeScript, JavaScript, C, C++
Machine Learning	Pytorch, Tensorflow, Sklearn, Pandas, Numpy
Technology	Azure, AWS, GCP, Docker, GIT

ACADEMIC SERVICE

Peer Review

- IEEE Transactions on Mobile Computing (2026), WIREs Data Mining and Knowledge Discovery (2026), IEEE BigData (2026), COMSNETS (2026, 2027), Pattern Recognition Letters (2025)

Program Committee

- **TPC Member**, International Conference on COMmunication Systems & NETworkS (COMSNETS 2027)

Conference & Workshop Organization

- **Organizing Team Member**, NSF TRACE Robotic Testbed Workshop, UMBC 2026
- **Local Organizer**, IEEE International Conference on Pervasive Computing and Communications (PerCom) 2025

University Leadership

- **GEARS Chair**, UMBC Graduate Student Association [Webpage] Jul 2026–Present
  - Lead UMBC's campus-wide **Research Symposium** and **Three Minute Thesis (3MT)** competition that showcases student research from all three colleges.
- **Council Member**, Research and Creative Achievement Council, UMBC [Webpage] Aug 2026-Present

TEACHING & MENTORING

Teaching

- **IS 420: Database Application Development**, UMBC Aug 2026–Present
  - Led weekly lab sections for 90 students covering SQL and PL/SQL, ER modeling, normalization, stored procedures, triggers, and transaction control; graded examinations and evaluated course projects.

Mentoring

- Mentored NSF REU undergraduate researchers (2025) and a UMBC PhD student (2026–Present).

AWARDS & HONORS

- NSF Student Travel Grant, IEEE PerCom 2025.
- Inducted as a full member of the Sigma Xi Research Honor Society, 2026.

REFERENCES

- Available upon request.