

# Vishnu Kadiyala

Ph.D. Candidate, Computer Science · University of Oklahoma

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## Research Focus

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Multi-Agent Reinforcement Learning under partial observability; decentralized policy learning and implicit coordination via learned belief representations; learned communication for cooperative multi-agent systems; learning dynamics and optimization pathologies in cooperative MARL training; applications to autonomous driving and V2X.

## Education

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**University of Oklahoma**, Norman, OK Expected May 2027

Ph.D. in Computer Science

*Graduate coursework: Visual Navigation for Autonomous Vehicles (CS 5970, Fall 2022; based on MIT 16.485) — visual SLAM, multi-view geometry, bundle adjustment, VIO. C++, ROS, GTSAM, OpenCV.*

**University of Oklahoma**, Norman, OK May 2022

M.S. in Electrical and Computer Engineering

*Thesis: Localization of Tables and Plots in Documents Using Deep Neural Networks*

**KLE Technological University**, India May 2019

B.E. in Electronics and Communication Engineering

## Technical Expertise

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**Machine Learning:** Multi-Agent Reinforcement Learning, Deep Learning, Transformers, Attention Mechanisms, CNNs, U-Nets, Diffusion Models

**Programming Languages:** Python, C, C++

**Frameworks:** PyTorch, JAX / Flax, TensorFlow

**Simulation Environments:** MPE (Speaker-Listener), SMAX, Highway-Env, MetaDrive, Waymax

**Data & Systems:** HPC / SLURM, CUDA, Distributed Training, Multi-Machine Orchestration (Tailscale + SSH), Pandas, NumPy, Xarray

**Tools:** Git / GitHub, Linux, ROS, Reproducible ML Pipelines

## Research Experience

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**Multi-Agent RL Research — University of Oklahoma** 2025 – Present

- **Under review at NeurIPS 2026:** *When Auxiliary Losses Fail: Non-Stationary Targets Induce Directional Gradient Noise.* Characterized a gradient-interference pathology in attention + auxiliary-loss architectures across both cooperative MARL and supervised learning. **290+ runs across 7 experiments**; three architectural fixes (stop-gradient on the auxiliary target,  $\lambda$ -annealing, mean-pool attention) recover lost performance.
- Cross-domain validation across Overcooked, Simple, and SMAX (MARL) and CIFAR-100 (vision), demonstrating the pathology is not RL-specific.
- Designed evaluation protocols that distinguish coordination from coincidence: ablations, counterfactual tests, and seed-pooled population estimators.
- Developing **AwareGate** (in progress, ICLR 2027 target): learned communication-gating policy combining cross-attention message fusion with a recurrent belief state, for cooperative multi-agent systems including V2X.

**NSF AI2ES — ML Researcher ([GitHub](#))** 2023 – 2025

- Built a **Transformer-based** architecture with custom spatial / temporal embeddings for multi-modal irregular spatio-temporal data (ground stations + radar + satellite), achieving a **13× improvement** over the classical Marshall-Palmer baseline.

- Developed a **vision-based atmospheric visibility estimation** system using outdoor camera imagery for statewide inference beyond sparse ASOS sensor coverage.
- Designed and maintained reproducible ML training and evaluation pipelines on HPC infrastructure for large-scale multi-modal sensor datasets.
- Co-authored peer-reviewed paper: *Estimating Statewide Atmospheric Visibility From Camera Images* (AMS 2025).

**NASA GeoCARB — Deep Learning Researcher** ([GitHub](#)) 2021 – 2023

- Designed **U-Net** architectures for methane hotspot detection from satellite imagery, achieving **95% accuracy**.
- Improved anomaly detection from 80% to **90.2%** using diffusion-based generative models on satellite observations.
- Built data-quality assessment frameworks for satellite observation datasets including preprocessing validation, augmentation strategies, and quality assurance pipelines.

**Document Understanding with Deep Learning** Aug 2021 – May 2022

- Designed CNN-based architectures for **object detection and localization** of tables and plots in documents, achieving **99% detection accuracy**.
- Constructed annotated datasets with bounding-box labels and automated document generation pipelines for scalable training data.
- *Master's Thesis: Localization of Tables and Plots in Documents Using Deep Neural Networks.*

## Selected Publications

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### Under Review

- **V. P. Kadiyala.** *When Auxiliary Losses Fail: Non-Stationary Targets Induce Directional Gradient Noise.* Under review at NeurIPS 2026.

### Peer-Reviewed Conference Papers

- M. X. Sasser, M. Wilson Reyes, **V. P. Kadiyala**, A. Kurbanovas, K. J. Sulia, et al. *Estimating Statewide Atmospheric Visibility From Camera Images.* Proceedings of the 105th AMS Annual Meeting, 2025.
- E. Spicer, S. Crowell, F. Xu, **V. P. Kadiyala**, P. M. Klein, et al. *Exploring the Influence of Local Urban and Industrial Carbon-Based Pollutant Sources on Total Column Concentration Enhancements in Houston, Texas during TRACER.* Proceedings of the 104th AMS Annual Meeting, 2024.

### Theses

- **V. P. Kadiyala.** *Localization of Tables and Plots in Documents Using Deep Neural Networks.* Master's Thesis, University of Oklahoma, 2022.

## Teaching

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**Teaching Assistant — CS 2614 Computer Organization**, University of Oklahoma 2024 – Present

- Lead weekly hands-on labs on digital logic, assembly-level programming, and hardware / software interface fundamentals.
- Develop lab documentation, debugging workflows, and troubleshooting guides; provide one-on-one mentoring across varied skill levels.

## Industry & Engineering Experience

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**Test Automation Intern — Robert Bosch Engineering & Business Solutions** Jan 2019 – May 2019

- Developed hardware-in-the-loop (HIL) test automation pipelines for Engine Control Units (ECUs).
- Automated ECU software validation using ETAS LABCAR across hardware and digital fault layers.