GANDHIMATHI (MATHI) PADMANABAN

Ph.D. Candidate
University of Michigan-Dearborn
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Website - GitHub - LinkedIn

EDUCATION

Apr 2026 **Ph.D., Industrial and Systems Engineering** - *University of Michigan-Dearborn, USA*
Dissertation: "Enhancing Transportation Safety: Research on Driver Behaviors Using Advanced Machine Learning"
Advisor: Dr. Fred Feng

2021 **M.S., Human Centered Design and Engineering** - *University of Michigan-Dearborn, USA*
Thesis: "Computational Human Performance Modeling using Queuing Network in an Open-Source Platform"
Advisor: Dr. Fred Feng

2013 **B.E., Computer Science and Engineering** - *Anna University, India*
Thesis: "Automated Detection of Modifications in Software Requirement Traceability Links"
Advisor: Prof. Ramachandran Alagarsamy

Certifications: Connected & Automated Transportation Certificate (*Dec 2025*); Rackham DEI Certificate (2025); Post Graduate Diploma in Computer Applications (2011)

PUBLICATIONS (2 PEER-REVIEWED; 3 UNDER REVIEW; 2 IN PREPARATION)

Peer-Reviewed Conference Papers

1. Gandhimathi Padmanaban, Nathaniel P. Jachim, Hala Shandi, Lilit Avetisyan, Garrett Smith, Howrah Hammoud, and Feng Zhou. "An Autonomous Driving System - Dedicated Vehicle for People with ASD and their Caregivers". *AutomotiveUI '21 Adjunct: 13th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*. Association for Computing Machinery, 2021, pp. 142–147. DOI: https://doi.org/10.1145/3473682.3480282.
2. Gandhimathi Padmanaban, Fred Feng, Edward Dai, Ankit Saini, Guopeng Hu, and Yanan Zhao. "A Comparative Analysis of Acceleration and Deceleration Profiles for Aggressive Driving Styles and Fuel Economy Test Cycles". *WCX SAE World Congress Experience*. 2025. DOI: http://dx.doi.org/10.4271/2025-01-8605.

Papers Under Review & In Preparation

1. "A Machine Learning Pipeline Framework to Identify Aggressive Driving Based on Vehicle Kinematics and Driver's Pedal Operations". *Under review.*
2. "A Geometry-Informed Computer Vision Method for Detecting and Examining Overtaking Vehicles From A Bicycle". *Under review.*
3. "Quantifying Drivers-Overtaking-Bicyclists with Surrogate Safety Measures Derived from High-Resolution Digital Lidar". *Under review.*
4. "Geometry-Informed Distance Estimation from 2D Bounding Boxes for Vehicle Overtaking Analysis". *In Preparation.*
5. "Does Vehicle Type Influence Cyclist Overtaking Behavior? A Fine-Grained Vehicle Detection and Geometry-Informed Analysis Framework". *In Preparation.*

AWARDS AND GRANTS

- Student Visionary Award - International Forum on Research Excellence Conference(IFoRE' 25), Sigma Xi-The Scientific Research Honor Society, 2025
- Upsilon Pi Epsilon (UPE) Scholarship - Awarded for exceptional academic performance, extracurricular involvement, and leadership within the computing community, 2024

- Global Finalist - NASA Space Apps Challenge, 2023
- Irma M. Wyman Scholar, *Center for the Education of Women (CEW+), University of Michigan*, 2020-2021 ($11,500)
- Non-Resident Graduate Student Scholar, *University of Michigan-Dearborn*, 2020-2021 ($13,000)
- Deloitte Hackathon Special Mention, 2017 | Syncfusion Hackathon 2nd Place, 2015 (INR 35,000)

TALKS AND PRESENTATIONS

Talks

- **[WOC] Code – University of Michigan Ann Arbor**, Feb 2024
  NASA SpaceApps Experience: DigitwiML – Open-Source Project to model Digital Twin of C.elegans in Space
- **University of Michigan–Dearborn**, Sep 2021
  Guest Talk: IMSE 501 Human Factors & Ergonomics

Conference Presentations

- **Transportation Research Board Annual Meeting**, Jan 2026 *(Poster-Upcoming)*
  A Geometry-Informed Computer Vision Method for Detecting and Examining Overtaking Vehicles From A Bicycle
- **International Forum on Research Excellence (IFoRE' 25)**, Oct 2025 *(Workshop Session)*
  Hybrid Physics-Data Modeling for Sustainable Transportation: Bridging Classical Models and Modern AI
- **Automotive User Interfaces (AutoUI) Conference**, Apr 2025 *(Paper Presentation)*
  A Comparative Analysis of Acceleration and Deceleration Profiles for Aggressive Driving Styles and Fuel Economy Test Cycles
- **WCX SAE World Congress Experience**, Sep 2021 *(Paper Presentation)*
  An Autonomous Driving System – Dedicated Vehicle for People with ASD and their Caregivers

RESEARCH SOFTWARE & OPEN SOURCE PROJECTS

- **DigitwiML**: Digital Twin modeling platform for C.elegans in space (NASA SpaceApps Project) - GitHub
- **Human Performance Modeling Tools**: Open-source queuing network simulation platform for computational human performance modeling (Python)
- **Geometry-informed overtaking tracker** - Computer Vision system for tracking of vehicle overtaking bicyclist (Python)

RESEARCH EXPERIENCE

2022–*Now* **Graduate Student Research Assistant** - *University of Michigan-Dearborn, USA*
Advisor/PI: Dr. Fred Feng

2011–13 **Research Assistant** - *Anna University, India*
Advisor/PI: Prof. Ramachandran Alagarsamy

PROFESSIONAL EXPERIENCE (INDUSTRY)

2017–18 **Development Lead/Consultant**
Deloitte (Offices of the US) – Bangalore, India

2015–17 **Programmer Analyst**
Cognizant – Chennai, India

2013–15 **Software Engineer Level-II**
Syncfusion – Chennai, India

TEACHING AND MENTORING

2024–*Now* **Certified Instructor** - *The Carpentries*
Hands-on Data Science & Programming Workshops (Python data analysis, visualization, Git). University of Tennessee Knoxville (May 2025) | CZI Foundation (Nov 2024) | University of Michigan (Mar 2024)

2023–*Now* **Instructor & Mentor** - *WoCCode - University of Michigan-Ann Arbor*
Machine Learning and Python workshop: materials open-sourced. Machine Learning Workshop (Feb 2024) | Summer 2023 Boot Camp

2010–12 **Student Instructor / Teaching Assistant** - *Anna University, India*
Courses: Artificial Intelligence, Probability and Queuing Theory, Transforms and PDEs, Systems Software Laboratory

SERVICE AND LEADERSHIP

Leadership: President, Upsilon Pi Epsilon Michigan Beta Chapter (2024-2025) • Member: SAE International (AI in Simulation Task Force), Sigma Xi, Alpha Pi Mu, Society of Industrial and Applied Mathematics, ACM, HFES

Reviewer: TRB Annual Meeting 2026, ICIS 2025, AutoUI 2024, CHI 2024, AMCIS 2024, CUI 2024, IMX 2024, DIS 2024

Community: MIDAS AI Summit Student Volunteer (2023,2025) • WoC|CodeNova Hackathon Judge (2025) • WocCode Mentor • Certified Instructor & Lesson Maintainer • NASA SpaceApps & MHacks Judge • STEM High School Tutor (2010-13)

TECHNICAL EXPERTISE

AI/ML Methods	Geometry-Informed Computer Vision, Deep Learning (CNN, RNN, Transformers), Supervised Learning, Ensemble Methods, Time Series Analysis, Bayesian Methods, Physics-Informed Machine Learning, Uncertainty Quantification and Calibration, Out-of-Distribution Detection
Domains	Transportation Safety, Driver Behavior Analysis, Driver-Bicyclist Interactions, Human Factors Engineering, Naturalistic Driving Studies
Tools & Frameworks	OpenCV, YOLOv5, RT-DETR, ByteTrack, Multi-Object Detection & Tracking, Multi-Modal Data Fusion, LiDAR
Programming	**Expert**: Python (TensorFlow, PyTorch, scikit-learn, OpenCV, pandas), Git, LaTeX; **Proficient**: Julia, R, MATLAB, C#, UI Frameworks, SQL; **HPC**: Great Lakes cluster (Slurm), Docker
Research	Experimental Design, Statistical Analysis, Scientific Writing, Peer Review, Institutional Review Board (IRB) Protocols, Cross-Validation, Academic Collaboration
Foundations	Optimization, statistical learning, multivariable calculus, mathematical modeling, geometric computer vision, vision transformers, multimodal/VLM (pretraining, attention, evaluation)