

SUCHINTHAKA WANNINAYAKA

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PROFILE

Passionate and results-driven Machine Learning researcher with over 5+ years of experience in Generative AI, Computer Vision, and Deep Learning. Specialized in image reconstruction, multimodal learning, and Semantic Communication frameworks. Demonstrated ability to design scalable and efficient AI-driven solutions for visual understanding, image generation, and communication-oriented tasks. Strong track record of contributing to advanced research and developing practical frameworks that push the boundaries of modern AI.

EDUCATION

University of California, Davis, Davis, CA	Sep. 2022 - Jun. 2026 (Expected)
<i>Ph.D. Candidate in Electrical and Computer Engineering, GPA: 3.91/4.0</i>	
M.S. in Electrical and Computer Engineering, GPA: 3.91/4.0	Sep. 2022 - Sep. 2025
University of Moratuwa, Sri Lanka	Dec. 2015 - Jan. 2020
<i>BSc. Engineering (Hons) specialized in Electronic and Telecommunication Engineering, GPA: 3.75/4.20</i>	

WORKING EXPERIENCES

AI/ML Researcher — University of California, Davis, <i>Davis, CA</i>	2022 - Present
• Led research on Federated Learning, Diffusion Models, Vision Transformers, Generative Adversarial Networks, Image Compression, and Semantic Communications using the PyTorch framework on HPC GPU servers. Managing GPU servers to optimize lab computation resources.	
• Developed innovative frameworks for diffusion-based semantic communication and goal-oriented systems.	
Software Engineer — Codify Lanka (Pvt) Ltd, <i>Sri Lanka</i>	May 2021 - 2022
• Engineered and optimized advanced payment systems and comprehensive reporting tools for CutAndDry, a high-impact eCommerce and logistics platform tailored to the food industry, ensuring scalability and robust financial operations.	
Software Engineer — Axiata Digital Labs (ADL), <i>Sri Lanka</i>	2020 - 2021
• Spearheaded the design and implementation of the "API Catalog" feature for ADL Digital Telco Enabler (ADL-DTE), significantly improving development efficiency and strategic decision-making, while delivering scalable backend and frontend solutions deployed for leading telecommunication enterprises.	
Research Intern — Singapore University of Technology and Design (SUTD), <i>Singapore</i>	July - Dec, 2018
• Researched IoT and Machine Learning at the Smart Systems Lab, developing air quality monitors and an IoT gateway with diverse wireless protocols.	

SKILLS

Programming Languages: Python, MATLAB, C++, Java

AI/ML Frameworks and Libraries: PyTorch (including PyTorch Lightning), TensorFlow, Keras, Hugging Face Transformers

AI/ML Expertise: Generative AI (Diffusion Models, GANs, VAEs, Flow-based Models), Large Language Models (LLMs), Vision-Language Models (VLMs), LLM Fine-tuning (LoRA, QLoRA, PEFT), Deep Learning Architectures, Multimodal Learning, Computer Vision, Image Reconstruction, Neural Network Optimization, Federated Learning

Development & Infrastructure: High-Performance Computing (HPC), GPU Server Management, Distributed Training, Docker, Git, AWS, Linux/Unix, Full-Stack Development (React, Angular, Spring Boot, Express, JavaScript, PHP)

RESEARCH PROJECTS

Generative AI for Semantic Image Generation

Leveraging cutting-edge generative AI techniques and diffusion models, we have developed innovative frameworks for efficient, high-quality image generation with potential applications in semantic communication systems:

- **Noise-Optimized Diffusion Framework (Diff-GOⁿ)** *[Diffusion Models, PyTorch]*
Introduced a Noise-Restricted Forward Diffusion (NR-FD) process with a pre-sampled noise bank to reduce computational resources during training. Integrated an LPIPS-based early stopping criterion for greater efficiency. In semantic communication, it ensures high bandwidth efficiency while generating high-quality semantic image representations.
- **Enhanced Generative Feedback Framework (Diff-GO+)** *[VQ-VAE, Diffusion Models, PyTorch]*
Improved semantic image generation quality through local generative feedback (LGF) while optimizing computational efficiency. Introduced dictionary learning for effective noise codebook design. When applied to semantic communication, it achieves ultra-high bandwidth compression while preserving perceptual and task-driven accuracy.
- **Latent Mixture Integration Framework (LaMI-GO)** *[VQ-Diffusion, VQ-GAN, PyTorch]*
Designed a task-driven latent integration approach using VQ-Diffusion models and VQGAN to enable ultra-high bandwidth efficiency while maintaining the fidelity of semantic image representations and downstream task performance.
- **Vector Quantized Generative Framework (TACO)** *[VQ-VAE, PyTorch, Imitation Learning]*
Developed a Vector Quantized Variational Autoencoder (VQ-VAE) for task-driven semantic quantization and imitation learning, improving semantic image generation and its applications, such as autonomous driving.

Enhanced Probe Vehicles for Intelligent Transportation Systems

Undergraduate Honors Thesis, University of Moratuwa

Developed a system combining vehicle sensors and neural networks to estimate CO₂ emissions, optimize fuel-efficient route planning, and measure International Roughness Index (IRI) with mobile and web applications.

INDUSTRIAL PROJECTS

Digital Telco Enabler (ADL-DTE)

Axiata Digital Labs, Sri Lanka

Led the design and implementation of the "API Catalog" feature for ADL-DTE, improving development efficiency and decision-making while building scalable backend and frontend components for seamless integration.

Payment System for CutAndDry Platform

Codify Lanka (Pvt) Ltd, Sri Lanka

Developed a robust payment system and reporting tools for a universal eCommerce and logistics platform, enhancing scalability, financial operations, and transaction reporting.

RECENT PUBLICATIONS

- A. Wijesinghe, S. Zhang, **S. Wanninayaka**, W. Wang, and Z. Ding, "Diff-GO+: An Efficient Diffusion Goal-Oriented Communication System with Local Feedback," *IEEE Transactions on Wireless Communications*, 2025.
- A. Wijesinghe, **S. Wanninayaka**, W. Wang, Y. Chao, S. Zhang, and Z. Ding, "LaMI-GO: Latent Mixture Integration for Goal-Oriented Communications Achieving High Spectrum Efficiency," *IEEE Transactions on Neural Networks and Learning Systems*, accepted.
- **S. Wanninayaka**, A. Wijesinghe, W. Wang, Y. Chao, S. Zhang, and Z. Ding, "Diff-GOn: Enhancing Diffusion Models for Goal-Oriented Communications," *IEEE International Conference on Communications (ICC)*, 2025.
- Y. Chao, Y. Chen, W. Wang, A. Wijesinghe, **S. Wanninayaka**, S. Zhang, and Z. Ding, "Task-Driven Semantic Quantization and Imitation Learning for Goal-Oriented Communications," *IEEE International Conference on Communications (ICC)*, 2025.
- A. Wijesinghe, W. Wang, **S. Wanninayaka**, S. Zhang, and Z. Ding, "TACO: Rethinking Semantic Communications with Task Adaptation and Context Embedding," *IEEE Global Communications Conference (GLOBECOM)*, accepted.
- A. Wijesinghe, S. Zhang, **S. Wanninayaka**, W. Wang, and Z. Ding, "Diff-GO: Diffusion Goal-Oriented Communications with Ultra-High Spectrum Efficiency," *IEEE International Conference on Communications Workshops (ICC Workshops)*, 2024.