

# SUCHINTHAKA WANNINAYAKA

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## PROFILE

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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

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**University of California, Davis, *Davis, CA*** Sep. 2022 - Jun. 2026 (Expected)  
*Ph.D. Candidate in Electrical and Computer Engineering, GPA: 3.91/4.0*  
*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  
*BSc. Engineering (Hons) specialized in Electronic and Telecommunication Engineering, GPA: 3.75/4.20*

## WORKING EXPERIENCES

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**AI/ML Researcher** — University of California, Davis, *Davis, CA* 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, *Sri Lanka* 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), *Sri Lanka* 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), *Singapore* 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

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**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

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### 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-GO<sup>n</sup>)** [*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

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### 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

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- 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.