

Malsha V. Perera

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Summary

Final-year Ph.D. candidate in Electrical and Computer Engineering at Johns Hopkins University with expertise in computer vision and deep learning, focusing on mitigating data memorization and addressing fairness and bias in generative models. Experienced in low-level vision tasks such as image restoration. Passionate about developing responsible AI systems and advancing generative modeling and computer vision research.

Education

- Ph.D. **Johns Hopkins University** | Baltimore, MD | Electrical Engineering Aug 2021 – Present
Advisor: Vishal M. Patel
Highlighted Courses: Machine Perception, Machine Intelligence, Machine Learning for Signal Processing, Vision as a Bayesian Inference, Foundations of Probabilistic Machine Learning
- B.Sc. **University of Moratuwa** | Sri Lanka | Biomedical Engineering Jan 2016 – Jan 2020
Included in Dean's Honors List in all 8 consecutive semesters.
Class rank : 3rd out of 117, Faculty rank : 4th out of 948 students.

Research Experience

- Graduate Research Assistant** | Johns Hopkins University | Baltimore, MD Aug 2021 – Present
- Conducting research in computer vision and generative AI, with a focus on developing and analyzing advanced generative and multimodal learning frameworks.
 - Conducting research on face restoration under extreme degradation, developing methods that preserve identity while achieving high perceptual quality.
 - Designed and implemented methods to analyze and mitigate social bias and data memorization in generative models and multimodal large language models (MLLMs), improving model robustness, fairness, and generalization.
 - Utilized diffusion-based and deep generative methods to solve low-level vision problems, including face restoration, SAR image despeckling, and weather artifact removal.
- Applied Scientist Intern** | Amazon Fulfillment Technologies | Bellevue, WA May 2025 – Aug 2025
- Interned with the AFT AI team at Amazon, contributing to research and development efforts in video understanding and event detection.
 - Designed and implemented a lightweight video classification model for detecting false events in videos from Amazon fulfillment centers, achieving 99% detection accuracy.
 - Utilized multimodal large language models (MLLMs) for video understanding to enhance the interpretation of complex activities in real-world warehouse environments.
- Applied Scientist Intern** | Amazon Web Services (AWS) AI | San Francisco, CA May 2024 – Aug 2024
- Interned with the Foundations Research Team (FRT) at AWS AI.
 - Conducted research on compartmentalized image generation in text-to-image diffusion models, designing and implementing methods that leverage state-space models (SSMs) to improve controllability in image synthesis.
- Junior Lecturer** | University of Moratuwa | Sri Lanka Jan 2020 – Aug 2021
- Conducted research on deep learning-based retinal vascular segmentation, hand gesture recognition using EMG signals, human pose estimation, and phase unwrapping.
 - Instructed courses in Signals and Systems, Circuits and Systems Design, Medical Electronics and Instrumentation, and Analysis of Physiological Systems.

- Conducted research on deep learning frameworks for automated brain hemorrhage segmentation in CT images, improving accuracy and efficiency in medical image analysis.
- Developed an analytical system for fluorescent microscopy images to automatically identify stages of adipogenesis, enabling quantitative analysis of adipocyte browning in cellular studies.

Technical Skills

- **Deep Learning:** Diffusion Models, GANs, Variational Autoencoders (VAEs), Large Language Models (LLMs), Vision-Language Models (VLMs), Multimodal LLMs (MLLMs) State-Space Models (Mamba)
- **Computer Vision and Image Processing:** Image/ Video generation, Image Restoration, Face Restoration, SAR Image Despeckling, Weather Artifact Removal, Medical Imaging (CT, microscopy)
- **Programming:** Python, MATLAB, R, C++
- **Frameworks and Libraries:** Python, PyTorch, TensorFlow, OpenCV, scikit-learn, NumPy, Pandas, HuggingFace
- **Software and Tools:** Git, Linux, LaTeX, Jupyter Notebooks, AWS (EC2), Weights & Biases

Selected Publications

Malsha V. Perera and Vishal M. Patel. Unbiased-Diff: Analyzing and Mitigating Biases in Diffusion Model-based Face Image Generation. *IEEE Transactions on Biometrics, Behavior, and Identity Science (T-BIOM)*, 2025.

Malsha V. Perera and Vishal M. Patel. Mitigating Replication and Bias in Diffusion-Based Face Image Synthesis Models With Rewards. *IEEE Transactions on Biometrics, Behavior, and Identity Science (T-BIOM)*, 2025.

Malsha V. Perera and Vishal M. Patel. Debias-DPO: Debiasing Diffusion based Face Image Generation with Direct Preference Optimization. *IEEE International Joint Conference on Biometrics (IJCB)*, 2025.

Malsha V. Perera*, Kartik Narayan*, and Vishal M. Patel. Investigating Social Biases in Multimodal LLMs. *IEEE International Conference on Automatic Face and Gesture Recognition (FG)*, 2025.

Aimon Rahman*, **Malsha V. Perera***, and Vishal M. Patel. Frame by Familiar Frame: Understanding Replication in Video Diffusion Models. *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, 2025.

Malsha V. Perera and Vishal M. Patel. Analyzing Bias in Diffusion-based Face Generation Models. *IEEE International Joint Conference on Biometrics (IJCB)*, 2023.

Malsha V. Perera, Nithin Gopalakrishnan Nair, Wele Gedara Chaminda Bandara, and Vishal M. Patel. SAR Despeckling using a Denoising Diffusion Probabilistic Model. *IEEE Geoscience and Remote Sensing Letters*, 2023.

Malsha V Perera* and Ashwin De Silva*. A Joint Convolutional and Spatial Quad-Directional LSTM Network for Phase Unwrapping. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2021.

Ashwin De Silva*, **Malsha V. Perera***, Kithmin Wickramasinghe, Asma M Naim, Thilina Dulantha Lalitharatne, and Simon L Kappel. Real-time hand gesture recognition Using temporal muscle activation maps of multi-channel sEMG signals. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2020.

* denotes equal contribution.

Selected Awards & Recognition

- World Finalists at the IEEE ComSoc Student Competition ranked among the top 15 in the world (2019)
- Singapore International Pre-Graduate Award Awarded by Agency for Science, Technology and Research, Singapore for top international students (2018)
- International Physics Olympiad (IPhO) - Member of Sri Lankan national team (2015)
- Asian Physics Olympiad (APhO) - Member of Sri Lankan national team (2015)
- Silver Medal - National Physics Olympiad, Sri Lanka (2014)