

# Aryan Mishra

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## EDUCATION

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**University of Maryland**

College Park, Maryland

*Master of Engineering – Robotics*

*Expected: May 2025*

**Vellore Institute of Technology**

Vellore, India

*Bachelor of Technology – Electronics and Communication Engineering*

*June 2023*

## RESEARCH AND WORK EXPERIENCE

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**National Institute of Standards and Technology - Gaithersburg, MD**

November 2024 - Present

**Generative AI Engineer**

Professional Research and Experience Program student from UMD, part of Retrieval Group, Information Technology Laboratory

- Developing pipeline for testing of multi-modal inputs as authentic or fabricated and identifying sensitive contents.
- Generated robust datasets for evaluation using diffusion, Flux and styleGAN models, fine-tuned Flux models using LoRa.
- Deployed anti-spoof, transformer classifier, spatial based image for facial detection, recognition and verification on image and video inputs.

**Department of Statistics, Uni of MD- College Park, MD**

August 2024 - Present

**Machine Learning Researcher**

Worked as a volunteer on Geometric Deep learning, currently taking an independent study for Spring 2025 semester.

- Independent research on geometric deep learning for graphs, grids and data manifolds.
- Working on understanding and devising novel methods to harness the power of graph neural networks.
- Implemented regularization terms for approximation of high dimensional manifolds in smaller dimensions.

**Department of Mechanical Eng., Uni of MD – College Park, MD.**

January 2024 – December 2024

**Machine Learning Research Volunteer**

Part of two projects: Development of a soft robotic gripper, Medical Image analysis

- Engineered 3D-printed soft robotic grippers and deployed ML to predict object size, shape, and material from pressure-volume curves
- Deployed VNET with Attention Mechanism on the Stanford Type B Aorta Dissection dataset, achieving a Dice Coefficient of 0.80, Jaccard Mean of 76.3, AsD Mean of 0.98.
- Developed a transformer-based encoder for the VNET architecture.

## PROJECTS

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### Autonomous Scene Segmentation

September 2024 – December 2024

*PyTorch, Swin Transformer, Trans-UNET, Python*

- Devised and trained from scratch Trans-UNET, Swin-Trans-UNET and UNET. Performed pixel-wise segmentation of KITTI Images
- Achieved Dice coefficients of 0.88, 0.80, and 0.87 for three segmentation models, with the Swin Transformer-UNET architecture demonstrating superior performance and attained the lowest cross-entropy loss of 0.27 among the compared approaches.

### Vision Language Model

August 2024 – December 2024

*PyTorch, SigLip, Python, Google-Gemma, OpenCV*

- Combined 400M SigLIP and 2B Gemma Models into a sub-3B VLM works for VQA, QA tasks and referring segmentation.

### Multimodal Trajectory Prediction

July 2024 – August 2024

*PyTorch, Python, OpenCV*

- Addressing the uncertainties faced by self-driving vehicles with a Multiple Trajectory Prediction (MTP) model by predicting multiple possible paths and the likelihood of each using probability adhering to geometric and angular meaning using the NuScenes Dataset.

### Retrieval Augmented Generation

June 2024 – July 2024

*PyTorch, RAG, Python*

- Implemented a Retrieval Augmented Generation (RAG) pipeline using the Gemma-2-9b-it LLM model. Achieved high efficiency for real-time query answering, optimizing for scalable performance and reduced latency.

### Generative Adversarial Networks

June 2024

*PyTorch, OpenCV, PIL, Python*

- Deployed multiple GAN models, including Deep Convolution GAN, Cycle GAN, and Progressive GAN, on diverse datasets such as MNIST, Celeb A, and the Summer to Winter Yosemite dataset.

### Hippocampal volumetric quantification of Alzheimer's progression

March 2024 – May 2024

*PyTorch, OpenCV, PIL, Python, UNET, Google-DeepLabV3+*

- Leveraged UNET and DeepLabV3+ architectures to diagnose and monitor Alzheimer's disease progression using 260 NIFTI images from the Medical Decathlon dataset.
- Achieved robust segmentation performance with Mean Dice Coefficient scores of 0.87 and 0.81 and mean Jaccard Index values of 0.77 and 0.785.

### Segmentation of 3D and CT Stanford Type B Aortic Images

January 2024 – December 2024

*PyTorch, OpenCV, PIL, Python, VNET, VNET + Transformer*

- leveraging a VNET architecture with an attention mechanism to enhance the segmentation accuracy of 3D MRI and CT images, specifically targeting Type-B Aortic Dissection (TBAD)

- Achieved robust segmentation performance with Mean Dice Coefficient score of 0.88 and Mean Jaccard Index values of 0.76.

## TECHNICAL SKILLS

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- **Languages:** Python, C++, MATLAB, RUST
- **Frameworks:** TensorFlow, PyTorch, Keras, CUDA, OpenAI Gym, OpenCV, Jax, LORA, Hugging Face, Flux, Diffusion Models and Flow Matching.
- **Software/Tools:** AWS, ROS1/2, C-Make, Gazebo, Linux, Git/GitHub, Docker, Robot Perception, Localization, Deep Learning, Computer Vision, Artificial Intelligence, Microsoft Suite, Content Writing