

# Arushi Sinha

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## EDUCATION

**Johns Hopkins University**, Baltimore, MD Aug 2022 - May 2024 (Expected)  
Master of Science in Electrical and Computer Engineering GPA: 3.81/4  
Thesis: Diffuse2Adapt: Controlled Diffusion for Synthetic-to-Real Domain Adaptation  
Advisor: Prof. Rama Chellappa

**Manipal Institute of Technology**, Manipal, India Jul 2018 - Jun 2022  
Bachelor of Technology in Electronics and Instrumentation Engineering GPA: 3.83/4

## WORK EXPERIENCE

**Althea.ai - Data Science Intern** Feb 2024 - Present

- Developing a machine learning model to improve HEDIS (Healthcare Effectiveness Data and Information Set) scores of health insurance plans while addressing health inequity.
- Identified key HEDIS measures for targeted improvement through analysis of 15-year trends.
- Enhanced location precision of Social Determinants of Health (SDoH) risk attribution using geocode data extraction.
- Building a pipeline to forecast member compliance to HEDIS measures using SDoH indicators, enabling precise healthcare interventions.

**Johns Hopkins University - Machine Learning Research Assistant** Feb 2023 - Present  
Artificial Intelligence for Engineering and Medicine Lab ([AIEM](#))

- Enhanced classification model performance by bridging the synthetic-to-real domain gap using controlled diffusion and Vision-Language Models.
- Built a context-aware image-to-image translation pipeline with Stable Diffusion, ControlNet, and image captioning.
- Trained style-specific text tokens to incorporate target domain style into the translation process.
- Improved classification accuracy by 17.3% by training a classifier with these source images translated to target domain.

## TECHNICAL PROJECTS

**Predicting Ejection Fraction of heart using Segmentation guided Video Vision Transformers** Jan 2023 - Apr 2023

- Automated the process of predicting heart diseases using echocardiogram video analysis.
- Segmented the left ventricle region in 10,031 echocardiogram videos using DeepLabv3 segmentation model.
- Trained a video vision transformer on these segmented videos to predict the Ejection Fraction (EF) per frame.
- Achieved a mean absolute error (MAE) of 5.81 with this method when compared with the ground truth EF.
- Achieved an area under the curve (AUC) of 93% on using these predictions to classify healthy and at-risk patients by using an EF of 35 as threshold.

**Image Quality Enhancement with Diffusion Models for Face and Endoscopic Images** Aug 2022 - Dec 2022

- Trained a diffusion model to upscale face and endoscopic images while maintaining image quality.
- Achieved a 10.47% reduction in root mean square error (RMSE) for face imagery using our diffusion model compared to a regression-based CNN baseline method. Similarly, obtained a 7.77% improvement for endoscopic images.
- Demonstrated strong domain generalization ability by training on endoscopic domain and evaluating on face images.

**Defense Mechanisms Against Adversarial Attacks in Computer Vision** Sep 2022 - Nov 2022

- Developed a robust image classification model resistant to adversarial attacks.
- Achieved a test accuracy of 80% using this ResNet-18 model on CIFAR-10 test set without adversarial attacks.
- Implemented several adversarial attacks: Gaussian Noise, Fast Gradient Sign Method, Carlini-Wagner, and Projected Gradient Descent on the model trained on CIFAR-10.
- Built a defense algorithm against gaussian noise attack which improved test classification accuracy by 8.33%.

## SKILLS

**Languages & Frameworks:** Python, SQL, PyTorch, Scikit-Learn, Pandas, NumPy, XGBoost, Hugging Face, Diffusers, Matplotlib, Seaborn, PyTorch Lightning, Tableau, Docker, Bash, C/C++, MATLAB, HTML, CSS

**Cloud Computing:** AWS SageMaker, AWS Redshift