

Rhitvik Sinha

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EDUCATION

Courant Institute of Mathematical Sciences, New York University	New York, NY
<i>Master of Science in Computer Science</i>	2022 - 2024
Courses: Computer Vision, Machine Learning, Reinforcement Learning, Large Language & Vision Models, DL Systems	
Indian Institute of Technology, Kharagpur	Kharagpur, India
<i>Bachelor of Technology (Honours) in Electrical Engineering</i>	2018 - 2022
Courses: Deep Learning, Data Analytics, Transform Calculus, Probability & Stochastic Processes	

TECHNICAL SKILLS

Languages: Python, C/C++, CUDA, MATLAB, R, JavaScript, Scala, Java
Python Tools: NumPy, PyTorch, TensorFlow 2.x, OpenCV, Gym/Gymnasium/PettingZoo, multiprocessing, Z3, Pandas, GeoPandas
Developer Tools: Git, Docker, AWS, GCP, \LaTeX , VS Code, Unity (ML-Agents)

EXPERIENCE

Systems and Applications Engineer	Summer 2023
<i>Cirrus360 Corp., Richardson, TX</i>	<i>Supervisor: Dr. Alan Gatherer</i>
<ul style="list-style-type: none">Improved compile time of Gabriel™ (a platform for RAN deployment described using a Domain Specific Language) by 20-30% (logarithmic speedup as CPU cores are increased) through parallelization strategies using Python's multiprocessing module.Developed a Flask-hosted Automatic Speech Recognition application utilizing OpenAI's Whisper and PyTorch's TorchAudio, improving transcription efficiency with 8-bit quantization.Created multiple Python utilities to automate testing, increasing productivity and reducing development time.Modified configuration files to simulate constrained hardware environments, ensuring robustness and adaptability of Gabriel™.	
Graduate Employee Adjunct	Fall 2023
<i>Courant Institute of Mathematical Sciences, New York University</i>	<i>Supervisor: Prof. Eyal Lubetzky</i>
Led recitations, held office hours, and coordinated grading and material preparation for MATH-UA 121: Calculus 1.	

PROJECTS

Image Encoding Schemes for Vision Transformers Paper	Fall 2023
<i>Course Project (CSCI-GA 3033 Special Topics: Large Language & Vision Models), NYU</i>	<i>Guide: Prof. Saining Xie</i>
<ul style="list-style-type: none">Improved image classification performance by 7% on CIFAR-10 and 8% on CIFAR-100 using Mixed-Resolution Tokenization, leveraging a saliency scorer for adaptive patch sizes, outperforming baseline Vision Transformers.Achieved 85% accuracy with patch embeddings, demonstrating their robustness and efficiency despite low computational cost, validated through extensive experiments with varying patch sizes.Explored advanced tokenization techniques, including VQ-VAE and initial convolutions, identifying limitations in their application for classification tasks, and highlighting mixed-resolution tokenization as a promising direction for further research.	
Adaptive SphereFormer: Dynamic Radial Windows for Better Sparse Learning Paper	Fall 2023
<i>Course Project (CSCI-GA 2271 Computer Vision), NYU</i>	<i>Guide: Prof. Rob Fergus</i>
<ul style="list-style-type: none">Developed the Adaptive SphereFormer, improving the existing state-of-the-art SphereFormer's radial window self-attention with dynamic adjustments based on point distance, increasing overall mean Intersection over Union (mIoU) by 1%.Achieved efficient memory management and better segmentation accuracy by progressively expanding window sizes with distance from the origin, validated on the SemanticKITTI dataset.	
Optimizing Diffusion Models for Image De-Noising Paper	Fall 2022
<i>Course Project (CSCI-GA 2565 Machine Learning), NYU</i>	<i>Guide: Prof. Rajesh Ranganath</i>
<ul style="list-style-type: none">Modified and trained diffusion models for noisy image inputs, analyzing the impact of noise levels, diffusion steps, and cycles; implemented and trained a class-conditioned diffusion model.Developed a diffusion model to regenerate images with missing pixels, effectively functioning as a Masked Auto-Encoder.Conducted literature review on VAEs, GANs, and diffusion models, and reproduced benchmarks for Denoising Diffusion Probabilistic Models (DDPM).	
Barenet: INT8 Quantized Transformers from Scratch Code	Spring 2024
<i>Course Project (CSCI-GA 3033 Special Topics: Big Data & Machine Learning Systems), NYU</i>	<i>Guide: Prof. Jinyang Li</i>
Developed a fully functional Multi-Layer Neural Net with int8 quantization and attention mechanisms, with CUDA kernels for matrix operations to achieve efficient transformer inference and performance optimization, creating a limited-functionality PyTorch clone.	
Multi-Agent RL with Unity (SoccerTwos)	Spring 2023
<i>Course Project (DS-GA 3001 Special Topics: Reinforcement Learning), NYU</i>	<i>Guide: Prof. Jeremy Curuksu</i>
Developed a Multi-Agent RL system using Unity's ML-Agents PettingZoo Wrapper to train agents in the SoccerTwos environment, implementing and comparing PPO, SAC, and POCA policies; achieved agents that autonomously learned collaborative 'attack' and 'defense' strategies through self-play.	
Deep Learning for Extreme Weather Forecasting	Spring, Fall 2021
<i>Undergraduate Research, IIT Kharagpur</i>	<i>Guide: Prof. Adway Mitra</i>
Conducted research on extreme weather forecasting using Capsule Neural Networks and Analog Weather Forecasting techniques, demonstrating superior performance over CNNs and logistic regression in predicting heat/cold waves 1-5 days ahead using T2m and Z500 data from the NCAR CESM-LENS dataset.	