Yogesh Kulkarni

ykulkarn@usc.edu
yogkul2000.github.io

Education

University of Southern California, Los Angeles, CA — May 2024
Master of Science in Computer Science

Pune Institute of Computer Technology, Pune, India — May 2022
Bachelor of Engineering in Computer Engineering

Research Interests

Developing vision-language models for applications in robotics, natural language processing, and healthcare. Enhancing the robustness of these models through adversarial training and privacy-preserving techniques. Exploring novel methods for multimodal learning across vision and language domains. Investigating trustworthiness, safety, and societal impacts of advanced AI systems.

Publications

EnsembleNTLDetect: An intelligent framework for electricity theft detection in smart grid
Y. Kulkarni, S. Hussain, K. Ramamritham and N. Somu
IEEE International Conference on Data Mining Workshops (ICDM), 2021

Kryptonite: An adversarial attack using regional focus
Y. Kulkarni, K. Bhambani
International Conference on Applied Cryptography and Network Security (ACNS), 2021

Intensive image malware analysis and least significant bit matching steganalysis
Y. Kulkarni and A. Gorkar
IEEE International Conference on Big Data (Big Data), 2020

Research Experience

DEVCOM US Army Research Laboratory, Los Angeles, CA — Jan 2023 - March 2024
Graduate Research Assistant with Meida Chen
Built a 3D style transfer pipeline with a Vision Transformer backbone using CLIP guided gaussian splatting for transferring real colors to a synthetic point cloud with guidance from text prompts.
Utilized probabilistic diffusion models (DDPM) guided by semantic features and self-attention, leveraging pre-trained SparseUNet for this problem.
Explored Pix2Pix and CycleGAN with backbone architectures like Point Transformer, KPConv, SparseUNet, and PointNet for 3D Point Cloud Colorization in 3D Photogrammetric point clouds.

Nokia Bell Labs, New Providence, NJ — June 2023 - August 2023
Research Intern with Thomas Woo
Implemented automatic model parallelism and partitioning for GPT-3 and LLaMA foundational models, increased model training throughput by 15% across heterogeneous clusters.
Designed and executed communication and compute efficient inter-node pipeline parallelism approach for training LLMs on heterogeneous and geo-distributed cluster GPUs.

Episource LLC, Mumbai, India — January 2022 - March 2022
NLP Intern
Implemented and deployed a solution for Abbreviation - Disambiguation of real-time Clinical Texts.
Prepared an annotated dataset and re-engineered an ACL research paper, fine-tuned Bio_ClinicalBERT and PubmedBERT to achieve accuracy of 99% and 98%.
Mapped 200+ clinical drugs to their strength, dosage, form with a custom Python script and boosted company's existing NER model by 15%.

RBCDSAI (IIT Madras), Chennai, India — July 2021 - October 2021
Research Intern with Nivethitha Somu
Proposed an End-to-End framework for detecting Electricity Theft in Industrial Smart Grids.
Applied Enhanced Dynamic Time Warping for imputation, Stacked Auto-Encoder for dimensionality reduction & Conditional GAN's for robustness attaining an impressive accuracy of 99% & Matthews Correlation Coefficient of 0.98.

Omdena, Remote — October 2020 - January 2021
Junior ML Engineer
Worked with Kenya Red Cross Society to classify Sentinel1 and Sentinel2 satellite imagery into different cropland types for 16 counties of Kenya which were severely affected by desert locust attacks.
Devised a custom version of U – Net Convolutional Neural Network for image segmentation achieving an impressive 81% accuracy on the LandCoverNet dataset.
Devised a custom LSTM network for predicting future NDVI (Normalized difference vegetation index) values and to prepare the counties for upcoming desert locust attacks on croplands having an RMSE score of 0.024.

DRDO HQ, New Delhi, India — July 2020 - October 2020
Research Intern
Investigated Hex dump, EXIF data of images for identifying embedded payloads with sophisticated string-matching algorithms in Python.
Developed a novel, robust and scalable framework for malware analysis of images.
Constructed a Stacked Ensemble classifier using XGBoost, Catboost & Feedforward Neural Net for detecting LSB Matching Steganography both for color & grayscale images, with an AUC of 0.98 & 0.87 respectively.

Side Projects

Dual Policy Networks for Multi-Task RL
Engineered a dual-teacher network model improving policy distillation in multi-task robotic environments, utilizing Deep Q Networks.
Developed a cross-attention module enabling superior learning efficiency, evidenced by higher average rewards in Cartpole and Acrobot tasks.
Demonstrated marked performance gains in complex Atari environments, outperforming single-teacher and baseline models in adaptability and resilience.

Imitation Learning for Autonomous Driving in POMDP Framework
Implemented behavior cloning and conditional imitation learning (CoIL) algorithms in a POMDP framework for autonomous driving policies.
Leveraged Mixture Density Networks to output Gaussian distribution parameters, optimizing action predictions.
Conducted systematic evaluations in intersection and lane-change scenarios, refining the neural network architectures for optimal performance.

Technical Skills

Languages: Python, C/C++, SQL, JavaScript
Libraries/Frameworks: PyTorch, TensorFlow, Pandas, SpaCy, NumPy, DeepSpeed, ColossalAI
Analytical Tools & Databases: MongoDB, Docker, Spark, MLFlow, Kubernetes, GCP

Awards

Google Research India Graduate Symposium	Jan 2022
Conference Travel Grant for ICDM conference in Auckland, NZ	Dec 2021
IIT Madras Summer Fellowship	Sep 2021
Conference Travel Grant for IEEE Big Data Conference in Atlanta, USA	Dec 2020