KAMALESH KUMAR

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#### Education

#### University of Massachusetts Amherst Sep. 2024 – May 2026 (Expected) Master of Science in Computer Science Amherst, MA Indian Institute of Technology (IIT) Madras Jul. 2020 - May 2024 B. Tech in Civil Engineering, Minor in Artificial Intelligence & Machine Learning Chennai, India **Relevant Coursework** Machine Learning • Complex Networks • Computational Cognition • Multi-Armed Bandits • Reinforcement Learning • Dynamic Game Theory • Non-Linear Optimization Data Structures Algorithms Experience

#### Mitacs Globalink

Reinforcement Learning (RL) Research Intern at the Convergence Lab, St. Francis Xavier University

- Received the Mitacs Globalink award to research evolutionary algorithmic approaches such as genetic programming (GP) to discover novel reward functions in RL, thereby eliminating the need for hand-crafted reward functions.
- Conceptualized experiments to test different GP fitness functions using Stable Baselines3 and the DEAP framework.
- Parallelized training of the PPO algorithm across the population of reward functions in the Compute Canada cluster.
- Showed the ability of GP in discovering better performing reward functions in MuJoCo and other Gym environments.

# Paris AI Research Institute

Reinforcement Learning (RL) Research Intern at the MILES lab, Université Paris-Dauphine - PSL

- Awarded the Charpak Scholarship by the French Embassy in India to research adversarial & robust RL by analyzing possible adversarial models that can arise in Markov Decision Processes (MDPs).
- Investigated state, action, and kernel perturbing adversaries, and established theoretical equivalences between them.
- Proved connections between optimal transport distance, optimal couplings, and adversarial risk in RL

#### Nuartin Labs

Machine Learning Intern

- Built pipeline for efficient watermark removal for downstream consumers alongside the founding member.
- Developed an end-to-end pipeline consisting of calibrated localization, image super-resolution, and object segmentation.
- Parallelized the training across four Nvidia T4 GPUs, and deployed final pipeline for clients such as Walmart.

# Projects

Improving Sketch Queries for Robust Retrieval of 3D CAD Models | IIT Madras Aug. 2022 – Dec. 2023

- Designed a two-stage cascaded GAN architecture to facilitate sketch completion of incomplete query sketches. Work published at Computer & Graphics'23
- Proposed a novel three-branch factorization based on conditional Wasserstein Generative Adversarial Network (GAN)to clean defective sketches and thus improvised a dataset of 58K CAD sketches. Published at Computer & Graphics'24.

# Foundational Challenges in Large Language Models (LLMs) | IIT Madras

- Continued research on challenges in LLMs from a cognitive perspective, as part of the Computational Cognitions course.
- Investigated the symbolic behavior in LLMs by analyzing their formal & functional linguistic competencies.

# A Hybrid Approach to the Cold Start Problem of Recommender Systems

- Curated a hybrid matrix factorization scheme by including the user-item explicit features to aid content-based filtering.
- Inspected techniques that tackle sparse observations such as SVD & Slope-One and tested on MovieLens 100K dataset.

# Publications

- K. Kumar, P. P. Kendre, R. D. Manilal, and R. Muthuganapathy, "Sketchcleangan: A generative network to enhance and correct query sketches for improving 3d cad model retrieval systems," Computers & Graphics, vol. 123, 2024
- P. P. Kendre, K. Kumar, S. S. K. Jayasree, S. Rajan, A. Jayan, and R. Muthuganapathy, "Sketchcadgan: A generative approach for completing partially drawn query sketches of engineering shapes to enhance retrieval system performance," Computers & Graphics, vol. 115, 2023

# Technical Skills

Languages: Python, C++, MATLAB, LATEX, C, SQL

Libraries: PyTorch, TensorFlow, Stable-baselines, DEAP, Ray, Pathos, Gymnasium, OpenCV, Numpy, Pandas, Matplotlib Technologies/Frameworks: Linux, Git, GitHub

# May 2023 - Aug. 2023

Bangalore, India

Paris. France

#### Jun 2022 – Aug. 2022

Sep. 2023 – Nov. 2023

May 2021 – Jun. 2021

May 2024 – Aug. 2024

Canada