

K. Niranjan Kumar

<http://www.kniranjankumar.com>

Email : kniranjankumar.eee@gmail.com

Mobile : +1-404-514-1609

SUMMARY

Researcher with **7+ years** years of experience in **Reinforcement Learning, Robotics** and **Computer Vision**. Extensive experience in designing and training control policies for whole-body control, locomotion, navigation, manipulation.

EDUCATION

Georgia Institute of Technology

PhD in Electrical and Computer Engineering, GPA 4.0/4.0

Atlanta, GA

Jan. 2017 – May 2024

Georgia Institute of Technology

Master of Science in Electrical and Computer Engineering, GPA 4.0/4.0

Atlanta, GA

Aug. 2015 – Dec. 2016

National Institute of Technology

Bachelor of Technology in Electrical and Electronics Engineering, GPA 8.3/10

Trichy, India

July. 2011 – May 2015

PUBLICATIONS

1. T. Huang, N. Sontakke, K. N. Kumar, I. Essa, S. Nikolaidis, D. W. Hong, and S. Ha. Bayrntune: Adaptive bayesian domain randomization via strategic fine-tuning. *IROS*, October 2024
2. K. N. Kumar, I. Essa, and S. Ha. Words into action: Learning diverse humanoid robot behaviors using language guided iterative motion refinement. *LangRob workshop, CoRL*, 2023
3. K. N. Kumar, I. Essa, and S. Ha. Cascaded compositional residual learning for complex interactive behaviors. *IEEE Robotics and Automation Letters*, 8(8):4601–4608, 2023
4. K. N. Kumar, I. Essa, and S. Ha. Graph-based Cluttered Scene Generation and Interactive Exploration using Reinforcement Learning. *ICRA*, May 2022
5. K. N. Kumar, I. Essa, S. Ha, and C. K. Liu. Estimating Mass Distribution of Articulated Objects using Non-prehensile Manipulation. *NeurIPS ORLR Workshop (Oral)*, Dec 2020

EXPERIENCE

Applied Researcher - Robotic Controls

Feb 2024 – Present

Sanctuary AI

Lynnwood, WA

- Created a framework to train human-like walking policies on H1 humanoid robot, combining motion imitation and reward-engineering based RL.
- Developed data-driven techniques for actuator modeling in humanoid robots.
- Formulated and developed collision avoidance approaches using barrier-constraints to ensure safety.

Research Intern

May 2019 – July 2019

Samsung Research America

Mountain View, CA

- Worked at the AI center on long-range video understanding using neural networks.
- Built graphical representations of video to tackle few shot video classification built on top of I3D architecture.

Research Intern

June 2018 – August 2018

*Nokia Bell Labs**New Providence, NJ*

- Interned with the Mathematics and Algorithms group at Bell labs and worked on training procedures that make neural networks robust to adversarial attacks.
- Studied the effect of weight normalization techniques on the loss landscape of neural networks.

Research Intern

Aug 2016 – Dec 2016

*Emory University School of Medicine**Atlanta, GA*

- Designed and developed a smart head-mounted eye dropper device with a built-in camera to track the drop's trajectory using a machine learning model.

ACADEMIC PROJECTS**Learning dynamic and agile skills for a humanoid robot from language commands** Feb 2023 – Dec 2023

- Built a framework that utilizes Large Language Models (LLMs) to control and direct training of RL control policies for a Digit humanoid robot from language instructions.
- Developed cross-morphological motion re-targeting to map trajectories from human to digit skeleton.

Interactive navigation with a quadruped robot

Dec 2021 – Dec 2022

- Developed learning based control policies for a quadruped robot to interactively navigate an indoor environment.
- The approach incrementally develops complex skills by learning residuals on top of a library of pre-learned policies using Deep Reinforcement Learning. The robot dynamically navigates through a house, opening doors, manipulating objects, and crawling through tight spaces to reach its goal, achieving state-of-the-art performance.

Object search in clutter using physical plausibility priors

Aug 2020 – Aug 2021

- Developed a robotic system to efficiently discover hidden objects present in cluttered environments.
- Built a scene grammar to represent structured clutter and used it as a unifying representation to generate and rearrange structured clutter. Developed a pair of RL agents that generate and explore complex cluttered scenes by interactively rearranging and discovering hidden objects. Both these agents use Graph Neural network architectures, and generalize to an arbitrary number of objects.
- Deployed the policies trained in simulation on real cluttered scenes with a UR10 robot (sim2real) and an e-pick vacuum suction gripper.

Mass estimation of articulated objects

Aug 2018 – Feb 2020

- Built RL policies to efficiently interact with articulated objects and estimate their mass distribution.
- Developed a dual-network approach to interactive perception, where a Predictor neural network minimizes estimation error and a Policy neural network selects optimal actions that reveal the maximum information.
- Deployed the learned policy on UR10 robot (sim2real), developed dynamic pushing strategies for manipulating 3D printed articulated toys and demonstrated state-of-the-art results on estimation of mass distribution.

TECHNICAL SKILLS**Languages:** Python, C++**Developer Tools:** Git, Docker**Libraries/Packages:** NumPy, Scipy, Matplotlib, Pandas, Jupyter, OpenCV, ROS, MATLAB**Machine Learning Libraries:** Tensorflow, Pytorch**Physics Libraries:** Pybullet, Pydart, Issac Gym**Hardware:** Vicon motion capture, Raspberry pi, MyDAQ, FPGAs, Leap motion controller**Robots:** TurtleBot, UR10, Unitree A1, H1 Agility Robotics Digit, FPV Quadcopters

VOLUNTEERING/ LEADERSHIP**Web Chair**, Conference on Robot Learning 2023**Reviewer**, IEEE Transactions on Robotics (TRO), ACM Transactions on Human-Robot Interaction (THRI), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Conference on Robot Learning (CoRL)**Head of Spider Electronics**, R&D club**Overall Coordinator**, EEE Association