

Niranjan Kumar

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RESEARCH STATEMENT

The goal of my research is to build embodied agents that learn manipulation policies to improve their understanding of objects around them. I am interested in applying machine learning techniques to tackle problems in computer vision, reinforcement learning, robotic manipulation and intuitive physics.

EDUCATION

Georgia Institute of Technology <i>PhD in Electrical and Computer Engineering, GPA 4.0/4.0</i>	Atlanta, GA Jan. 2017 – Present
Georgia Institute of Technology <i>Master of Science in Electrical and Computer Engineering, GPA 4.0/4.0</i>	Atlanta, GA Aug. 2015 – Present
National Institute of Technology <i>Bachelor of Technology in Electrical and Electronics Engineering, GPA 8.3/10</i>	Trichy, India July. 2011 – May 2015

PUBLICATIONS

1. K. N. Kumar, I. Essa, and C. K. Liu. Estimating Mass Distribution of Articulated Objects using Non-prehensile Manipulation. *NeurIPS Workshop on Object Representations for Learning and Reasoning (Accepted as an Oral presentation)*, Dec 2020

EXPERIENCE

Graduate Teaching/Research Assistant <i>Georgia Institute of Technology</i> <ul style="list-style-type: none">• 6475 Graduate Computational Photography course• Responsibilities: Designing assignments, grading, discussions on Piazza	Jan 2017 – Present Atlanta, GA
Research Intern <i>Samsung Research America</i> <ul style="list-style-type: none">• Interned at the AI center and worked on long-range video understanding using neural networks• Investigated the applicability of graphical representations of video to tackle few shot video classification	May 2019 – July 2019 Mountain View, CA
Research Intern <i>Nokia Bell Labs</i> <ul style="list-style-type: none">• 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	June 2018 – August 2018 New Providence, NJ
Research Intern <i>Emory University School of Medicine</i> <ul style="list-style-type: none">• Designed and developed a smart head-mounted eye dropper device that automatically administers eye drops into the user's eyes.• The device has an in-built camera that tracks the drop as it falls into the user's eye, and re-administers it in-case of failure.	Aug 2016 – Dec 2016 Atlanta, GA
Research Intern <i>National University of Singapore</i> <ul style="list-style-type: none">• Developed an Explicit Finite Difference solver that computes the option price by considering stock price in the past and estimating how it might vary in the future• Implemented the algorithm in Verilog to enable deployment on FPGA hardware	May 2014 – July 2014 Singapore

ACADEMIC PROJECTS

- Object search in clutter** | *Advised by Dr. Schoon Ha and Dr. Irfan Essa* Aug 2020 – Present
- Building robotic agents that learn how to interact with a cluttered scene to discover hidden objects.
 - Designing simulated worlds with a cluttered pile of realistic objects that a robot can interact with and learn from.
- Realistic object manipulation video generation** | *Advised by Dr. Karen Liu* Aug 2018 – May 2019
- A Generative Adversarial Network that generates realistic videos of hands manipulating objects from motion capture data.
- ArchNet** | *Advanced Computer Vision course project* Mar 2017 – May 2017
- A Generative Adversarial Network with cyclic consistency loss (cycle-GAN) that translates images from one architectural style to another. The network learns to generate Paris (architectural style A) like images from street images of Barcelona (Architectural style B).
- Motion textures from single image** | *Advised by Dr. Irfan Essa* Aug 2016 – May 2017
- Generating an infinite video sequence of fluids from static images using a CNN and minimal user input.
- Selecting real world objects with eye gaze** | *Advised by Dr. Ayanna Howard* Jan 2016 – May 2016
- Built a system that helps paralyzed patients select objects of interest from a scene displayed on a monitor in real-time by an eye-gaze tracker. The objects of interest are detected and tracked by using SURF features between a live video frame and a stored object model.
- Library assistant robot** Oct 2015 – Dec 2015
- Built a Turtlebot based, library assistant robot, that helps a user search and identify a particular book in the library. The robot plans its path and then navigates by avoiding obstacles and after reaching its destination reads the QR-codes of the items stacked in front of it. It then identifies the item the user wanted and highlights it by using a projector (using a projection mapping technique).

GRADUATE COURSEWORK

Interactive Robot Learning	Advanced Computer Vision
Statistical Techniques for Robotics	Computational Photography
Mathematical Foundations for ML	PDEs for Image Processing and CV
Statistical Machine Learning	Digital Image Processing
Control of Robotic Systems	Linear Systems and Control

TECHNICAL SKILLS

Languages: Python, C/C++
Developer Tools: Git, Docker, VS Code, Visual Studio, PyCharm
Libraries/Packages: NumPy, Scipy, Matplotlib, Pandas, Jupyter, OpenCV, ROS, MATLAB
Neural Network Libraries: Tensorflow, Pytorch
Physics Libraries: Bullet, Dart
Robots: UR10, TurtleBot

VOLUNTEERING/ LEADERSHIP

Gamma Beta Phi
Head of Spider Electronics, R&D club
Overall Coordinator, EEE Association