Ninad Khargonkar

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# Education

2019 - Present: **University of Texas at Dallas**, *Ph.D. in Computer Science* - [Intelligent Robotics and Vision Lab](https://labs.utdallas.edu/irvl/)

2017 - 2019: **University of Massachusetts, Amherst**, *M.S in Computer Science*

2013 - 2017: **Indian Institute of Technology (IIT) Kanpur**, *B.S. in Mathematics and Scientific Computing*

# Work Experience

## Machine Learning/AI Internship – *Covariant.ai*

Jan 2024 - May 2024 | Emeryville, CA

* Worked as a researcher in problem domain of AI-based robotics for warehousing and logistics operations
* Explored generative models like VAE and Latent Diffusion for robot grasp generation from real-world inputs
* Building robot foundation models that can deal with multi-modal inputs like text and images

## Research and Development Internship – *Kitware Inc.*

Jun 2022 - Aug 2022 | Remote

* Researched machine learning algorithms for approximating medial skeleton of point clouds & voxels
* Implemented UNet based segmentation models for skeletonizing 2D images and adapted them for 3D setting
* Demonstrated improved results via point-cloud skeletonization on data from hippocampi and leaflet regions

## Graduate Research Assistant – *University of Texas at Dallas*

Aug 2019 - Present | Dallas, TX

* Researcher in Intelligent Robotics & Vision Lab, working on robot grasping, 3D vision and learning from humans
* Concurrent research on interactive perception for unseen object segmentation in cluttered environments
* Prior work on submodular information measures for machine learning problems in data selection & active learning
* Involved in mentoring students, working as a teaching assistant and taking guest lectures in selected courses

## Mitacs Globalink Research Internship – *University of Manitoba, Winnipeg*

May 2016 - Jul 2016 | Winnipeg, Canada

* Studied the problem of graph sampling and extracting relevant statistics like clustering coefficient
* Implemented scale-down sampling with like Metropolis-Hastings and Jump random walks in R
* Statistical models like ERGM were used for producing model fits and simulating random networks
* Worked on second project for simulating team performance and biases in a football tournament structure

# Technical Skills

**Programming Languages:** Python, C/C++, R

**Frameworks/Libraries:** PyTorch, ROS, CUDA, IsaacGym, Unity, OpenGL

**Development Tools:** Git/GitHub, Docker, VS Code, Vim, Tmux, LaTeX, Pandoc

# Research Projects

**Interactive Perception** | *Unseen Object Segmentation*

* Leveraging long term robot interaction with objects for real world unseen object segmentation
* Proposed self-supervised data collection method to improved real world segmentation performance
* Extended the method to utilize uncertainty in segmentation for minimizing number of interactions

**Object Manipulation** | *Robust Grasping & Skill Transfer*

* Learning a common representation across different robot gripper grasps for efficient skill transfer
* Proposed object contact-based metric learning constraints for effective learning in common space
* Demonstrated applications for human to robot grasp trasnfer via our encoding + retrieval pipeline

**Robot Benchmarking** | *Perception, Grasping & Motion Planning*

* Developed an intuitive method for replicable, real-world scenes of objects for robot benchmarking
* Implemented scene generation pipeline in simulation with focus on cluttered but graspable scenes
* Extened 10 existing methods across pose estimation, segmentation and grasping for real world experiments

**Submodular Information Measures** | *Robust Machine Learning*

* Proposed novel information theoretic measures for submodular set functionsin context for robust machine learning
* Theoretical properties backed up with applications on outlier aware subsets, summarization & clustering tasks
* Follow up works demonstrated computer vision applications in active learning for object detection

# Relevant Publications

1. MultiGripperGrasp: A Dataset for Robotic Grasping from Parallel Jaw Grippers to Dexterous Hands, *In IEEE International Conference on Intelligent Robots and Systems (IROS) 2024*.
2. RISeg: Robot Interactive Object Segmentation via Body Frame-Invariant Features, *In IEEE International Conference on Robotics and Automation (ICRA) 2024*.
3. SceneReplica: Benchmarking Real-World Robot Manipulation by Creating Replicable Scenes, *In IEEE International Conference on Robotics and Automation (ICRA) 2024*.
4. CIS2VR: CNN-based Indoor Scan to VR Environment Authoring Framework, *In IEEE International Conference on AI & extended and Virtual Reality (AIxVR) 2024*.
5. Self-Supervised Unseen Object Instance Segmentation via Long-Term Robot Interaction. *In Robotics: Science and Systems (RSS), 2023*.
6. Skeletal Point Representations with Geometric Deep Learning. *In IEEE International Symposium on Biomedical Imaging (ISBI), 2023.*
7. NeuralGrasps: Learning Implicit Representations for Grasps of Multiple Robotic Hands. *In Conference on Robot Learning (CoRL), 2022.*
8. Virtepex: Virtual Remote Tele-Physical Examination System. *In ACM SIGCHI Conference on Designing Interactive Systems (DIS), 2022.*
9. Submodular combinatorial information measures with applications in machine learning. *In International Conference on Algorithmic Learning Theory (ALT), 2021.*

# Other Experience

**Professional Service:**

* Reviewer for CoRL, ICRA, IROS, IEEE VR, ACM MM, ICMR, ICHI
* Workshop organizer for [Workshop for Neural Representation Learning for Robot Manipulation](https://neurl-rmw.github.io/) at CoRL 2023

**Teaching Assistant:** Machine Learning, Robotics, Computer Graphics, NLP, Statistics for Data Science

**Mentorship:** Peer mentor for new PhD students at UT-Dallas and member of Counselling Service at IIT Kanpur

# Achievements & Awards

* Awarded the competitive IEEE RAS Travel Grant and UTD Graduate Student Assembly travel award.
* Recipient of Inspire scholarship awarded by Govt. of India for academic performance at IIT Kanpur.
* Awarded the Mitacs Globalink scholarship for summer research internship in Canada.
* Secured a percentile score of 97.7 in JEE (Advanced)-2013 and a percentile score of 99.8 in JEE (Main)-2013 national engineering entrance examinations.