

# NINAD KHARGONKAR

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## EDUCATION

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2019 - Present: **University of Texas at Dallas**, *Ph.D. in Computer Science - Intelligent Robotics and Vision Lab*

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

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### **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

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**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

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### **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

### **Robot 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 transfer via our encoding + retrieval pipeline

### **Replicable 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
- Extended 10 existing methods across pose estimation, segmentation and grasping for real world experiments

### **Submodular Information Measures** | *Machine Learning*

- Proposed novel information theoretic measures for submodular set functions in 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

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

## OTHER EXPERIENCE

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### **Professional Service:**

- Reviewer for CoRL, ICRA, IROS, IEEE VR, ACM MM, ICMR, ICHI
- Organizing committee member: [Workshop for Neural Representation Learning for Robot Manipulation](#) at CoRL'23

**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

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- Awarded the competitive IEEE RAS Travel Grant for ICRA 2024 in Japan.
- UT Dallas Graduate Student Assembly travel award for paper presentation.
- Awarded the Mitacs Globalink scholarship for summer research internship in Canada.
- Recipient of Inspire scholarship awarded by Govt. of India for academic performance at IIT Kanpur.
- Secured a percentile score of 97.7 in JEE (Advanced)-2013 and 99.8 in JEE (Main)-2013 national engineering entrance examinations.