

NINAD KHARGONKAR

Site: kninad.github.io | GitHub: [kninad](https://github.com/kninad) | Email: ninadk.uta@gmail.com | LinkedIn: linkedin.com/in/kninad

EDUCATION

2019 - 2024: **University of Texas at Dallas** - *Ph.D. in Computer Science*

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

Research and Development Internship

Jun 2022 - Aug 2022: *Kitware Inc*

- 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

Aug 2019 - Present: *University of Texas at Dallas*

- 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

May 2016 - Jul 2016: *University of Manitoba, Winnipeg*

- 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, Unity, OpenCV, CUDA, 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

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 transfer via our encoding + retrieval pipeline

Scan to VR | *Virtual World Reconstruction*

- Working on the problem of efficient and robust 3D object retrieval from a RGB-D scan of indoor environment

- Implemented a pipeline to convert 3D scans to virtual Unity scenes by fetching closest matching CAD models

Submodular Information Measures | *Robust 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
- Proposed measures have also demonstrated use case for computer vision in active learning for object detection

Virteplex | *Remote Strength Assessment*

- Design and development of a mixed reality system in Unity for Kinect-based force estimation of body movements
- Utilized Kinect to track body joints and an inverse dynamics solver to infer force/torque estimates for an user
- User studies with subject matter experts showed the benefit of using a contact-less estimation method v/s telehealth

PUBLICATIONS

1. Self-Supervised Unseen Object Instance Segmentation via Long-Term Robot Interaction. (*In Submission, arXiv: 2302.03793*).
2. Skeletal Point Representations with Geometric Deep Learning. *In IEEE International Symposium on Biomedical Imaging (ISBI), 2023.*
3. NeuralGrasps: Learning Implicit Representations for Grasps of Multiple Robotic Hands. *In Conference on Robot Learning (CoRL), Proceedings of Machine Learning Research (PMLR), 2022.*
4. Virteplex: Virtual Remote Tele-Physical Examination System. *In ACM SIGCHI Conference on Designing Interactive Systems (DIS), 2022.*
5. Generalized submodular information measures: Theoretical properties, examples, optimization algorithms, and applications. *In IEEE Transactions on Information Theory Journal, 2021.*
6. Submodular combinatorial information measures with applications in machine learning. *In International Conference on Algorithmic Learning Theory (ALT), Proceedings of Machine Learning Research (PMLR), 2021.*

OTHER EXPERIENCE

Professional Service: ICRA'22, IROS'22, ICMR'22, ICHI'22, IEEE VR'21, ACM MM'21, IJCAI'20 (external reviewer)

Teaching Assistant: Machine Learning, Robotics, Statistical Methods, Graphics, Natural Language Processing

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

COURSE PROJECTS

Faster Inference for Chow-Liu Trees | *Machine Learning*

- Developed approximation algorithms for faster inference in Chow-Liu tree probabilistic graphical model
- Tried out sub-quadratic variants for minimum weight spanning tree computation & compared with optimal setting

Data Subset Selection | *Optimization Algorithms*

- Framed subset selection from training data as an optimization problem with minimal impact on validation loss
- Utilized gradient approximation scheme to show utility on logistic regression and neural network models

Part of Speech Tagger for Hindi | *Natural Language Processing*

- Designed a machine learning method for a Hindi PoS tagger by leveraging word embeddings and an English tagger
- Showed performance gain of 12% on domain classification of Hindi docs when using inferred PoS labels

Marching Cubes based Reconstruction | *Computer Graphics*

- Implemented a base version of marching cubes algorithm for 3D iso-surface extraction using OpenGL and C++
- Improved initial results via better representation for vertex normal by averaging over faces for a vertex

ACADEMIC ACHIEVEMENTS

- Recipient of Inspire scholarship awarded by Indian Govt. for academic performance at IIT Kanpur.
- Awarded the Mitacs Globalink scholarship for fully funded 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.