Ninad Arun Khargonkar

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Objective

My research interests lie at the intersection of computer vision & robotics with problems in robot manipulation, learning from humans, object segmentation, and 3D understanding. I am interested in applying my research and development skills to cross-domain problems and real-world applications.

Education

University of Texas at Dallas — Richardson, TX
Doctor of Philosophy (Ph.D.) in Computer Science — *Aug. 2019 – May 2024*

University of Massachusetts, Amherst — Amherst, MA
Master of Science (M.S) in Computer Science — *Aug. 2017 – May 2019*

Indian Institute of Technology (IIT), Kanpur — Kanpur, India
Bachelor of Science (B.S) in Mathematics & Scientific Computing — *Jul. 2013 – Jun. 2017*

Experience

Research & Development Internship — Jun. 2022 – Aug. 2022
Kitware Inc — *Remote*

- Researched machine learning algorithms for approximating medial skeleton of 3D point clouds & voxels
- Implemented existing UNet based models for skeletonizing 2D images and adapted them for 3D images
- Demonstrated improved results from the proposed pipeline on 3D medical data from hippocampi and leaflet regions. Prepared technical report for submission to IEEE ISBI

Graduate Research Assistant — Aug. 2019 – Present
University of Texas at Dallas — *Richardson, TX*

- Research in Intelligent Robotics & Vision Lab on robot grasping, 3D vision and learning from humans
- Concurrent research on interactive perception for unseen object segmentation in cluttered environments
- Designed novel submodular information measures for data selection, active learning and summarization
- Implemented an exergaming system in Unity for remote strength assessment with Kinect RGB-D sensor

Mitacs Globalink Research Internship — May 2016 – Jul. 2016
University of Manitoba — *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

Skills

Programming Languages: Python, C++, C#, R, Java, HTML/CSS
Frameworks/Libraries: PyTorch, ROS, Unity, OpenCV, CUDA, OpenGL
Development Tools: Git, GitHub, Docker, VsCode, Vim, Tmux, Pandoc, LaTeX
Teaching: Teaching Assistant for Statistical Methods, Machine Learning, Robotics, NLP, Graphics, Digital Logic
Mentoring: Advising junior PhD students and mentoring two undergraduates on a directed research project
Coursework: Machine Learning, Computer Vision, Robotics, Deep Learning, Graphics, Optimization

PROJECTS

Faster Inference for Chow-Liu Trees | *Python, Numpy* Machine Learning

- Developed approximation algorithms for faster inference in Chow-Liu tree probabilistic graphical model
- Focused on trying out sub-quadratic time variants for minimum weight spanning tree computation
- Proposed approximations demonstrated competitive results against the optimal setting

Data Subset Selection | *C++, Python, PyTorch* Optimization Algorithms

- Studied optimization problem of training data subset selection 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 | *Python, nltk* Natural Language Processing

- Designed a semi-supervised method for a Hindi PoS tagger by leveraging an existing English tagger
- FastText word embeddings and a parallel corpus between the 2 languages were used for method
- Showed performance gain of 12% on domain classification of Hindi docs by using inferred PoS labels

Marching Cubes | *C++, OpenGL* Computer Graphics

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

PUBLICATIONS

NeuralGrasps: Learning Implicit Representations for Grasps of Multiple Robotic Hands. In Conference on Robot Learning (CoRL), Proceedings of Machine Learning Research (PMLR), 2022.

Virtepex: Virtual Remote Tele-Physical Examination System. In ACM SIGCHI Conference on Designing Interactive Systems (DIS), 2022.

Generalized submodular information measures: Theoretical properties, examples, optimization algorithms, and applications. In IEEE Transactions on Information Theory Journal, 2021.

Submodular combinatorial information measures with applications in machine learning. In International Conference on Algorithmic Learning Theory (ALT), Proceedings of Machine Learning Research (PMLR), 2021.

PROFESSIONAL SERVICE

2022: IROS, ICMR, ICHI, ACM MM
2021: IEEE VR, ACM MM
2020: IJCAI (external reviewer)

AWARDS & ACTIVITIES

- 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
- Mentored freshmen and organized workshops as a Student Guide in Counselling Service of IIT Kanpur
- 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

EXTRACURRICULAR

Football: Playing on indoor court/turf and active interest in Fantasy Premier League
Blogging: Writing about best practices and interesting topics from technical/personal domains
Project Euler: Occasionally solving math problems, sometimes in a new programming language