Vinit Sarode

Research Scholar - RI, CMU

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EDUCATION

Visvesvaraya National Institute of Technology **Nagpur, India**
Bachelors of Technology in Mechanical Engineering (CGPA: 8.51/10) *July'14 - May'18*

RESEARCH INTERESTS

Computer Vision | Deep Learning | Point Cloud Registration | Pose Estimation | 3D Reconstruction | Medical Image Segmentation | Reinforcement Learning | Domain Generalization.

KEY SKILLS

Programming: Python, PyTorch, TensorFlow, Keras, Cuda, C++, Java, MATLAB, ROS, Keras
Software: Git, Pybullet, Gazebo, V-REP, Simulink, SolidWorks, CATIA

RESEARCH EXPERIENCE

Research Associate
June'18 - Present

with Prof. Howie Choset at Biorobotics Lab, Carnegie Mellon University (CMU) [*link*]

3D Point Cloud Registration (Alignment)

- Designed a point cloud registration network that is robust to noise and an inlier points estimation network for the registration of occluded point clouds.
- Demonstrated correspondences as a robust parameter through the improvements in existing registration networks. Retrained them with a new loss based on correspondences.

Multi-Class Ultrasound Segmentation for Arteries, Veins & Nerves

- Contributed on the blood vessel segmentation for RoboTRAC project that focuses on robot-guided needle insertion for trauma care of soldiers.
- Developed a novel automatic pipeline for robotic control of ultrasound image acquisition, 3D reconstruction, and subsequent planning for needle insertion.

Reinforcement Learning

- Used variational auto-encoders to overcome the dimensionality problems for the use of images in augmented random search policies.
- Simulated the autonomous maneuvering of surgical snake robot through intubation tube using Deep Q-Network in Gazebo simulator that uses camera for the feedback.

Undergraduate Researcher
Aug'17 - May'18

with Prof. Shital Chiddarwar at IvLabs, Visvesvaraya National Institute of Technology, Nagpur [*link*]

- Developed a Self Re-configurable Transformer Robot that consists of multiple snake robots having capability to reconfigure in legged robots such as biped and quadruped.
- Focused on the part of localization of snake robots using the visual markers attached to them. Implemented marker detection and its pose estimation algorithms.

Research Intern
June'17 - Aug'17

with Prof. Calogero Oddo at The Biorobotics Institute, Scuola Superiore SantAnna, Italy [*link*]

- Designed a compliant anthropomimectic robotic arm based on pneumatic muscles to achieve human-like cognitive characteristics through sensory-actuation control.
- Developed a low-cost 3D printed tactile sensor and performed the analysis of its force data acquired using LabVIEW Rio Evaluation Kit.

PROJECTS

Learning3D: A Modern Library for Deep Learning on 3D Point Clouds Data [*code*]   *Feb'20 - Present*
- Developed an open source library that contains reference codes and pre-trained models of different research work under a single large codebase in the domain of deep learning for point clouds.
- Developed with an intention for easy code replicability and to support the development of deep learning algorithms on top of the existing state-of-art research work on point clouds.

Implementation of Augmented Random Search Algorithm on Bipedal-Walker [*code*]   *Oct'19 - Dec'19*
- Studied augmented random search (ARS) paper and implemented the algorithm with the BipedalWalker-v2 environment provided as a baseline by OpenAI.
- Achieved comparable results with the paper and ranked 3rd on OpenAI's leader-board for BipedalWalker-v2.

Globally Optimal Registration of Noisy Point Clouds [*code*]   *Nov'18 - Jan'19*
- Studied the mathematical formulation of mixed integer programming-based approach for globally optimal registration algorithm developed by the graduate student at the Biorobotics Lab.
- Implemented the algorithm using C++ programming language and the Gurobi Optimizer library to improve the computational speed as compared to the original python implementation.

Bipedal Robot [*link*]   *Nov'16 - May'17*
- Simulated a static walking gait cycle for an eight degree of freedom bipedal robot on Simulink simulator in MATLAB.
- Developed a working prototype of the bipedal robot and successfully replicated the simulation results with the implementation of the walking gait cycle on the real hardware.

PUBLICATIONS

MaskNet: A Fully-Convolutional Network to Estimate Inlier Points   *2020*
Vinit Sarode*, Animesh Dhagat*, Arun Srivatsan, Nico Zevallos, Simon Lucey, Howie Choset | [*link*] [*code*]
In Proceedings of IEEE International Conference on 3D Vision (3DV)

Correspondence Matrices are Underrated   *2020*
Tejas Zodage, Rahul Chakwate, **Vinit Sarode**, *Arun Srivatsan, Howie Choset |* [*link*] [*code*]
In Proceedings of IEEE International Conference on 3D Vision (3DV)

A Study of Domain Generalization on Ultrasound-based Multi-Class Segmentation   *2020*
Edward Chen, Tejas Mathai, **Vinit Sarode**, *Howie Choset, John Galeotti |* [*link*]
In Proceedings of Machine Learning for Health, NeurIPS

**Multi-Class Bayesian Segmentation of Robotically Acquired Ultrasound Enabling
3D Site Selection for Planning Safer Needle Insertion**   *2020*
Edward Chen, Abhimanyu, **Vinit Sarode**, *Howie Choset, John Galeotti*
Under review at IEEE International Conference on Robotics and Automation (ICRA)

One Framework to Register Them All: PointNet Encoding for Point Cloud Alignment   *2019*
Vinit Sarode*, X. Li*, H. Goforth, Y. Aoki, A. Dhagat, R. A. Srivatsan, Simon Lucey, Howie Choset | [*link*] [*code*]
arXiv preprint arXiv:1912.05766

PCRNet: Point Cloud Registration Network using PointNet Encoding   *2019*
Vinit Sarode*, Xueqian Li*, H. Goforth, Y. Aoki, R. A. Srivatsan, Simon Lucey, Howie Choset | [*link*] [*code*]
arXiv preprint arXiv:1908.07906

Self-Reconfigurable Transformer Robot   *2018*
S. Agrawal, S. Addepalli, **Vinit Sarode**, *Y. Phalak, R. Deotalu, R. Thakkar, Shital Chiddarwar |* [*link*]
Poster presentation at International Conference on Robotics and Automation (ICRA).

ACADEMIC SERVICE

- Reviewer for Conferences: IEEE ICRA 2021, IEEE RA-L 2020, Virtual Reality & Intelligent Hardware 2020