Haresh Karnan

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Education

The University of Texas at Austin
Austin , TX, USA

PhD in Mechanical Engineering (Robotics Portfolio Program) *August. 2018 - May 2022 (Tentative)*

- Graduate Courses : Reinforcement Learning, Autonomous Robots, Deep Learning, Machine Learning.
- Advised by Dr. Peter Stone, Learning Agents Research Group.
- Research Area : Deep Reinforcement Learning, Sim-to-Real, Computer Vision, Robotics.

Texas A&M University
College Station, TX, USA

MS. in Aerospace Engineering, Dynamics and Control *August. 2016 - July. 2018*

- Graduate Courses : Artificial Intelligence, Estimation Theory, Optimal Control, Pattern Recognition, Probabilistic Robotics.

National Institute of Technology, Tiruchirappalli
Tiruchirappalli, TN, India

B.Tech. in Instrumentation and Control Engineering *June. 2012 - July. 2016*

- Undergraduate Courses : Computer Vision, Data Structures and Algorithms, Linear Control, Neural Networks, Sensors and Instrumentation.

Work Experience

Amazon DEX Robotics (Amazon Scout)
Austin, TX, USA

Applied Scientist Intern *May. 2020 - Aug. 2020*

- Worked on Deep Learning and Computer Vision techniques to improve localization accuracy of Amazon's Scout package delivery robots.
- Benchmarked Deep Learning based Keypoint extraction algorithms for robot localization in the real world.
- Achieved over 55% improvement in pose estimation accuracy by implementing hierarchical visual 3D localization in unstructured environments.

Amazon DEX Robotics (Amazon Scout)
Seattle, WA, USA

Applied Scientist Intern *May. 2019 - Aug. 2019*

- Applied Generative Adversarial Training to extract low level semantic image features for monocular robot localization in sidewalks.
- Improved transfer from Simulation to Real world by applying Domain Randomization techniques.
- Benchmarked our novel approach with existing visual localization pipelines and achieved 30% improvement in localization accuracy.
- Submitted as a patent to the US Patent Office.

Projects

Active member of UT Austin's RoboCup@Home team - AustinVilla@Home *Jan. 2019 - Present*

- Worked on Toyota's HSR robot to solve service robot tasks and participated in RoboCup 2019 @ Sydney, Australia.
- Implemented "Take out the Trash" task to perform autonomous cleanup of an indoor environment by the HSR. **[Video]**
- Trained object detection and segmentation networks to identify objects, build a semantic map and solve interactive tasks.
- Implemented object re-identification using Triplet loss based metric learning for robust person tracking and following.

Member of UT Austin's RoboCup Standard Platform League - RoboSoccer team - UTAustinVilla *Sep. 2019 - Present*

- Worked on the Sim-to-Real problem of transferring a walk policy from Simulation to a Real world NAO humanoid robot.
- Modelled real world transitions as a stochastic MDP and used action transformation for modifying the Simulator.
- Successfully transferred a bipedal robot walk policy to walk on a bumpy terrain. **[Video]**

Publications & Patent

Neural Information Processing Systems (NeurIPS) *Areas : [RL, Imitation Learning, Sim-to-Real, Robotics]*

- "An Imitation from Observation Approach to Transfer Learning with Dynamics Mismatch", Haresh Karnan, et al., Neural Information Processing Systems, 2020. **[Paper]**

International Conference on Intelligent Robots and Systems (IROS) *Areas : [RL, Sim-to-Real, Vision, Robotics]*

- "Stochastic Grounded Action Transformation for Robot Learning in Simulation", Haresh Karnan, Peter Stone, et al., IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) , 2020. **[Paper]**
- "Reinforced Grounded Action Transformation for Sim-to-Real Transfer", Haresh Karnan, Peter Stone, et al., IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) , 2020. **[Paper]**
- "Visual Feedback Control of Tensegrity Robotic Systems", Haresh Karnan, Robert Skelton, et al., IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) , 2017. **[Paper]**

AAAI - Human Robot Interaction Workshop (AI-HRI) *Areas : [Systems Integration, Deep Learning, Vision, Robotics]*

- "Solving Service Robot Tasks: UT Austin Villa@Home 2019 Team Report", Haresh Karnan, Peter Stone, et.al. AAAI Workshop AI-HRI 2019. **[Paper]**

RSS - Sim-to-Real workshop *Areas : [Transfer Learning, Robotics, Sim-to-Real]*

- "An Imitation from Observation approach to Sim-to-Real transfer", Haresh Karnan, Peter Stone, et al. Robotics: Science and Systems 2020. **[Paper]**

Patent (Submitted)

- Visual feature extraction for delivery robot localization in sidewalks (work done as an intern at Amazon Scout).

Skills

- Languages : C++, Python, Matlab, Arduino Language
- Libraries : OpenCV, PyTorch, Pytorch-Lightning, ROS, Keras (Tensorflow), scikit-learn
- Software : MuJoCo, Gazebo, Git, CMake, COLMAP