Arpit Agarwal

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RESEARCH INTEREST Tactile sensing, Robotics Simulation and robotic control

INDUSTRIAL EXPERIENCE

Nvidia, Project Isaac — Pittsburgh, Pennsylvania

AI/ Robotics Engineer — Jul 2018 – Aug 2019

- Part of Isaac SDK Project[link], collection of tools for next-generation robots with computer vision, manipulation and navigation capabilities.
- Focused on developing dynamic control algorithms for legged locomotion and 7-dof articulated robot arms.

Intel, Data Center AI — Santa Clara, California

Rendering Research Internship — May 2023 – Aug 2023

- Part of GPU research group on advanced graphics
- Focused on applying machine learning techniques to physics-based rendering

EDUCATION

Carnegie Mellon University, School of Computer Science — Pittsburgh, Pennsylvania

PhD in Robotics Engineering — 2019 – Ongoing

- Focus : Computer simulation of light in vision based tactile sensing; Computer Graphics
- Build simulation pipeline for vision-based tactile sensors using physics-based light transport simulation
- Experience with Mitsuba(0.6, 2.0, 3.0) framework and cuda backend
- Have experience with Nvidia Optix 7.0 raytracing API and Vulkan
- Have experience in modelling and characterizing appearance models(BRDF) of metal pigments in real world using computational imaging

Carnegie Mellon University, School of Computer Science — Pittsburgh, Pennsylvania

M.S. in Robotics Engineering — Aug 2016 – Jul 2018

- Cumulative GPA: 4.04 / 4.0
- **Masters Thesis**: Deep Reinforcement Learning with Skill Library: Exploring with Temporal Abstractions and coarse approximate Dynamics Models [pdf]
- Courses Taken: Planning, Reinforcement Learning, Computer vision, Machine learning(PhD), KDC.

Indian Institute of Technology Kanpur — Kanpur, India

B.Tech. in Electrical Engineering — Jun 2012 – May 2016

- Cumulative GPA: 3.44 / 4.00

PUBLICATIONS

- Robotic Defect Inspection with Visual and Tactile Perception for Large-scale Components [Pre-print]
  International Conference on Intelligent Robots and Systems 2023
  Arpit Agarwal, Abhiroop Ajith[2], Chengtao Wen[2], Veniamin Stryzheus[3], Brian Miller[3], Matthew Chen[3], Micah K. Johnson[4], Jose Luis Susa Rincon[2], Justinian Rosca[2] and Wenzhen Yuan
  Affiliations: 2 - Siemens Corporations, 3 - Boeing, 4 - GelSight Inc.
- Simulation of Vision-based Tactile Sensors using Physics based Rendering [IEEE Xplore]
  International Conference on Robotics and Automation 2021
  Arpit Agarwal, Timothy Man and Wenzhen Yuan
- Grasp Stability Prediction with Sim-to-Real Transfer from Tactile Sensing [Pre-print]
  International Conference on Intelligent Robots and Systems 2022
  Zilin Si, Zirui Zhu, **Arpit Agarwal**, Stuart Anderson and Wenzhen Yuan
- Improving Grasp Stability with Rotation Measurement from Tactile Sensing [Pre-print]
  International Conference on Intelligent Robots and Systems 2021
  Raj Kolamuri, Zilin Si, Yufan Zhang, **Arpit Agarwal** and Wenzhen Yuan
- Model Learning for Look-ahead Exploration in Continuous Control [Pre-print]
  AAAI Conference on Artificial Intelligence 2019 **(Oral Presentation)**
  Arpit Agarwal, Katharina Muelling and Katerina Fragkiadaki

- Reinforcement Learning of Active Vision for Manipulating Objects under Occlusions[PDF]
  Conference on Robot Learning, 2018
  Ricson Cheng, **Arpit Agarwal** and Katerina Fragkiadaki

RESEARCH EXPERIENCE

Robotics Institute, Carnegie Mellon University

- Graduate Research Student, Computer Science Department — Aug 2016 – Jul 2018
  - **Supervisors**: Prof. Katharina Muelling, Robotics Institute, CMU
    Prof.Katerina Fragkiadaki, Machine Learning Department, CMU
  - Learning hierarchical policies for manipulation in long horizon robotics tasks in simulation and real world tasks.
  - Implementation of simulated environment in Mujoco simulator and experimentation with Trust Region Policy optimization and Guided Policy Search algorithms for objects placed on table-top.
  - Implemented Metric learning based correspondence embedding learning for point feature representation of scene using optical flow
  - Focus: Manipulation, Deep Learning, Perception, Planning

Cornell University

- Graduate Research Scholar, Computer Science Department — May 2015 – Jul 2015
  - **Supervisor**: Ashutosh Saxena, Caspar.ai
  - Learning natural language grounding to robot instructions and user-context aware planning in home settings
  - Focus: Learning, Natural Language Processing, Planning
  - **RaQuel: Robot Query Language**, target robotic language using functional programming contructs for getting information from RoboBrain Demo
  - Focus: Functional programming, cloud robotics, database systems

RELEVANT PROJECTS

Expert guided exploration for Reinforcement learning — Jan 2018 – May 2018

- Developed 2 novel algorithms for exploration using experts advice in Reinforcement Learning for discrete and continuous control problems. The approach is orthogonal to policy learning method in RL.
- Implemented and tested the approach for Frozen-Lake and Four Room discrete state and action space environments
- Integrated DQN and DDPG policy training for continuous state space environments.
- Focus: Deep Reinforcement Learning, Deep Learning, Robotics

Zero Shot Transfer Learning for Robotics — Jan 2017 – May 2017

- Implemented the parallel version of Guided Policy Search algorithm for learning control policies for simulated robotics systems in Mujoco simulator.
- Tested the policy transfer between different simulated for 2-3 DoF robotic arms in 2D plane.
- Focus: Deep Reinforcement Learning, Deep Learning, Robotics

CONFERENCE REFEREEING

IROS 2018, 2019, Humanoids 2018 and ICRA 2018, 2020, 2021

COMPUTING SKILLS

Robots: Kinova **Jaco 2** (7 DoF robotic arm), Ghost Robotics **Minitaur**(4 Legged dynamic UGV), Rethink Robotics **Baxter**(7 DoF manipulator arm)
Deep Learning Frameworks: Tensorflow, PyTorch
Computing Languages: C++, Python, C, ROS, Matlab, OpenCV, PCL
Operating Systems Windows, Linux(Ubuntu)
Utilities Git, LaTeX