Samarth Brahmbhatt

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EDUCATION

Doctor of Philosophy, Robotics (advisor: James Hays, co-advisor: Charles C. Kemp)
School of Interactive Computing, Georgia Institute of Technology, GA — May 2020

Master of Science in Engineering, Robotics (advisor: Kostas Daniilidis)
University of Pennsylvania, PA. — May 2014

Bachelor of Technology, Electronics & Communication Engineering
Nirma University, Ahmedabad, India. — May 2012

REFEREED PUBLICATIONS

1. "Zero-Shot Transfer of Haptics-based Object Insertion Policies" - **Samarth Brahmbhatt**, Ankur Deka, Andrew Spielberg, and Matthias Müller, *International Conference on Robotics and Automation (ICRA) 2023*
2. "PressureVision: Estimating Hand Pressure from a Single RGB Image" - Patrick Grady, Chengcheng Tang, **Samarth Brahmbhatt**, Christopher D. Twigg, Chengde Wan, James Hays, and Charles C. Kemp, *The European Conference on Computer Vision (ECCV) 2022 (oral)*
3. "Visual Pressure Estimation and Control for Soft Robotic Grippers" - Patrick Grady, Jeremy A. Collins, **Samarth Brahmbhatt**, Christopher D. Twigg, Chengcheng Tang, James Hays, and Charles C. Kemp, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2022*
4. "ContactOpt: Optimizing Contact to Improve Grasps" - Patrick Grady, Chengcheng Tang, Minh Vo, Christopher D. Twigg, **Samarth Brahmbhatt**, and Charles C. Kemp, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2021 (oral)*
5. "ContactPose: A Dataset of Grasps with Object Contact and Hand Pose" - **Samarth Brahmbhatt**, Chengcheng Tang, Christopher D. Twigg, Charles C. Kemp, James Hays, *The European Conference on Computer Vision (ECCV) 2020*
6. "Towards Markerless Grasp Capture" - **Samarth Brahmbhatt**, Charles C. Kemp, and James Hays, *Third Workshop on Computer Vision for AR/VR, CVPR 2019*
7. "ContactGrasp: Functional Multi-finger Grasp Synthesis from Contact" - **Samarth Brahmbhatt**, Ankur Handa, James Hays, and Dieter Fox, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2019*
8. "ContactDB: Analyzing and Predicting Grasp Contact via Thermal Imaging" - **Samarth Brahmbhatt**, Cusuh Ham, Charles C. Kemp, James Hays, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2019 (oral, **best paper finalist**)*
9. "MapNet: Geometry-Aware Learning of Maps for Camera Localization" - **Samarth Brahmbhatt**, Jinwei Gu, Kihwan Kim, James Hays, Jan Kautz, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2018 (spotlight)*
10. "DeepNav: Learning to Navigate Large Cities" - **Samarth Brahmbhatt**, James Hays, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2017*
11. "StuffNet: Using 'Stuff' to Improve Object Detection" - **Samarth Brahmbhatt**, Henrik Christensen and James Hays, *IEEE Winter Conference on Applications of Computer Vision (WACV) 2017*
12. "Occlusion-Aware Object Localization, Segmentation and Pose Estimation" - **Samarth Brahmbhatt**, Heni Ben Amor and Henrik Christensen, *British Machine Vision Conference (BMVC) 2015*

13. "Single Image 3D Object Detection and Pose Estimation for Grasping" - Menglong Zhu, Kosta Derpanis, Yinfei Yang, **Samarth Brahmbhatt**, Mabel Zhang, Cody Phillips and Kostas Daniilidis, *IEEE International Conference on Robotics and Automation (ICRA) 2014*
14. "RoboCup 2013 Humanoid Kidsize League Winner" - Daniel D. Lee, Seung-Joon Yi, Stephen McGill, Yida Zhang, Larry Vadakedathu, **Samarth Brahmbhatt**, Richa Agrawal and Vibhavari Dasagi, *RoboCup 2013: Robot World Cup XVII, Springer Berlin Heidelberg 2014*
15. "Practical OpenCV" - **Samarth Brahmbhatt**, *book published by Apress Media LLC*

INVITED TALKS

1. "Learning Compliant Object Insertion" - Nirma University, 5 August 2022
2. "Learning Compliant Object Insertion" - CyPhySS 2022, IISc Bangalore Robert Bosch Centre for Cyber Physical Systems, 29 July 2022
3. "Contact-Rich Manipulation by Humans and Robots" - Department of Computational and Data Sciences, IISc Bangalore, 28 July 2022
4. "Contact-Rich Manipulation by Humans and Robots" - Department of Computer Science and Engineering, IIT Gandhinagar, 27 July 2022
5. "6-part lecture series on Computer Vision, Machine Learning, and Robotics" - Nirma University, June-July 2021
6. "Sim-to-Real Robot Learning" - Symbiosis Institute of Technology, 16 May 2021
7. "Contact-Centric Grasping Behavior" - Guest lecture at the Robotic Caregivers: From Dreams to Reality Spring 2020 course at Georgia Tech.
8. "Hand-Object Contact" - University of Toronto People, AI, & Robots Research Group, March 2021
9. "Hand-Object Contact During Grasping: Capture, Analysis, and Applications" - CVPR 2020 Doctoral Consortium, June 2020
10. "A Contact-Centric Understanding of our Functional Grasping Behavior" - Guest Lecture in Georgia Tech BMED 8813 course on robotic caregivers, Spring 2020
11. "A Contact-Centric Understanding of our Functional Grasping Behavior" - Stanford Vision and Learning Lab, Stanford CA USA 23 March 2020
12. "A Contact-Centric Understanding of our Functional Grasping Behavior" - Facebook AI Research, Pittsburgh PA USA 28 February 2020
13. "A Contact-Centric Understanding of our Functional Grasping Behavior" - Facebook Reality Labs, Redmond WA USA 26 February 2020
14. "A Contact-Centric Understanding of our Functional Grasping Behavior" - Amazon Robotics & AI, Seattle WA USA 24 February 2020

WORK EXPERIENCE

Intel Labs May 2022 - present
Research Scientist
Reinforcement learning for contact-rich robot manipulation (Pub. 1), navigation, and locomotion.

Intel Labs July 2020 - April 2022
Postdoctoral Researcher with Matthias Müller and Vladlen Koltun

- Reinforcement learning for contact-rich robot manipulation (Pub. 1), navigation, and locomotion.
- RGB image-based prediction of hand-object pose (Pub. 4) and contact pressure (Pub. 2), as well as soft robot gripper contact pressure (Pub. 3).

Institute for Robotics and Intelligent Machines, Georgia Tech Fall 2014 - Spring 2020
Graduate Research Assistant, advisor: James Hays, co-advisor: Charles C. Kemp

- Understanding functional grasps of household objects, focusing on hand-object contact and hand pose (Pubs. 5 to 8)
- Learning to navigate large cities using Convolutional Neural Networks (CNNs) (Pub. 10)
- Panoptic segmentation as a local context signal to improve object detection (Pub. 11)
- Detection and 3D pose estimation of partially occluded objects (Pub. 12)

Facebook Reality Labs, Sausalito, CA Summer 2019
Research Intern, advisors: Chengcheng Tang and Chris Twigg
Creating a large and diverse dataset of paired 3D hand pose, object pose, hand-object contact and multi-view RGB-D images. Deep learning experiments for the novel task of hand-object contact prediction (Pub 5).

NVIDIA Research, Seattle Summer 2018
Robotics Research Intern, advisors: Ankur Handa and Dieter Fox
Synthesizing functional human-like grasps for diverse robotic end-effectors, from human demonstrations of hand-object contact (Pub 7).

NVIDIA Research, Santa Clara Summer 2017
Research Intern, advisors: Jinwei Gu and Kihwan Kim
Deep learning for image-based camera localization: proposed novel algorithms to use geometric constraints between images and to make use of large amounts of unlabelled data through semi-supervised learning (Pub. 9).

Dextro, Inc. New York City Summer 2015
Intern, advisor: Sanchit Arora
Panoptic segmentation as a local context signal to improve object detection (Pub. 11)

GRASP Laboratory, *University of Pennsylvania* Spring 2013 - Spring 2014
Research Assistant with Kostas Daniilidis and Daniel Lee
- Detection, 6-DOF pose estimation, and PR2 robot grasping of objects in clutter from a single RGB image (Pub. 13, wiki)
- Particle filter localization and player-goalkeeper communication for direction disambiguation for the Robocup 2013 humanoid robot football competition winning team (Pub. 14, wiki)
- High-performance inference code for "Active Deformable Part Models" - Zhu et. al., ECCV 2014
- Detecting partially occluded objects in RGB images (Masters' thesis)

School of Engineering and Applied Sciences, *University of Pennsylvania* Fall 2013
Teaching Assistant
- MEAM 510: Design of Mechatronic Systems
- MEAM 520: Introduction to Robotics

SERVICE

- Nirma University Alumni Sponsored Lab: Started a robotics and computer vision lab at my undergraduate university by collaborating with other alumni and department faculty. Involved fundraising, student mentoring, and organization building.
- Delivered a 6-part lecture series on computer vision, machine learning, and robotics at my undergraduate university consisting of lectures and homework notebooks.
- Regularly review for CVPR (outstanding reviewer 2019), RSS, ECCV, ICRA, IROS, BMVC, WACV, T-PAMI, and RA-L.
- RoboGrads: VP Academics (2017), VP PhD Robotics Program (2018)
- Asha for Education: Ran the Atlanta half-marathon thrice to raise funds, coached the running group twice

SELECTED COURSEWORK

Learning in Robotics (UPenn ESE 650) Spring 2013
- RGB-D point-cloud registration for 3D mapping (wiki)
- Planar Simultaneous Localization and Mapping using a particle filter (wiki)
- Image panoramas using 3-DOF orientation tracking by an Unscented Kalman Filter (wiki)
- Path planning in aerial photographs using imitation learning (wiki)
- Probabilistic color image segmentation using Gaussian Mixture Models (wiki)

Computer Vision and Computational Photography (UPenn CIS 581) Fall 2013
- Logo replacement using Shape Context feature matching (wiki)
- Panoramas by Corner appearance feature matching (wiki)
- Image Morphing by Thin Plate Splines (wiki)

Machine Perception (UPenn CIS 580) Spring 2013
- Image stitching using vanishing points and matching points (wiki)
- Logo warping using perspective transforms (wiki)

Intro to Parallel Programming (Udacity Online Course) Summer 2014
- Tone mapping using histogram equalization
- Poisson blending of masked images

COMPUTER SKILLS

- Programming Languages: C++, Python
- Libraries and Tools: MuJoCo, PyTorch, TF-Agents, Unity ML Agents, ROS, GTSAM, OpenCV