

# Samarth Brahmbhatt

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## EDUCATION

*Doctor of Philosophy*, Robotics (advisor: [James Hays](#))

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

## PUBLICATIONS

1. “[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*
2. “[Towards Markerless Grasp Capture](#)” - **Samarth Brahmbhatt**, Charles C. Kemp, and James Hays, *Third Workshop on Computer Vision for AR/VR, CVPR 2019*
3. “[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*
4. “[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)*
5. “[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)*
6. “[DeepNav: Learning to Navigate Large Cities](#)” - **Samarth Brahmbhatt**, James Hays, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2017*
7. “[StuffNet: Using ‘Stuff’ to Improve Object Detection](#)” - **Samarth Brahmbhatt**, Henrik Christensen and James Hays, *IEEE Winter Conference on Applications of Computer Vision (WACV) 2017*
8. “[Occlusion-Aware Object Localization, Segmentation and Pose Estimation](#)” - **Samarth Brahmbhatt**, Heni Ben Amor and Henrik Christensen, *British Machine Vision Conference (BMVC) 2015*
9. “[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*
10. “[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*
11. “[Practical OpenCV](#)” - **Samarth Brahmbhatt**, book published by Apress Media LLC

## RESEARCH EXPERIENCE

*Intel Intelligent Systems Lab*  
**Postdoctoral Researcher**

Fall 2020 - present

*Institute for Robotics and Intelligent Machines, Georgia Tech*  
**Graduate Research Assistant**

Fall 2014 - Spring 2020

- Understanding functional grasps of household objects, focusing on hand-object contact and hand pose (Pubs. 1 to 4)
- Learning to navigate large cities using Convolutional Neural Networks (CNNs) (Pub. 6)
- Object detection and semantic segmentation using CNNs (Pub. 7)
- Detection and 3D pose estimation of partially occluded objects (Pub. 8)

*Facebook Reality Labs, Sausalito, CA*

Summer 2019

### **A novel functional grasping dataset, image-based hand-object contact prediction**

Advisors: [Chengcheng Tang](#), [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 1).

*NVIDIA Research, Seattle*

Summer 2018

### **Hand pose optimization for human-guided multi-fingered grasping**

Advisors: [Ankur Handa](#), [Dieter Fox](#)

Synthesizing functional human-like grasps for diverse robotic end-effectors, from human demonstrations of hand-object contact (Pub 3).

*NVIDIA Research, Santa Clara*

Summer 2017

### **Deep Learning for Camera Localization**

Advisors: [Jinwei Gu](#), [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. 5).

*Dextro, Inc. New York City*

Summer 2015

### **Improving CNN-based object localization using local context**

- Implemented a Convolutional Neural Network system for object localization and semantic segmentation (Pub. 7)
- Used semantic segmentation as a local context signal to improve object detection
- Implemented CPU and GPU versions of various required layers in Caffe

*GRASP Laboratory, University of Pennsylvania*

Spring 2014

### **Detecting Partially Occluded Objects in Images (Masters' Thesis)**

- Augmented the DPM object detection algorithm to detect up to 60% occluded objects
- Used HOG features and graph-cuts to segment all pixels inside the bounding box to object/non-object
- Used Structural SVM to train HOG feature and graph edge weights (Pub. 8)

*GRASP Laboratory, University of Pennsylvania*

Summer 2013

### **Detection and 6-DOF pose estimation of objects from a single 2D image**

Helped develop an algorithm to detect objects using their shape and estimate their 6-DOF pose from a single RGB image by matching the outline with a CAD model (Pub. 9). Works in heavily cluttered scenes.

*GRASP Laboratory, University of Pennsylvania*

Spring 2013

### **Robocup 2013 Humanoid Kid-size soccer international competition**

Our team won the Kid-size competition after competing against international teams. I contributed to the particle-filter based localization system and player location disambiguation based on the goalkeeper ball estimate.

## INVITED TALKS

- [Hand-Object Contact During Grasping: Capture, Analysis, and Applications](#) - CVPR 2020 Doctoral Consortium, June 2020
- [A Contact-Centric Understanding of our Functional Grasping Behavior](#) - Guest Lecture in Georgia Tech BMED 8813 course on robotic caregivers, Spring 2020
- “A Contact-Centric Understanding of our Functional Grasping Behavior” - Stanford Vision and Learning Lab, Stanford CA USA 3/23/2020
- “A Contact-Centric Understanding of our Functional Grasping Behavior” - Facebook AI Research, Pittsburgh PA USA 2/28/2020
- “A Contact-Centric Understanding of our Functional Grasping Behavior” - Facebook Reality Labs, Redmond WA USA 2/26/2020
- “A Contact-Centric Understanding of our Functional Grasping Behavior” - Amazon Robotics & AI, Seattle WA USA 2/24/2020

## 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:* [PyTorch](#), [ROS](#), [GTSAM](#), OpenCV, Vim, Git,  $\text{\LaTeX}$

## SERVICE

- Reviewer for: T-PAMI, T-CI, RA-L, BMVC 2020, CVPR 2020, ECCV 2020, IROS 2020, BMVC 2019, CVPR 2019 (outstanding reviewer), RSS 2019, CVPR 2018, IROS 2016, ICRA 2015, IROS 2015
- [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