

# Hanbyul Joo

Ph.D. Candidate  
Robotics Institute, School of Computer Science  
Carnegie Mellon University  
201 Smith Hall, 5000 Forbes Avenue, Pittsburgh, PA 15213

Email: [hanbyulj@cs.cmu.edu](mailto:hanbyulj@cs.cmu.edu)

Web: <http://www.cs.cmu.edu/~hanbyulj>

## EDUCATION

- Ph.D. Candidate** 2012 – May 2018 (*expected*)  
Robotics Institute, Carnegie Mellon University  
Advisor: Prof. Yaser Sheikh  
Thesis: [Measuring and Modeling Kinesic Signals in Social Communication](#)  
Thesis Committee: Yaser Sheikh, Takeo Kanade, Louis-Philippe Morency,  
David Forsyth (UIUC), Mina Cikara (Harvard)
- M.S.** 2009  
Electrical Engineering, KAIST  
Advisor: Prof. In So Kweon  
Thesis: Graph-based Boundary Matching for Deformable Objects
- B.S.** 2007  
Computer Science, KAIST  
*Magna Cum Laude*

## RESEARCH INTEREST

**Measuring the full spectrum of 3D social signals** (facial expressions, hand gestures, and body motions) transmitted during interpersonal social interaction toward **computational behavioral science**, using tools from computer vision, machine learning, computer graphics, and robotics.

## PUBLICATIONS

- "Total Capture: A 3D Deformation Model for Tracking Faces, Hands, and Bodies"  
**Hanbyul Joo**, Tomas Simon, and Yaser Sheikh  
IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018 (**Oral**)  
**CVPR Best Student Paper Award** (of 3,309 submissions)
- "Panoptic Studio: A Massively Multiview System for Social Interaction Capture"  
**Hanbyul Joo**, Tomas Simon, Xulong Li, Hao Liu, Lei Tan, Lin Gui, Sean Banerjee, Timothy Godisart, Bart Nabbe, Iain Matthews, Takeo Kanade, Shohei Nobuhara, and Yaser Sheikh  
Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**), 2017.
- "Hand Keypoint Detection in Single Images using Multiview Bootstrapping"  
Tomas Simon, **Hanbyul Joo**, Iain Matthews, and Yaser Sheikh  
IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2017.
- "Panoptic Studio: A Massively Multiview System for Social Motion Capture"  
**Hanbyul Joo**, Hao Liu, Lei Tan, Lin Gui, Bart Nabbe, Iain Matthews, Takeo Kanade, Shohei Nobuhara and Yaser Sheikh  
International Conference on Computer Vision (**ICCV**), 2015 (**Oral**).
- "MAP Visibility Estimation for Large-Scale Dynamic 3D Reconstruction"  
**Hanbyul Joo**, Hyun Soo Park, and Yaser Sheikh  
IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2014 (**Oral**).
- "Graph-based Shape Matching for Deformable Objects"  
**Hanbyul Joo**, Yekeun Jeong, Olivier Duchenne, and InSo Kweon  
IEEE International Conference on Image Processing (**ICIP**), 2011.

"Graph-Based Robust Shape Matching for Robotic Application"

**Hanbyul Joo**, Yekeun Jeong, Olivier Duchenne, Seong-Young Ko, and InSo Kweon  
IEEE International Conference on Robotics and Automation (**ICRA**), 2009.

"Statistical Background Subtraction Based on the Exact Per-pixel Distributions"

Youngbae Hwang, **Hanbyul Joo**, Junsik Kim, and InSo Kweon  
International Association of Pattern Recognition workshop on Machine Vision Applications (**MVA**), 2007.

## WORK EXPERIENCES

**Oculus Research Pittsburgh, USA**

Research Intern

May. 2017 – Oct. 2017

Worked on a *3D Human Body, Face, and Hand Tracking and Modeling* project

**Disney Research Zurich, Switzerland**

Research Intern

June. 2015 – Oct. 2015

Mentor: Thabo Beeler and Derek Bradley

Worked on a *3D Face Capture* project

**Electronics and Telecommunications Research Institute (ETRI), South Korea**

Research Scientist

Feb. 2009 – Jun.2012

Worked on *full 3D reconstruction technology for broadcasting communication fusion* project

Developed a real-time markerless motion capture system using 20 broadcast cameras

Developed a system for automatic rigging and animation of 3D virtual avatar

## TUTORIAL ORGANIZATION

"DIY A Multiview Camera System: Panoptic Studio Teardown "

**Hanbyul Joo**, Tomas Simon, Hyun Soo Park, Shohei Nobuhara, Yaser Sheikh

In Conjunction with CVPR 2017.

## AWARDS & SCHOLARSHIPS

**CVPR Best Student Paper Award**

2018

**Samsung Scholarship**

2012 - 2017

Tuition and stipend for Ph.D. study (\$50K/year, for 5 years)

**Governmental Scholarship for KAIST Graduate Students**

2007 - 2009

**Governmental Scholarship for KAIST Undergraduate Students**

2002 - 2006

## DATASETS & LIBRARIES

**Panoptic Studio Dataset:** <http://domedb.perception.cs.cmu.edu>

A dataset of 3D hands, bodies, and face motion for social groups captured by the Panoptic Studio

**OpenPose Library:** <https://github.com/CMU-Perceptual-Computing-Lab/openpose>

The first real-time multi-person system to jointly detect human body, hand, and facial keypoints on single images.

## TALKS

**Measuring and Modeling Social Signals for Computational Behavioral Understanding**

MIT, Media Lab

Nov 2017

## **The Panoptic Studio: A Massively Multiview System for Social Interaction Capture**

UC Berkeley, Computer Vision Group (hosted by Prof. Alexei A. Efros)	<i>Dec 2016</i>
Stanford, Computer Vision and Geometry Lab (hosted by Prof. Silvio Savarese)	<i>Dec 2016</i>
Adobe Research, San Jose	<i>Dec 2016</i>
ACM International Conference on Multimodal Interaction (ICMI), ASSP4MI workshop	<i>Nov 2016</i>
Carnegie Mellon University, VASC Seminar	<i>Dec 2015</i>
International Conference on Computer Vision (ICCV), Oral Talk	<i>Dec 2015</i>
ETH Zurich, Computer Vision and Geometry lab (hosted by Prof. Marc Pollefeys)	<i>Oct 2015</i>
Seoul National University (hosted by Prof. Kyoung Mu Lee)	<i>June 2015</i>
ETRI, CG Team	<i>May 2015</i>
KAIST (hosted by Prof. In So Kweon)	<i>May 2015</i>

## **MAP Visibility Estimation for Large-Scale Dynamic 3D Reconstruction**

Carnegie Mellon University, Civil & Environmental Engineering	<i>Feb. 2015</i>
Carnegie Mellon University, People Image Analysis Consortium	<i>Nov. 2014</i>
Autodesk, Reality Computing Meetup, Pittsburgh	<i>Nov. 2014</i>
Conference on Computer Vision and Pattern Recognition (CVPR), Oral Talk	<i>Jun. 2014</i>
Carnegie Mellon University, VASC Seminar	<i>Jun. 2014</i>

## **SELECTED PRESS COVERAGE**

- BBC News**, [The Dome Which Could Help Machines Understand Behavior](#), *Oct. 2017*
- Reuters**, [500-Camera Dome Trains Computer To Read Body Language](#), *Oct. 2017*
- EBS (Korean TV Channel)**, [Docuprime: The Global War For Talent](#), *Mar. 2017*
- CMU News**, [Scientists Put Human Interaction Under The Microscope](#), *Mar. 2017*
- The Verge**, [Cracking The Elaborate Code](#), *Dec. 2016*
- SPIEGEL ONLINE**, [The Panoptic Studio: Computer Decipher The Secrets of Body Language](#), *Dec. 2015*
- Wired (Italian)**, [Panoptic Studio: The Latest Generation of Motion Capture](#), *Jul. 2015*
- Voice of America**, [New Studio Yields Most Detailed Motion Capture in 3D](#), *Apr. 2015*
- Reuters**, [Motion capture on a whole new level](#), *Apr. 2015*
- Discovery Channel Canada**, [Daily Planet Show, Future Tech: Panoptic Studio](#), *Jan. 2015*
- IEEE Spectrum**, [Camera-Filled Dome Recreates Full 3-D Motion Scenes](#), *Jul. 2014*
- Discovery News**, [Amazing 3-D Flicks from Dome of 500 Cameras?](#), *Jul. 2014*
- NBC NEWS**, [Camera-Studded Dome Tracks Your Every Move With Precision](#), *Jul. 2014*
- CNet**, [Tomorrow Daily: New video capture tech](#), *Jul. 2014*
- Engadget**, [Watch A Dome Full of Cameras Capture 3D Motion in Extreme Detail](#), *Jul. 2014*
- GIZMODO**, [A Dome Packed With 480 Cameras Captures Detailed 3D Images In Motion](#), *Jul. 2014*
- THE Verge**, [Scientists build a real Panopticon that captures your every move in 3D](#), *Jul.2014*

**Science Daily**, Hundreds of Videos Used To Reconstruct 3-D motion Without Markers, *Jul. 2014*

**PHYS.ORG**, Researchers Combine Hundreds of Videos To Reconstruct 3D Motion Without Markers, *Jul. 2014*

**Slate**, Freezing Memories in Time, *Jul. 2014*

**PetaPixel**, Researchers Use a 480-Camera Dome to More Accurately Capture 3D Motion, *Jul. 2014*

**Gizmag**, Camera-studded Dome Used To Reconstruct 3D Motion, *Jul. 2014*

**theENGINEER**, 3D Motion Captured Without Markers, *Jul. 2014*

**CMU News**, Carnegie Mellon Combines Hundreds of Videos To Reconstruct 3D Motion ..., *Jul. 2014*

## **PATENTS**

Motion capture apparatus and method (Patent No.: US 8805024 B2)

**Hanbyul Joo**, Seong-Jae Lim, Ji-Hyung Lee, Bon-Ki Koo

Method for automatic rigging and shape surface transfer of 3D standard mesh model based on muscle and nurbs by using parametric control (Patent No.: US 7171060 B2)

Seong Jae Lim, Ho Won Kim, **Hanbyul Joo**, Bon Ki Koo

3D model shape transformation method and apparatus (Patent Application No.: US 20120162217 A1)

Seong-Jae Lim, **Hanbyul Joo**, Seung-Uk Yoon, Ji-Hyung Lee, Bon-Ki Koo.

## **TEACHING**

**Teaching Assistant**, Carnegie Mellon University  
16-720 Computer Vision (Instructor: Martial Hebert)

*Fall 2014*