

# Hyung-gun Chi

PHD STUDENT · SOFTWARE ENGINEER

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## Research Interests

My research interests lie in the fields of Computer Vision and Machine Learning. More specifically, I am interested in Representation Learning for human action, 3D Geometric Deep Learning and Generative Adversarial Network.

## Education

### Purdue University

West Lafayette, IN, USA

PHD IN ELECTRICAL AND COMPUTER ENGINEERING

Aug. 2018 - PRESENT

- Advisor: Professor Karthik Ramani

### Yonsei University

Seoul, South Korea

BS IN MECHANICAL ENGINEERING

Mar. 2010 - Feb. 2017

- Advisor: Professor Soo-Hong Lee
- 2011-2013, 2-year military service

## Publications and Patents

### Conference Proceedings

- [C3] **H. Chi**, M. Ha, S. Chi, Q. Huang, and K. Ramani. InfoGCN: Representation Learning for Human Skeleton-based Action Recognition. Submitted, 2021.
- [C2] **H. Chi**, S. Kim, X. Hu, Q. Huang, and Karthik Ramani. A Large-scale Mechanical Components Benchmark for Deep Neural Networks. In proceedings of the 16th *European Conference on Computer Vision (ECCV)*, 2020.
- [C1] S. Kim, **H. Chi**, and Karthik Ramani. First-Person View Hand Segmentation of Multi-Modal Hand Activity Video Dataset. In proceedings of the 31st *British Machine Vision Conference (BMVC)*, 2020.

### Journal Papers

- [J4] S. Kim, J. Bae, **H. Chi**, S. Hong, B. S. Koh, & Ramani, K. Egocentric View Hand Action Recognition by Leveraging Hand Surface and Hand Grasp Type, Submitted, 2021.
- [J3] S. Kim, **H. Chi** and Karthik Ramani. Object synthesis by learning part geometry with surface and volumetric representations. In *Computer-Aided Design* (2021): 102932.
- [J2] S. Kim, N. Winovich, **H. Chi**, G. Lin, and K. Ramani. Latent transformations neural network for object view synthesis. In *The Visual Computer* (2019): 1-15.
- [J1] H. T. Hwang, **H. Chi**, N. K. Kang, H. B. Kong and Soo-Hong Lee. An Evaluation Methodology for 3D Deep Neural Network using Visualization in 3D Data Classification. In *Journal of Mechanical Science and Technology (JMST)* 33, no. 3 (2019): 1333-1339.

### Patents

- [P2][PDF] K. Ramani, S. Kim, and **H. G. Chi**, "Pixel-wise Hand Segmentation of Multi-modal Hand Activity Video Dataset." U.S. Patent Application No. 17/109,193.
- [P2][PDF] **H. G. Chi**. *Computer Input Automation System*. KR Patent No. 10-1745330, issued 2017.

## Research Projects

### Pose Relation Transformer for Predicting Occluded Pose

C-Design LAB, Purdue Univ.

GRADUATE RESEARCH ASSISTANT

Aug. 2020 - Present

- Developed a novel hand and body pose estimation framework that effectively predicts joint location under occlusion.

### Representation Learning for Skeleton-based Human Action [C3]

C-Design LAB, Purdue Univ.

GRADUATE RESEARCH ASSISTANT

May. 2021 - Present

- Developed a novel representation learning framework for skeleton-based human action. Proposed framework effectively represents human skeleton utilizing Self-Attention mechanism and Information Bottleneck.
- Proposed framework improves performance of deep neural network in skeleton-based action recognition task.

### Egocentric View Hand Action Recognition [J4]

C-Design LAB, Purdue Univ.

GRADUATE RESEARCH ASSISTANT

Aug. 2020 - Feb. 2021

- Proposed a novel hand action estimation pipeline that learns the distribution of mean curvatures of the hand surface which imposes detailed geometric information
- The results of this project are preprinted on <https://arxiv.org/pdf/2109.03783.pdf>.

## A Large-scale Mechanical Component Benchmark Dataset [C2]

C-Design LAB, Purdue Univ.

GRADUATE RESEARCH ASSISTANT

Feb. 2019 - Mar. 2020

- Introduced large-scale mechanical components a benchmark for the classification and retrieval tasks named Mechanical Components Benchmark.
- Developed a data collecting pipeline including annotation interface and database.
- Benchmarked state-of-the-art 3D Deep Neural Networks for classification and retrieval tasks to explore the descriptor for mechanical components.

## Hand segmentation with RGBD-T data [C1, P2]

C-Design LAB, Purdue Univ.

GRADUATE RESEARCH ASSISTANT

Jul. 2019 - May. 2020

- Proposed a novel hand video dataset with RGB, Depth, and Thermal images for hand segmentation.
- Developed a method which segment hands and objects with a multi-modal Deep Neural network dealing with RGBD-T data.

## Part Geometry Net (PGNet) [J3]

C-Design LAB, Purdue Univ.

GRADUATE RESEARCH ASSISTANT

Oct. 2018 - Aug. 2019

- Proposed a Generative Adversarial Network (GAN) that synthesize 3D objects given a discrete category condition and continuous instance-level attributes by fusing the various types of geometric information.
- Constructed a part identifier module which learns part geometry to preserve part properties of 3D objects.

## Latent Transformation Neural Network (LTNN) [J2]

C-Design LAB, Purdue Univ.

GRADUATE RESEARCH ASSISTANT

Aug. 2018 - April. 2019

- Proposed a fully-convolutional conditional generative network which is capable of view synthesis using a light-weight neural network suited for real-time applications.
- Developed conditional transformation unit which is designed to learn the latent space transformations corresponding to specified target views.

## Interpretable 3D Deep Neural Network [J1]

Knowledge-Based Design LAB, Yonsei Univ.

UNDERGRADUATE RESEARCH ASSISTANT

Feb. 2016 - Jul. 2017

- Proposed an uncertainty evaluation method for 3D Deep Neural Networks by calculating the prediction difference of every voxel.
- Developed a web-based 3D CAD search engine using a 3D Deep Neural Network for demonstration.

## Working Experience

### Software Engineer and CEO

Seoul, South Korea

NEIL LAB CORPORATION

Sep. 2016 - Dec. 2017

- Founded and led a start-up company as a CEO and senior software engineer.
- Developed an office automation system specifically for automating office tasks such as sending an e-mail or issuing receipts.
- Designed a back-end system and database for customer web-service which automatically scraps and integrates customers' financial and personal data. (Relevant patent: [P1])

## Skills

### Research and Development Stacks

<b>Major Languages</b>	Python, C/C++
<b>Machine Learning</b>	PyTorch, TensorFlow, Keras
<b>Web Frameworks</b>	Django, Flask, Node.js
<b>Computer Vision</b>	OpenCV, OpenGL
<b>Web Languages</b>	Nginx, React, HTML5, PHP, JavaScript, CSS
<b>Database</b>	MySQL, PostgreSQL, SQLite, MongoDB

### Other Tools and Skills

<b>Text Editors</b>	Neovim & Vim
<b>Other Languages</b>	Shell Scripts(bszsh, zsh), Matlab(Octave), R
<b>Operating Systems</b>	macOS, Linux Debian/Ubuntu, Windows
<b>IDE</b>	VSCode, Eclipse, IDEA
<b>Softwares</b>	SolidWorks, Catia, AutoCAD
<b>VCS</b>	Git

## Academic Activities

**Reviewer** The British Machine Vision Conference (BMVC) 2020, 2021.

## References

<b>Karthik Ramani</b>	Professor, Purdue University	ramani@purdue.edu
<b>Soo-Hong Lee</b>	Professor, Yonsei University	shlee@yonsei.ac.kr