

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.
- [P1][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

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

Other Tools and Skills

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

Academic Activities

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

References

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