Hyung-gun **Chi**

PHD STUDENT

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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 Computer Vision, and their applications in VR/AR.

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, S. Lee, Q. Huang, and K. Ramani. InfoGCN: Representation Learning for Human Skeleton-based Action Recognition, In proceedings of *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022.
- [**C2**] **H. Chi**, S. Kim, X. Hu, Q. Huang, and K. 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 K. 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

- [**J3**] S. Kim, **H. Chi** and K. 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.

Preprinted papers

- S. Kim, J. Bae, **H. Chi**, S. Hong, B.S. Koh, and K. Ramani . Egocentric View Hand Action Recognition by Leveraging Hand Surface and Hand Grasp Type. *arXiv preprint arXiv:2109.03783*, 2021.

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.

Work Experience

Research Intern — *San Jose, CA, USA*

Honda Research Institute — *May. 2022 - Aug. 2022*

- Conduct research on future Action Localization task

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**]*)

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.

Represetnation Learning for Skeleton-based Human Action [*C3*] *C-Design LAB, Purdue Univ.*

Graduate Research Assistant *May. 2021 - Dec 2021*

- 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 Themral 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.
- Consturcted 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 uncerntainty 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.

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 Langauges	Shell Scripts(bszh, 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.

· Journal of Visual Communication and Image Representation (JVCI)

· Journal of Computing and Information Science in Engineering (JCISE)

References

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