Hyung-gun **Chi**

PHD Candidate

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Research Interests

My research interests are primarily focused on the intersection of Computer Vision and Machine Learning, with a particular emphasis on Representation Learning for human actions, 3D Computer Vision techniques, and their practical applications. I aim to explore the development and integration of advanced algorithms for human action recognition, 3D scene understanding, and object detection, specifically for use in Virtual Reality (VR) / Augmented Reality (AR) devices and Autonomous Vehicles.

Education

Purdue University — *West Lafayette, IN, USA*

PhD in Electrical and Computer Engineering — *Aug. 2018 - Dec. 2023 (Expected)*

- Thesis: Learning Representation for Human Action
- Advisor: Prof. Karthik Ramani

Purdue University — *West Lafayette, IN, USA*

MS in Electrical and Computer Engineering — *Aug. 2018 - Dec. 2022*

- Advisor: Prof. Karthik Ramani

Yonsei University — *Seoul, South Korea*

BS in Mechanical Engineering — *Mar. 2010 - Feb. 2017*

- Advisor: Prof. Soo-hong Lee
- 2-year military service (2011-2013)

Professional Experience

Toyota Research Institute — *Los Altos, CA, USA*

Research Intern — *May. 2023 - Aug. 2023*

- Conducted human-robot interaction research (Host : Dr. Thomas Kollar).

Honda Research Institute USA — *San Jose, CA, USA*

Research Intern — *Jan. 2023 - May. 2023*

- Conducted human motion prediction research for autonomous vehicles (Host: Dr. Kwonjoon Lee).

Honda Research Institute USA — *San Jose, CA, USA*

Research Intern — *May. 2022 - Aug. 2022*

- Conducted research on future action forcasting task for autonomous vehicles (Host: Dr. Chiho Choi).

Convergence Design Lab, Purdue University — *West Lafayette, IN, USA*

Graduate Research Assistant — *Aug. 2018 - Present*

- Conducted skeleton-based human action recognition and pose estimation research (Advisor: Prof. Karthik Ramani).

HeumLabs Corporation — *Seoul, South Korea*

Software Engineer & CEO — *Sep. 2016 - Dec. 2017*

- Founded and managed a start-up company as a CEO.
- Developed an office automation system specifically for automating office works.

Knowledge-based Design Lab, Yonsie University — *Seoul, South Korea*

Undergraduate Researcher — *Jan. 2016 - Aug. 2016*

- Participated on the 3D computuer vision research (Advisor: Prof. Soo-Hong Lee).

Publications and Patents

Journal Papers

- [**J4**] H. Lee, J. Lee, S. Kwon, K. Ramani, **H. Chi**, and D. Mun. 3D CAD Model Simplification for Mechanical Parts Using Generative Adversarial Networks. In *Computer-Aided Design*, under revision.
- [**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. Hwang, S. Lee, **H. Chi**, N. Kang, H. Kong, J. Lu, and H. Ohk. 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.

Conference Proceedings

- [**C9**] W. Roh, S. Lee, **H. Chi**, S. Kim. Functional Hand Type Prior for 3D Hand Pose Estimation & Action Recognition from Egocentric View Monocular Videos, *British Machine Vision Conference (**BMVC**)*, 2023. Submitted.
- [**C8**] **H. Chi**, S. Chi, Q. Huang, and K. Ramani. Skeleton-ODE: Learning Representation by Predicting the Future for Online Skeleton-based Action Recognition, *International Conference on Computer Vision (**ICCV**)*, 2023. Submitted.
- [**C7**] S. Kim, S. Seo, **H. Chi**, K. Ramani, J. Kim, and S. Kim. Higher-order Relation Reasoning for Trajectory Prediction, *International Conference on Computer Vision (**ICCV**)*, 2023. Submitted.
- [**C6**] **H. Chi**, K. Lee, N. Agarwal, K. Ramani, and C. Choi. AdamsFormer for Spatial Action Localization in the Future, In proceedings of *Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2023.
- [**C5**] Y. Xu, A. Bazarjani, **H. Chi**, C. Choi, and Y. Fu. Uncovering the Missing Pattern: Unified Framework Towards Trajectory Imputation and Prediction, In proceedings of *Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2023.
- [**C4**] **H. Chi***, S. Chi*, S. Chan, and K. Ramani. Pose Relation Transformer: Refine Occlusions for Human Pose Estimation, In proceedings of *IEEE International Conference on Robotics and Automation (**ICRA**)*, 2023.
- [**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 Annotated Mechanical Components Benchmark for Classification and Retrieval Tasks with Deep Neural Networks, In proceedings of *European Conference on Computer Vision (**ECCV**)*, 2020.
- [**C1**] S. Kim, **H. Chi**, X. Hu, A. Vegesana, and K. Ramani. First-Person View Hand Segmentation of Multi-Modal Hand Activity Video Dataset, In proceedings of *British Machine Vision Conference (**BMVC**)*, 2020.

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

- [**P5**] **H. Chi**, K. Lee, Y. Xu, and C. Choi. System and Method for Providing Spatio-Temporal Action Localization in the Future. US Patent Application.
- [**P4**] Y. Xu, A. Bazarjani, **H. Chi**, and C. Choi. Trajectory Imputation and Prediction, US Patent Application.
- [**P3**] K. Ramani, **H. Chi**, and S. Chi. Pose Relation Transformer Refine Occlusions for Human Pose Estimation. US Patent Application.
- [**P2**] K. Ramani, S. Kim, and **H. Chi**. Pixel-wise Hand Segmentation of Multi-modal Hand Activity Video Dataset. US Patent 11,562,489 B2.
- [**P1**] **H. Chi**. Computer Input System for Office/Factory Automation. WO Patent 2018/074729 A1.

Academic Activities

Reviewer

- Conference on Neural Information Processing Systems (NeurIPS) 2023
- The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2023
- The IEEE/CVF International Conference on Computer Vision (ICCV) 2023
- The British Machine Vision Conference (BMVC) 2020 - 2023
- The IEEE Conference on Artificial Intelligence (CAI) 2023
- Journal of Visual Communication and Image Representation (JVCI)
- Journal of Computing and Information Science in Engineering (JCISE)
- Computer Vision and Image Understanding (CVIU)

Invited Talks

Sungkyunkwan University — *Seoul, South Korea*

Guest Lecturer: Advancements in Human Action Recognition: Learning Human Skeleton Representations — *May. 2023*

Keymuyng University — *Deagu, South Korea*

Guest Lecturer: Learning Representation for Human Action Recognition — *Apr. 2023*

Yonsei University — *Seoul, South Korea*

Guest Lecturer: Learning Representation for Human Action Recognition — *Apr. 2023*

Hongik University — *Seoul, South Korea*

Guest Lecturer: Learning Representation for Human Action Recognition — *Dec. 2022*

Awards and Honors

2022	**Travel Grants**, Purdue Graduate Student Government	*West Lafayette, IN, USA*
2016	**KISTI (Korea Institute of Science and Technology Information) President's Award**, Edison Challenge – Computer Aided Design Section	*Seoul, South Korea*
2016	**CDE (Korea Society for Computational Design and Engineering) President's Award**, CDE Challenge – Computational Design and Engineering Tools Section	*Daejeon, South Korea*

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**

References

Karthik Ramani	Professor, Purdue University	ramani@purdue.edu
Soo-Hong Lee	Professor, Yonsei University	shlee@yonsei.ac.kr
Chiho Choi	Senior Staff Engineer, Samsung Semiconductor USA	chiho1.choi@samsung.com