Hyung-gun **Chi**

PHD CANDIDATE

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Research Interests

I am passionate about the intersection of Computer Vision and Machine Learning, emphasizing representation learning for human actions and 3D Computer vision. I aim to harness large language models to enhance action recognition, 3D Computer Vision, and object detection, particularly in VR/AR, and Autonomous Vehicles.

Education

Purdue University — *West Lafayette, IN, USA*

PHD IN ELECTRICAL AND COMPUTER ENGINEERING — *Dec. 2023 (Expected)*

- Thesis: Towards Improved Representations on Human Activity Understanding (Advisor: Prof. Karthik Ramani).

Purdue University — *West Lafayette, IN, USA*

MS IN ELECTRICAL AND COMPUTER ENGINEERING — *Dec. 2022*

Yonsei University — *Seoul, South Korea*

BS IN MECHANICAL ENGINEERING — *Feb. 2017*

Professional Experience

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

RESEARCH INTERN — *May. 2023 - Aug. 2023*

- Carried out research on multi-modal representation learning for robotics, focusing on aligning representations of language, vision, and sensor data [C9]. (Host: Dr. Thomas Kollar)

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

RESEARCH INTERN — *Jan. 2023 - May. 2023*

- Led research initiatives on creating human motion from language descriptions using LLMs [C13]. (Host: Dr. Kwonjoon Lee).

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

RESEARCH INTERN — *May. 2022 - Aug. 2022*

- Conducted research into future action forecasting [C6, P5] and trajectory prediction [C5, P4] for autonomous vehicles (Host: Dr. Chiho Choi).

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

GRADUATE RESEARCH ASSISTANT — *Aug. 2018 - Present*

- Conducted research on human action perception [C1, C3, J7], human pose estimation [C4, P3], and 3D computer vision [J2-4, C2]. (Advisor: Prof. Karthik Ramani).

HeumLabs Corporation — *Seoul, South Korea*

SOFTWARE ENGINEER & CEO — *Sep. 2016 - Dec. 2017*

- Founded and led a start-up company that develops an office automation system for office works [P1].

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

UNDERGRADUATE RESEARCH ASSISTANT — *Jan. 2016 - Aug. 2016*

- Contributed to research on explainable AI, specifically targeting advancements in 3D computer vision [J1] (Advisor: Prof. Soo-hong Lee).

Publications and Patents

* denotes equal contribution

Conference Proceedings

- [**C13**] **H. Chi**, S. Chi, H. Ma, N. Agarwal, F. Siddiqui, K. Ramani, K. Lee. Long-Term Human Motion Generation from the Action Text, *Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2024. (submitted)
- [**C12**] S. Kim, H. Baek, S. Lee, **H. Chi**, H. Lim, J. Kim, S. Kim. Enhanced Motion Forecasting with Visual Relation Reasoning, *Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2024. (submitted)
- [**C11**] S. Moon, H. Woo, H. Park, H. Jung, **H. Chi**, H. Lim, S. Kim, J. Kim. Improving Trajectory Prediction through Text-Guided High-Level Vision Data Extraction, *Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2024. (submitted)
- [**C10**] S. Kim, S. Seo, **H. Chi**, K. Ramani, J. Kim, and S. Kim. Higher-order Relation Reasoning for Trajectory Prediction, *Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2024. (submitted)
- [**C9**] **H. Chi**, J. Mercat, J. Barreiros, K. Ramani, and T. Kollar. Multi-Modal Representation Learning with Tactile Modality, In proceedings of *International Conference on Robotics and Automation (**ICRA**)*, 2024. (submitted)
- [**C8**] S. Chi, R. Jain, J. Shi, H. Doh, **H. Chi**, A. Quinn, and K. Ramani, CARING-AI: Context-aware Augmented Reality INstruction through Generative Artificial Intelligence, *In Conference on Human Factors in Computing Systems (**CHI**)*, 2024. (submitted)
- [**C7**] W. Roh, S. Lee, W. Ryoo, G. Oh, J. Lee, S. Hwang, **H. Chi**, and S. Kim. Functional Hand Type Prior for 3D Hand Pose Estimation & Action Recognition from Egocentric View Monocular Videos, *British Machine Vision Conference (**BMVC** Oral)*, 2023.
- [**C6**] **H. Chi**, K. Lee, N. Agarwal, Y. Xu, 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 *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.

Journal Papers

- [**J8**] J. Lee, J. Oh, **H. Chi**, M. Lee, J.Hwang, S. Jeong, S. Kang, H. Jee, H. Bae, J. Kim, B. Kimw. Deep Learning-Assisted Design of Bilayer Nanowire Gratings for High-Performance MWIR Polarizers, In *Nanoscale*. (submitted)
- [**J7**] **H. Chi**, S. Chi, Q. Huang, and K. Ramani. InfoGCN++: Learning Representation by Predicting the Future for Online Skeleton-based Action Recognition, *IEEE Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**)*. (under revision)
- [**J6**] S. Lee*, **H. Chi***, G. Oh, W. Byeon, S. Yoon, J. Kim, and S. Kim. Robust Sound-Guided Image Manipulation. In *Neural Networks (**NN**)*. (under revision)
- [**J5**] A. Unmesh, R. Jain, J. Shi, VK Chaitanya, **H. Chi**, S. Chidambaram, A. Quinn, and K. Ramani. Interacting Objects: A dataset of object-object interactions for richer dynamic scene representations. In *IEEE Robotics and Automation Letters (**RA-L**)*. To appear
- [**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* (2023): 103577.
- [**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* 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

- [**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 Services

Conference Reviewers

- The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2023 - 2024
- International Conference on Learning Representations (ICLR) 2024
- Conference on Neural Information Processing Systems (NeurIPS) 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
- International Conference on Computer Science and Application Engineering (CSAE), 2023

Journal Reviewers

- IEEE Transactions on Image Processing (TIP)
- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Robotics and Automation Letters (RAL)
- Computer Vision and Image Understanding (CVIU)
- Journal of Visual Communication and Image Representation (JVCI)
- Journal of Computing and Information Science in Engineering (JCISE)

Skills

Research and Development Stacks

Major Languages	**Python**, **C/C++**
Machine Learning	**PyTorch**, **TensorFlow**
Web Frameworks	Django, Flask, Node.js
Computer Vision	**OpenCV**, OpenGL
Web Languages	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, R
Operating Systems	Linux Debian/Ubuntu, MacOS, Windows
IDE	VSCode, Eclipse, IDEA
Cloud Platforms	AWS
VCS	**Git**

Awards and Honors

2023	**Conference Travel Funds**, Purdue Engineering Graduate Program	*West Lafayette, IN, USA*
2023	**Travel Grants**, Purdue Graduate Student Government	*West Lafayette, IN, USA*
2016	**Korea Institute of Science and Technology Information (KISTI) President's Award**, Edison Challenge – Computer Aided Design Section	*Seoul, South Korea*
2016	**Korea Society for Computational Design and Engineering (CDE) President's Award**, CDE Challenge – Computational Design and Engineering Tools Section	*Daejeon, South Korea*

References

Available upon request.