Hyung-gun **Chi**

AI RESEARCHER

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Research Interests

Focused on the intersection of Computer Vision and Machine Learning, with a keen interest in representation learning for 3D action recognition and object detection. My work aims to advance VR/AR and autonomous vehicle technologies by improving machine understanding of human actions through innovative algorithms and leveraging large language models for enhanced human-computer interaction.

Education

Purdue University   *West Lafayette, IN, USA*
PHD IN ELECTRICAL AND COMPUTER ENGINEERING   *Aug. 2018 - Dec. 2023*

- Thesis: Towards Improved Representations on Human Activity Understanding / Advisor: Dr. Karthik Ramani.

Purdue University   *West Lafayette, IN, USA*
MS IN ELECTRICAL AND COMPUTER ENGINEERING   *Aug. 2018 - Dec. 2022*

Yonsei University   *Seoul, South Korea*
BS IN MECHANICAL ENGINEERING   *Mar. 2010 - Feb. 2017*

- Advisor: Dr. Soo-hong Lee / 2 years of military service (2011-2012)

Professional Experience

Apple Inc.   *Cupertino, CA, USA*
AIML RESIDENT   *Jul 2024 -*

- Conducted multi-modal perception research as part of the Siri perception team.

Hanwha Vision America   *Santa Clara, CA, USA*
AI RESEARCHER   *Jan - June 2024*

- Conducted research in advanced human pose estimation and activity recognition, enhancing surveillance camera capabilities.
- Developed machine learning models to accurately predict human activities, significantly improving detection accuracy and reducing false positives.

Toyota Research Institute   *Los Altos, CA, USA*
ML RESEARCH INTERN   *May - Aug 2023*

- Led a project on multi-modal representation learning for robotics, achieving advancements in aligning language, vision, and tactile sensor.
- Published a comprehensive dataset comprising language descriptions, tactile images, and visual captures of robotic interactions, facilitating enhanced robot sensory perception and interaction studies.

Honda Research Institute   *San Jose, CA, USA*
CV RESEARCH INTERN   *Jan - May 2023 & May - Aug 2022*

- Led a research project that transformed language descriptions into human motion using LLMs, establishing a new benchmark in the field.
- Developed a specialized VQ-diffusion model for text-to-human motion generation, focusing on accurately predicting long-term movements.
- Conducted pioneering research in future action forecasting and trajectory prediction for autonomous vehicles, resulting in two patents and significant advancements in vehicle safety and navigation systems.
- Introduced an algorithm capable of predicting future action locations by integrating NeuralODE with the Transformer for enhanced accuracy.

Convergence Design Lab, Purdue University   *West Lafayette, IN, USA*
GRADUATE RESEARCH ASSISTANT   *Aug 2018 - Dec 2023*

- Advanced research in human action perception, pose estimation, and 3D computer vision, yielding numerous peer-reviewed publications and patents.
- Directed a team to innovate a 3D pose estimation algorithm from video, drastically enhancing both accuracy and processing speed.
- Developed a 3D object generation model utilizing GAN, focusing on the precise definition of geometrical features.
- Proposed an algorithm for skeleton-based action recognition that integrates self-attention mechanisms with graph-convolutional networks to capture human topology effectively.

HeumLabs Corporation   *Seoul, South Korea*
SOFTWARE ENGINEER & CEO   *Sep 2016 - Dec 2017*

- Founded and led a startup developing an office automation system, securing initial funding and overseeing the product development lifecycle.
- Achieved a successful market entry, with the system adopted by over 150 businesses within the first year.

Knowledge-based Design Lab, Yonsie University   *Seoul, South Korea*
UNDERGRADUATE RESEARCH ASSISTANT   *Jan. - Aug. 2016*

- Advanced research in explainable AI within 3D computer vision by analyzing the role of individual parts in classification, utilizing prediction difference analysis for deeper insights.

Publications and Patents

Conference Proceedings

- [**C14**] "CARING-AI: Context-aware Augmented Reality INstruction through Generative Artificial Intelligence", **CHI**, 2024 (submitted).
- [**C13**] "Context-Enriched Voxel Queries for Camera-based 3D Occupancy Prediction", **NeurIPS**, 2024 (submitted).
- [**C12**] "M2D2M: Discrete Diffusion Model for the Multi-Motion Generation from the Text", **ECCV**, 2024.
- [**C11**] "Enhanced Motion Forecasting with Visual Relation Reasoning", **ECCV**, 2024.
- [**C10**] "Improving Trajectory Prediction through Text-Guided High-Level Vision Data Extraction", **ECCV**, 2024.
- [**C9**] "Multi-Modal Representation Learning with Tactile Modality", **IROS**, 2024.
- [**C8**] "Higher-order Relation Reasoning for Trajectory Prediction", **CVPR**, 2024.
- [**C7**] "Functional Hand Type Prior for 3D Hand Pose Estimation & Action Recognition from Egocentric View Monocular Videos, **BMVC** (Oral), 2023.
- [**C6**] "AdamsFormer for Spatial Action Localization in the Future", **CVPR**, 2023.
- [**C5**] "Uncovering the Missing Pattern: Unified Framework Towards Trajectory Imputation and Prediction", **CVPR**, 2023.
- [**C4**] "Pose Relation Transformer: Refine Occlusions for Human Pose Estimation", **ICRA**, 2023.
- [**C3**] "InfoGCN: Representation Learning for Human Skeleton-based Action Recognition", **CVPR**, 2022.
- [**C2**] "A Large-scale Annotated Mechanical Components Benchmark for Classification and Retrieval Tasks with Deep Neural Networks", **ECCV**, 2020.
- [**C1**] "First-Person View Hand Segmentation of Multi-Modal Hand Activity Video Dataset", **BMVC**, 2020.

Journal Papers

- [**J9**] "Enhanced fringe-to-phase framework using deep learning", **Image and Vision Computing** (under review).
- [**J8**] "InfoGCN++: Learning Representation by Predicting the Future for Online Skeleton-based Action Recognition", **TPAMI** (under revision).
- [**J7**] "Deep Learning-Assisted Design of Bilayer Nanowire Gratings for High-Performance MWIR Polarizers, **Advanced Materials Technologies**, 2024.
- [**J6**] "Robust Sound-Guided Image Manipulation", **Neural Networks**, 2024.
- [**J5**] "Interacting Objects: A dataset of object-object interactions for richer dynamic scene representations", **RA-L**, 2024.
- [**J4**] "3D CAD Model Simplification for Mechanical Parts Using Generative Adversarial Networks", **Computer-Aided Design**, 2023.
- [**J3**] "Object synthesis by learning part geometry with surface and volumetric representations", **Computer-Aided Design**, 2021.
- [**J2**] "Latent transformations neural network for object view synthesis", **The Visual Computer**, 2019.
- [**J1**] "An Evaluation Methodology for 4D Deep Neural Network using Visualization in 3D Data Classification", **JMST**, 2019.

Preprinted papers

- [**X1**]"Egocentric View Hand Action Recognition by Leveraging Hand Surface and Hand Grasp Type", *arXiv*, 2021.

Patents

- [**P7**] "Multi-Motion Generation", US Patent App.
- [**P6**] "System and Method for Authoring Context-augmented Reality Instruction through Generative Artificial Intelligence", US Patent App.
- [**P5**] "Pose Relation Transformer Refine Occlusions for Human Pose Estimation", US Patent App.
- [**P4**] "Spatio Action Localization in the Future", US Patent App. 18/300,844.
- [**P3**] "Trajectory Imputation and Prediction", US Patent App. 18/182,195.
- [**P2**] "Pixel-wise Hand Segmentation of Multi-modal Hand Activity Video Dataset", US Patent 11,562,489 B2.
- [**P1**] "Computer Input System for Office/Factory Automation", WO Patent 2018/074729 A1.

Academic Services

Reviewer

- Conferences: **CVPR**(2023-2024), **ECCV**(2024), **ICCV**(2023), **ICML**(2024), **ICLR**(2024-2025), **NeurIPS**(2023), **AAAI**(2025), **BMVC**(2021-2023), **ACCV**(2024), **IROS**(2024), **ICPR**(2025).
- Journals: **TPAMI**, **TIP**, **CVIU**, **R-AL**, **TOMM**, **JVCI**, **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

2024	**Doctoral Consortium,** IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)	*Seattle, WA, USA*
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.