

# 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

PHD IN ELECTRICAL AND COMPUTER ENGINEERING

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

West Lafayette, IN, USA

Aug. 2018 - Dec. 2023

### Purdue University

MS IN ELECTRICAL AND COMPUTER ENGINEERING

West Lafayette, IN, USA

Aug. 2018 - Dec. 2022

### Yonsei University

BS IN MECHANICAL ENGINEERING

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

Seoul, South Korea

Mar. 2010 - Feb. 2017

## Professional Experience

### Apple Inc.

AIML RESIDENT

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

Cupertino, CA, USA

Jul 2024 -

### Hanwha Vision America

AI RESEARCHER

- 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.

Santa Clara, CA, USA

Jan - June 2024

### Toyota Research Institute

ML RESEARCH INTERN

- 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.

Los Altos, CA, USA

May - Aug 2023

### Honda Research Institute

CV RESEARCH INTERN

- 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.

San Jose, CA, USA

Jan - May 2023 & May - Aug 2022

### Convergence Design Lab, Purdue University

GRADUATE RESEARCH ASSISTANT

- 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.

West Lafayette, IN, USA

Aug 2018 - Dec 2023

### HeumLabs Corporation

SOFTWARE ENGINEER & CEO

- 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.

Seoul, South Korea

Sep 2016 - Dec 2017

### Knowledge-based Design Lab, Yonsie University

UNDERGRADUATE RESEARCH ASSISTANT

- 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.

Seoul, South Korea

Jan. - Aug. 2016

# Publications and Patents

## Conference Proceedings

- [C14] “CARING-AI: Context-aware Augmented Reality INstruction through Generative Artificial Intelligence”, **CHI**, 2025 (submitted).
- [C13] “Context-Enriched Voxel Queries for Camera-based 3D Occupancy Prediction”, **CVPR**, 2025 (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**, 2024.
- [J8] “InfoGCN++: Learning Representation by Predicting the Future for Online Skeleton-based Action Recognition”, **TPAMI** 2024.
- [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. 18/584,191.
- [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.
- [P1] “Computer Input System for Office/Factory Automation”, WO Patent 2018/074729 A1.

# Academic Services

## Reviewer

- Conferences: **CVPR**(2023-2025), **ECCV**(2024), **ICCV**(2023), **ICML**(2024-2025), **ICLR**(2024-2025), **NeurIPS**(2023), **AAAI**(2025), **BMVC**(2021-2023), **ACCV**(2024), **ICRA**(2025), **IROS**(2024), **ICPR**(2025), **ICASSP**(2025).
- Journals: **TPAMI**, **TIP**, **IJCV**, **TNNLS**, **JVCI**, **CVIU**, **TOMM**, **R-AL**, **TETCI**, **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 Languages	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	<b>Doctoral Consortium</b> , IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)	Seattle, WA, USA
2023	<b>Conference Travel Funds</b> , Purdue Engineering Graduate Program	West Lafayette, IN, USA
2023	<b>Travel Grants</b> , Purdue Graduate Student Government	West Lafayette, IN, USA
2016	<b>Korea Institute of Science and Technology Information (KISTI) President’s Award</b> , Edison Challenge – Computer Aided Design Section	Seoul, South Korea
2016	<b>Korea Society for Computational Design and Engineering (CDE) President’s Award</b> , CDE Challenge – Computational Design and Engineering Tools Section	Daejeon, South Korea

# References

Available upon request.