Hyung-gun Chi

SOFTWARE ENGINEER · MASTER STUDENT

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Research Interests

My research interests lie at the intersection of Computer Vision and Robotics, focusing on 3D Geometric Deep Learning for recognizing and synthesizing 3D objects. In this area, I applied machine learning (deep learning) algorithms for Augmented/Virtual Reality and Smart Factory.

Education

Purdue University *West Lafayette, IN, USA*

MASTER OF SCIENCE IN MECHANICAL ENGINEERING *Aug. 2018 - PRESENT*

- Advisor: Karthik Ramani, Donald W.Feddersen Professor of Mechanical Engineering

Yonsei University *Seoul, South Korea*

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING *Mar. 2010 - Feb. 2017*

- Advisor: Soo-Hong Lee, Professor of Mechanical Engineering
- 2011-2013, 2-year military service

Skills

Programming	Python, Matlab, C/C++, SQL, JavaScript, HTML, CSS, PHP
Frameworks	TensorFlow, PyTorch, Keras, ROS, OpenCV
Software	Creo Parametric, SolidWorks, HyperWorks, GAZEBO

Publications and Patents

Journal Papers

- [**J4**][**PDF**] S. Kim, **H. G. Chi** and Karthik Ramani. Object synthesis by learning part geometry with surface and volumetric representations. In *Computer-Aided Design*, submitted.
- [**J3**][**PDF**] S. Kim, N. Winovich, **H. G. Chi**, G. Lin, and K. Ramani. Latent transformations neural network for object view synthesis. In *The Visual Computer*, pp. 1-15, 2019
- [**J2**][**PDF**] H. T. Hwang, **H. G. 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(3), pp. 1333-1339, 2019
- [**J1**][**PDF**] JIN YONGZHU, **H. G. Chi** and Soo-Hong Lee. A Study on the Optimal Design of Pedestrian Robots Using Jansen Mechanism. In *CDE review*, 22(2), pp. 18-22, 2016

Conference Proceedings

- [**C5**][**PDF**] **H. G. Chi***, S. Kim*, X. Hu, B. Franz, Q. Huang, and Karthik Ramani. A Large-scale Mechanical Components Benchmark for Deep Neural Networks. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, submitted.
- [**C4**][**PDF**] S. Kim, **H. G. Chi**, A. Unmesh and Karthik Ramani. Multispectral Video Dataset for First-person View Hand Segmentation during Activity with Objects and Tools. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, submitted.
- [**C3**][**PDF**] L.Paredes, S. Chidambaram, X. Qian, **H. G. Chi** and Karthik Ramani. SleekPatch: Fabrication of a self-contained, slim hand wearable for interactions in mobile computing. In *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, submitted.
- [**C2**][**PDF**] H. Hwang, **H. G. Chi**, S. H. Lee. A Research about 3D Design Data Classification with 3D Convolutional Neural Network. In *Proceedings of the Society for Computational Design and Engineering Conference*, pp. 441-442, 2017
- [**C1**][**PDF**] M. H. Woo, S. H. Kim, **H. G. Chi**, M. W. Park, J. K. Kim and S. H. Lee. Development of Web-based, Module Structure Platform for Surgical Workflow Management. In *Proceedings of the Society for Computational Design and Engineering Conference*, pp. 439-441, 2016

Patents

- [**P1**][**PDF**] **H. G. Chi**. "Computer Input Automation System" KR Patent (2017): 10-1745330.

Research Experience

A Large-scale Engineering Part Benchmark Dataset *C-design LAB, Purdue Univ.*

RESEARCH ASSISTANT *Feb. 2019 - Present*

- Introduced a large-scale mechanical components benchmark for the classification and retrieval tasks named Mechanical Components Benchmark. (*Relevant publication:* [**C5**])
- 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 motion prediction with RGBD-T data · · · · · · · · · *C-design LAB, Purdue Univ.*

RESEARCH ASSISTANT · · · · · · · · · *Jul. 2019 - Present*

- Proposed a novel hand dataset by fusing RGB-D and thermal data for hand segmentation. (*Relevant publication:* [*C4*])
- Developed a method which segment hands and objects with a multi-modal Deep Neural network dealing with RGBD-T data.

Part Geometry Net (PGNet) · · · · · · · · · *C-design LAB, Purdue Univ.*

GRADUATE ASSISTANT · · · · · · · · · *Oct. 2018 - Aug. 2019*

- Built a Generative Adversarial Network which generates 3D objects given a discrete category condition and continuous instance-level attributes by fusing the various types of geometric information.
- Introduced a part identifier module which learns part geometry to preserve part properties of 3D objects. (*Relevant publication:* [*J4*])

Latent Transformation Neural Network (LTNN) · · · · · · · · · *C-design LAB, Purdue Univ.*

GRADUATE ASSISTANT · · · · · · · · · *Aug. 2018 - April. 2019*

- Developed a fully-convolutional conditional generative network which is capable of view synthesis using a light-weight neural network suited for real-time applications.
- Introduced the conditional transformation unit which is designed to learn the latent space transformations corresponding to specified target views. (*Relevant publication:* [*J3*])

Visual Programming Language for Mobile Robots and IoT Nodes · · · · · · · · · *C-design LAB, Purdue Univ.*

GRADUATE ASSISTANT · · · · · · · · · *Aug. 2018 - Feb. 2019*

- Proposed a web-based visual and spatial programming language that allows novice users and small industries to program mobile robots and IoT Nodes to execute planned tasks.
- Developed a virtual world using Robotic Operating System (ROS) and GAZEBO which simulates interaction between mobile robots and IoT devices.

SleekPatch · · · · · · · · · *C-design LAB, Purdue Univ.*

GRADUATE ASSISTANT · · · · · · · · · *Aug. 2018 - Dec. 2018*

- Proposed a parametrizing interface, simple and accessible fabrication workflow, and a pressure sensor using a soft piezoresistive elastomer material. Also, developed embedded system using Arduino and analyzed signals from different sensors and materials. (*Relevant publication:* [*C3*])

3D Deep Neural Network evaluation method · · · · · · · · · *Knowledge-Based Design LAB, Yonsie Univ.*

UNDERGRADUATE RESEARCH ASSISTANT · · · · · · · · · *Feb. 2016 – Jul. 2017*

- Proposed an evaluation method for 3D Deep Neural Networks by visualizing the impact of each voxel of each 3D objects and also a web-based 3D CAD search engine using a 3D Deep Neural Network for demonstration. (*Relevant publication:* [*J2*][*C2*])

Web-based Surgical Workflow Management Platform · · · · · · · · · *Knowledge-Based Design LAB, Yonsie Univ.*

UNDERGRADUATE RESEARCH ASSISTANT · · · · · · · · · *Feb. 2016 – Aug. 2016*

- Developed a web-based interface and database for integrated surgical information, to optimize surgical procedures and reduce the medical loss caused by communication errors and lack of information. (*Relevant publication:* [*C1*])

Working Experience

Python Developer · · · · · · · · · *Seoul, South Korea*

FINANCIAL INSIGHT · · · · · · · · · *Jan. 2018 - Jul. 2018*

- Worked as a Python developer in an early-stage startup company. Developed a web-scrapper and database for collecting financial data of the Korean stock market.

Python Developer and CEO · · · · · · · · · *Seoul, South Korea*

NEIL LAB CORPORATION · · · · · · · · · *Sep. 2016 - Dec. 2017*

- Developed an office automation system using Python specifically for automating tasks such as sending an e-mail or issuing receipts, and designed a back-end system and database for customer web-service which automatically scrap and integrate customer's financial and personal data. (*Relevant patent:* [*P1*])
- Founded and led a startup company as a CEO for a year and also worked as a Python developer. The company was funded $ 30,000 by the Seongnam Industry Promotion Agency.

Mechanic and Squad leader · · · · · · · · · *Inje, South Korea*

REPUBLIC OF KOREA ARMY · · · · · · · · · *Apr. 2011 – Jan. 2013*

- Maintained military weapons and equipment including firearms and vehicles.
- Led a squad as a squad leader; honored as a distinguished soldier.

Extracurricular Activity

Habitat for Humanity Korea Campus Chapter · · · · · · · · · *South Korea*

MEMBER & PRESIDENT · · · · · · · · · *Mar. 2010 – Aug. 2016*

- Constructed new houses for the homeless and renovated old houses, served more than 500 hours.
- Led and managed a volunteer group for a year; received the first honor from 2014 Yonsei Club Evaluation.

Korea Food for the Hungry International - campus volunteer group   *South Korea*

Member   *Apr. 2013 – Nov. 2013*

- Mentored preschool children and elementary school students at the Seoul Children's Center

Honors & Awards

2016   **KISTI (Korea Institute of Science and Technology Information) President's Award**,   *Seoul, South Korea*
         Edison Challenge – Computer Aided Design Section

2016   **CDE (Korea Society for Computational Design and Engineering) President's Award**,   *Daejeon, South Korea*
         CDE Challenge – Computational Design and Engineering Tools Section