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 Mechanical Component Benchmark Dataset [C5] — *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.
- 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 segmentation with RGBD-T data [*C4*]

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.
- Developed a method which segment hands and objects with a multi-modal Deep Neural network dealing with RGBD-T data.

Part Geometry Net (PGNet) [*J4*]

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.

Latent Transformation Neural Network (LTNN) *[J3]*

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.

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 *[C3]*

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.

3D Deep Neural Network evaluation method *[J2][C2]*

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.

Web-based Surgical Workflow Management Platform *[C1]*

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.

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**, 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*