

Jihoon Chung, WELL AP, LEED GA, FMP

CONTACT INFORMATION

Center for Architecture Science and Ecology
Rensselaer Polytechnic Institute
New York, United States

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RESEARCH INTERESTS

Building Information Modeling / Internet of Things / Ontology
digital twin, occupant behavior modeling, co-simulation, indoor environmental quality, building energy simulation, building monitoring system, interoperability, semantic web technology, parametric design, machine learning, computer vision, natural language process

EDUCATION

Rensselaer Polytechnic Institute, New York, United States

Ph.D., Architectural Science (Built Ecologies), GPA: 4.0/4.0, August 2021 – Current

- Advisor: Dr. Dennis Shelden
- Expected Graduation: May 2025

Graduate Certificates, GPA: 4.0/4.0, May 2024

- Machine Learning & AI / Business Intelligence

M.S., Architecture (Design Technology), GPA: 4.0/4.0, December 2023

- Advisor: Dr. Dennis Shelden

Yonsei University, Seoul, Korea

M.S., Architectural Engineering (Construction IT), GPA: 3.97/4.0, February 2021

- Thesis: “Technical Specification Framework for 3D Concrete Printers”
- Advisor: Dr. Ghang Lee

B.Arch, Architecture (5-year program), February 2019

- Thesis: “Haebang-ro: Relationship between Haebang-chon and Yongsan Park”
- Advisor: Moongyu Choi, AIA & KIRA

National University of Singapore, Singapore

Exchange Program for a year in AY2017

Gunmyungwon (건명원), Seoul, Korea

Future New School of Humanities, Arts & Science, February 2016

RESEARCH & WORK EXPERIENCE

Lawrence Berkeley National Laboratory, California

January 2024 – Current

Research Affiliate

- Enhanced standardized occupant behavior schema (obXML v.1.4) as a part of the ASHRAE RP-1815 project
- Updated the obFMU Application Guide and IDF files in the tutorial to enhance the compatibility with the latest version of EnergyPlus (v.24.1.0)
- Exploring development of a web platform for real-time energy simulation using EnergyPlus, occupant behavior simulator (obFMU), and sensor data
- Developing a data-driven occupant behavior simulator by integrating BIM and IoT
- Hosted by Dr. Tianzhen Hong

Center for Architecture Science and Ecology, New York

August 2021 – Current

Research Assistant

- Developed a web-based monitoring system for occupant behavior based on BIM, IoT, building automation system, and semantic web technologies

- Proposed an ontology recommending a viable solution to improve indoor environmental quality for multiple occupants and reduce energy use in a room
- Designed Arduino circuit boards and developed a web server for IoT-based plant modules to automatically manage the plant health and improve indoor air quality as a part of Plant Pixel project sponsored by OBMI

Autodesk, New York

May 2023 – August 2023

Intern, Sustainable Active and Passive Mechanical Systems Simulation and Optimization

- Explored integration of generative design process with natural ventilation simulation for evaluating the performance of the ventilation systems at the early design stage using EnergyPlus
- The internship project was published and introduced on the Autodesk Research blog [URL]
- Volunteered to support AEC Mentor Program for underrepresented-minority teenagers who participated in a paid two-week internship at Autodesk's Boston office

Saman Corporation, South Korea

February 2021 – July 2021

Researcher

- Planned application services using real-time data collected from IoT sensors on construction sites in a national research project 'Development of and digital twin platform for smart construction'
- Assisted to prepare kick-off meetings and presentations in a national research project 'XR Flagship Project (Construction part)'
- Wrote bills of quantities in a pilot design project on a box culvert organized by Korea Expressway Corporation

Building Informatics Group, Yonsei University

February 2018 – January 2021

Research Assistant

- Proposed a technical specification framework for 3D concrete printers through a systematic literature review and a Delphi study
- Developed a multi-dimensional classification algorithm for housing defects text data using BERT-based multitask learning technique (Recurrent Neural Network)
- Explored optimization algorithm for buildability of 3D concrete printing focused on operation planning and concrete properties

ATEAM Ventures, South Korea

May 2015 – August 2015

Strategic Planning staff

- Planned strategies for marketing & sales and held a 3D-printer exhibition at KINTEX, Ilsan
- Installed a factory to assemble 3D-printers and managed mechanical components
- Managed all customer inquiries, wrote customer manuals, and sent thank-you letters to early customer

XbarX (X_X), South Korea

May 2014 – February 2015

Sales Director & Co-founder

- Launched a beer recommendation app and beer-distribution web platform
- Got partnerships with 218 beer pub, bar, and restaurant in Seoul, South Korea
- Got a shared 3rd award with a \$4,500 cash prize in 'The 3rd Chung Ju-young Start-up Competition' and funding, \$140,000 from a start-up accelerator

TEACHING
& MENTORING
EXPERIENCE

Rensselaer Polytechnic Institute, New York

August 2021 – Current

Guest Lecturer

- 'Node-RED 101 for your own Smart IoT-based System' in 'Internetworking of Things (ECSE-4660/ECSE-6660)' course (February 23, 2024)

Project Mentor

- Taught and led an undergraduate group in a research-oriented class 'Research Investigation (ARCH-4958)' (Fall 2022 & Fall 2023)
- Advised an undergraduate to develop an algorithm evaluating plants' health using a color sensor as a part of the Plant Pixel project sponsored by OBMI (Fall 2023)
- Provided advice to undergraduates in an interdisciplinary project 'Smart Dormitory Devices and Development System (ECSE-4900)' (Fall 2022, Spring 2023 & Fall 2023)
- Participate in *Smart City Hackathon 2023* organized by Tech Valley Center of Gravity as a microcontroller-knowledgeable mentor (October 13-15, 2023)

Workshop Instructor

- 'Build an IoT Monitoring System for Your Smart Home' at Black Families Technology Awareness Day (February 12, 2022 & February 4, 2023)

Microsoft TEALS, New York

August 2023 – Current

Programming Teaching Assistant

- AP Computer Science A (Spring 2024) at El Camino High School, San Francisco, CA
- AP Computer Science Principles (Fall 2023) at Franklin D Roosevelt High School, NYC

Lawrence Berkeley National Laboratory, California

June 2024 – July 2024

Teaching Assistant & Project Facilitator

- Intro to Python & Data Science course in Experiences in Research (EinR) bootcamp 2024 (6-week summer internship)
- Intro to Python & Data Science course in Berkeley Lab Director's Apprenticeship Program (BLDAP) 2024
- Robotics projects in Science Accelerating Girls' Engagement in STEM (SAGE) summer camp 2024

Code Nation, New York

August 2022 – June 2024

Programming Teaching Assistant

- Intro to Web Development (Spring 2024) course at Collegiate Institute for Math & Science, NYC
- Intro to Web Development (AY2022–2023) & Fellowship I (JavaScript/jQuery, Fall 2023) courses at Achievement First East Brooklyn High School, NYC

Yonsei University, South Korea

March 2019 – June 2020

Teaching Assistant

- Engineering-Information Processing (Spring 2020)
- Computer Lab Manager (Spring 2019)

PUBLICATIONS

(Accepted) Chung, J. and Shelden, D. (2024) "A Framework of ifcJSON-based Digital Twin Platform for Monitoring Building Environment using BIM, IoT, and Semantic Web Technologies" *Proceedings of the 20th International Society for Computing in Civil and Building Engineering*

(Accepted) Chung, J., Karlicek, B., and Shelden, D. (2024) "Towards Real-Time Occupant Behavior Monitoring System: A Preliminary Study on Integrating BIM, IoT Sensors, and BAS" *Proceedings of ASCE International Conference on Computing in Civil Engineering 2024*

(Submitted) Chung, J., Neo, K., Khan, M., Cruz, E., Zheng, Z., Munasinghe, T., and Wei, J. C. (2024) "Exploring Flooding Fraction Prediction through Machine Learning Models Focusing on Medical Infrastructure in the Southeast U.S. Coastal Areas" *Proceedings of the IEEE BigData 2024*

Chung, J., Shahmansouri, N., Stoddart, J., Goldstein, R., and Locke, J. (2024) "Sustainability through Optimal Design of Buildings for Natural Ventilation using Updated Comfort and Occupancy Models" *Proceedings of International Building Performance Simulation Association – USA and SimBuild 2024*

Chung, J., Hong, T., Karlicek, R., Santos, H., Shelden, D., and Sparks, D. (2024) "Distributed Semantics to Support Built Environment Digital Twins" *Proceedings of NSF Workshop on Sustainable Computing for Sustainability 2024*

Chung, J., Tsamis, A., and Shelden, D. (2023) "A framework for monitoring and identifying indoor air pollutants based on BIM with IoT sensors" *Proceedings of Computer-Aided Architectural Design. INTERCONNECTIONS: Co-computing beyond boundaries: 20th International Conference, CAAD Futures 2023*, pp. 518-531, Delft, Netherlands, 5 Jul., https://doi.org/10.1007/978-3-031-37189-9_34

Chung, J., Jacoby-Cooper, G., Rook, K., Henrique, S., Shelden, D., Kendall, E., and McGuinness, D. (2023) "Towards an Indoor Environmental Quality Management Ontology" *Proceedings of First International Workshop on Semantic Web on Constrained Things @ ESWC-23 (SWoCoT-23)*, pp. 16-26, Hersonissos, Greece, 28 May., <https://hdl.handle.net/20.500.13015/6674>

Chung, J., Lee, G., and Kim, J. (2021) " Framework for Technical Specifications of 3D Concrete Printers" *Automation in Construction*, 127, 103732, <https://doi.org/10.1016/j.autcon.2021.103732>

(Submitted) Woo, J., **Chung, J.,** and Koo, H. (2021) " A Study on the Pedestrian Route Choices and Accessibility in the Retail Areas after Acute COVID-19: Focused on the Peak Commercial Activity's Hours in the Mangwon District" *Journal of the Urban Design Institute of Korea*

Chung, J., Lee, G., Kim, J. and Choi, J. (2020) "A Comparative Analysis of the Classification System for Three-Dimensional Concrete Printers" *Korean Journal of Construction Engineering and Management*, 21(2), 3-14, <https://doi.org/10.6106/KJCEM.2020.21.2.003>

Chung, J., Lee, G., and Kim, J. (2020) "A Systematic Review of the Geographic and Chronological Distributions of 3D Concrete Printers from 1997 to 2020", *Proceedings of the 37th International Symposium on Automation and Robotics in Construction (ISARC)*, pp. 84-19, Kitakyushu, Japan, 27-28 Oct., <https://doi.org/10.22260/ISARC2020/0014>

Lee, G., Cho, J., Song, T., Roh, H., Jung, J., **Chung, J.,** Yong, G., and Jeong, D. (2020) "Construction Field Management Using a Popular Text Messenger" *Proceedings of the 18th International Conference on Computing in Civil and Building Engineering*, pp. 971-979, https://doi.org/10.1007/978-3-030-51295-8_67

Chung, J., Lee, G., and Kim, J. (2018), "Performance Evaluation Criteria for Building 3D Printing Focused on Concrete Properties", *Proceedings of the 2018 Annual Conference of the Korea Institute of Construction Engineering and Management*, pp. 27-29, South Korea, 9 Nov.

PATANT

(Submitted) **Chung, J.,** Stoddart, J., Locke, J., Goldstein, R., and Shahmansouri, N. (2024) "Automated Generation and Analysis of Natural Ventilation Performance Using Tile-based Building Geometry", USA

(Submitted) **Chung, J.,** Stoddart, J., Locke, J., Goldstein, R., and Shahmansouri, N. (2024) "Automated Comparative Analysis of Alternative Comfort and Occupancy Models in Building Energy Analysis", USA

Kim, J., Lee, G., Lee, D., Lee, J., **Chung, J.** (2020), "3D printer for construction with continuous printing on the go and 3D printing system comprising it", Application Serial No. KR20200101482A, South Korea, <https://patents.google.com/patent/KR20200101482A/ko>

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| ARTICLE | Chung, J. (2024) "Want To Be More Comfortable Indoors? Let Your Building Help" <i>Every Day Matters</i> : RPI Blog, [URL] | |
| | Lee, G., Chung, J. , and Kim, J. (2021) "On What Basis Should We Buy a 3D Concrete Printer?" <i>Building Construction</i> , 21(4), 31-34, [URL] | |
| HONORS & AWARDS | DB Dream Master Scholarship Award <i>DB Kim-Jun-Ki Cultural Foundation, South Korea</i> | May 2024 |
| | IBPSA-USA SimBuild Conference Student Scholarship Award <i>IBPSA-USA SimBuild Conference 2024, United States</i> | March 2024 |
| | Graduate Research Symposium (Podium Presentations) , The 3 rd Prize <i>Rensselaer Polytechnic Institute, New York</i> | June 2022 |
| | Research Assistantship Award for 2021-2025 academic year <i>Rensselaer Polytechnic Institute, New York</i> | August 2021 |
| | The 17th Outstanding Thesis Competition , Honorable Mention <i>Architectural Institute of Korea, South Korea</i> | April 2021 |
| | 2019 Yonsei Startup Lab Contest (\$2,700) , Best Startup Award <i>Yonsei University, South Korea</i> | July 2019 |
| | 2018 KICEM Annual Conference , Excellent Paper Award <i>Korea Institute of Construction Engineering and Management, South Korea</i> | November 2018 |
| | Academic Scholarships for four semesters <i>Yonsei University, South Korea</i> | March 2016 – September 2018 |
| | The 12th Architectural Engineering Competition , Excellent Award <i>The Korean Structural Engineers Association, South Korea</i> | September 2016 |
| | Volunteer Full-Scholarship for two semesters <i>DB Kim-Jun-Ki Cultural Foundation, South Korea</i> | March & September 2016 |
| RESEARCH PROJECTS | The 3rd Chung Ju-yung Startup Competition (\$4,500) , Excellent Startup Award <i>The Asan Nanum Foundation, South Korea</i> | August 2014 |
| | The 18th National Boxing Competition for Non-Athlete , The 1 st Prize <i>Korea Boxing Institution, South Korea</i> | August 2012 |
| | Chief Superintendent's Award for Leadership <i>Seoul Metropolitan Office of Education, South Korea</i> | May 2011 |
| | Plant Pixel <i>OBM International, United States</i> | August 2023 – December 2023 |
| | Development of Digital Platform and Digital Twin based on Management Technology for Smart Construction <i>Korea Agency for Infrastructure Technology Advancement (KAIA)</i> | February 2021 – July 2021 |
| | XR Flagship Project (Construction part) <i>Ministry of Science and ICT & National IT Industry Promotion Agency, Korea</i> | June 2021 – Jul 2021 |
| | Development of Innovative Design, Material and Equipment for 3D Printing Small Buildings/Freeform Members <i>Korea Agency for Infrastructure Technology Advancement (KAIA)</i> | March 2018 – February 2021 |

PRESENTATIONS
& INVITED TALKS

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| How Programming is Used in Architecture & Building Technology? <i>Computer Science Career Panel, El Camino High School</i> | April 11, 2024 |
| A Daily Flooding Risk Assessment Map for Medical Infrastructures Using Machine Learning Algorithms <i>AGU23 Fall Meeting [Poster]</i> | January 22, 2024 |
| A framework of BIM & IoT-based Building Infrastructure for Monitoring Indoor Air Quality and Occupant Behavior <i>Research Showcase — Reunion & Homecoming 2023, RPI [Poster]</i> | October 13, 2023 |
| Sustainability through Optimal Design of Buildings for NV and Post-Occupancy Using Updated Comfort Models <i>Research Connections — Summer Intern Series, Autodesk [Oral]</i> | August 17, 2023 |
| Daily Flooding Risk Assessment Map for Medical Infrastructures using Machine Learning Algorithm <i>AmeriGEO Week 2023 'Data Driven Solutions for a Sustainable Planet' [Poster]</i> | August 8, 2023 |
| A framework for monitoring and identifying indoor air pollutants based on BIM with IoT sensors <i>20th International Conference of CAAD Futures 2023 [Oral]</i> | July 7, 2023 |
| Towards an Indoor Environmental Quality Management Ontology <i>2023 8th Annual Graduate Research Symposium, RPI [Oral]</i> | May 12, 2023 |
| A framework for monitoring and identifying indoor air pollutants based on BIM with IoT sensors <i>2023 8th Annual Graduate Research Symposium, RPI [Poster]</i> | May 12, 2023 |
| Air Quality Monitoring System based on BIM & IoT <i>EBESS Industry Workshop 'Well-being & Sustainability in the Built Environment', RPI [Poster]</i> | November 2, 2022 |
| Air Quality Monitoring System based on BIM & IoT <i>2022 Three Minute Thesis, RPI [Oral]</i> | May 13, 2022 |
| Air Quality Monitoring System based on BIM & IoT <i>2022 7th Annual Graduate Research Symposium, RPI [Poster, Oral – 3rd Place]</i> | May 13, 2022 |
| A Systematic Review of 3D Concrete Printers from 1997 to 2020 <i>37th International Symposium on Automation and Robotics in Construction (ISARC) [Oral]</i> | October 28, 2022 |
| Performance Evaluation Criteria for Building 3D Printing <i>2018 Annual Conference of KICEM [Oral]</i> | November 30, 2018 |

SKILLS

Programming Languages: Python, C#, JAVA, C++, JavaScript (Node.js, Three.js, ifc.js, Express.js, Node-RED), P5 Processing, SPARQL, SQL
CAD/CAE: Rhino (+Grasshopper, Ladybug, Honeybee, Butterfly), Revit (+Dynamo, Ladybug, Honeybee, Butterfly), Sketchup, CATIA, AutoCAD, Midas Civil
Design tools: Adobe Photoshop, Illustrator, InDesign, Premiere Pro, Experience Design
Machining: Arduino, Raspberry Pi, 3D printer, Laser Cutter
Others: OpenStudio (+EnergyPlus), Functional Mockup Unit (+obFMU, EnergyPlusFMU), Tensorflow (+Keras), Pytorch, SPSS, Protégé

CERTIFICATIONS

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| Facility Management Professional (Credential ID: 1193106) <i>International Facility Management Association (IFMA)</i> | June 27, 2024 |
| WELL AP (Credential ID: WELL-AP-0000134489) <i>International WELL Building Institute (IWBI)</i> | February 6, 2023 |

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| LEED Green Associate (Credential ID: 11476216-GREEN-ASSOCIATE) <i>U.S. Green Building Council</i> | August 13, 2022 |
| 2020 AI Technical Development Workshop (Image/Video Recognition) <i>Korea Electric Power Corporation (KEPCO)</i> | August 7, 2020 |
| The 9th Image Recognition Application Workshop <i>Fast Campus (패스트캠퍼스)</i> | October 19, 2019 |
| The 3rd Object Detection Application Workshop <i>Fast Campus (패스트캠퍼스)</i> | September 7, 2019 |
| DA BIM Specialist Intermediate Workshop <i>DAGROUP Urban Design & Architecture Co., Ltd</i> | July 14, 2019 |
| 2018 BIGDATA X CAMPUS (Python-based Big Data Analysis) <i>Korea Data Agency</i> | June 14, 2018 |

ACADEMIC SERVICE

Scientific Article Reviewer

- IBPSA-USA SimBuild 2024

Invited Juror

- Architectural Drawing & Representation at GSAPP, Columbia University (Fall 2023)

Judge

- Green Scholars Program Science Fair 2024
- Contra Costa County Science & Engineering Fair 2024
- Alameda County Science & Engineering Fair 2024

Application Reviewer

- Science en Accion 2024 at Berkeley Lab (9 applications)
- Science Accelerating Girls' Engagement in STEM (SAGE) 2024 at Berkeley Lab (19 applications)
- Quantum, Computing, Mathematics & Physics (QCaMP) 2024 at Berkeley Lab (19 applications)
- Berkeley Lab Director's Apprenticeship Program (BLDAP) 2024 (17 applications)

Session Chair

- IBPSA-USA SimBuild 2024

Committee Member

- IBPSA-USA, Emerging Professionals and Students organizing committee, International Building Performance Simulation Association
- ASHRAE, Technical Committee, The American Society of Heating, Refrigerating and Air-conditioning Engineers

LEADERSHIP EXPERIENCE

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| Project leader , Rensselaer Polytechnic Institute | January 2023 – May 2024 |
| <ul style="list-style-type: none"> • Led a class project with six computer-science students in <i>Xinformatics</i> and <i>Data Science</i> courses aiming to develop machine learning models for predicting flood using big data from NASA, FEMA, and HIFLD • Had poster presentations at <i>AGU23 Fall Meeting</i> and <i>AmeriGEO Week 2023</i> • Collaborated with Dr. Jennifer Wei, NASA Lead Scientist, and Thilanka Munasinghe, RPI Lecturer for publication | |
| Project leader , Social Algorithm 7.0 Workshop | August 2020 |
| <ul style="list-style-type: none"> • Led a team project in an international online-workshop organized by Social Algorithm Research Group | |

- Analyzed spatial network using Rhino + Grasshopper with Python, and conducted on-site surveys for the validation
- Based on the analysis result, submitted a journal article to *Journal of the Urban Design Institute of Korea*

Casting Director & Co-founder, We Ask, Korea **January 2013 – September 2014**

- Co-founded a conference-planning organization called '젊음이 묻습니다', gathering 100+ NGO-interested students
- Invited 30+ celebrities to have talks with students, such as Im Kwon-taek, Ko Un, Kim Jung-man, and so on
- Got sponsorships from publishers, theatres, and student councils to implement marketing plans

The 9th Chief Representative, Global Intelligence, Korea **January 2012 – July 2013**

- Directed a volunteer group consisting of 69 college students to organize mentoring programs for teenagers

**VOLUNTEER
EXPERIENCE**

Lawrence Berkeley National Laboratory, California **January 2024 – Current**
Application Review Board / Mentor / STEM Activity Supporter

Y-Zone Project in STEM Alliance, New York **October 2021 – September 2022**
Bilingual (Korean/English) Volunteer Translator

Major Mentoring Program in Yonsei University, Korea **March 2019 – May 2021**
Architecture-Major Mentor

Architecture School in Junglim Foundation, Korea **August 2018 – October 2018**
Architecture Tutor

Global Volunteering Program in Dongbu Foundation, Vietnam **January 2017**
Student Volunteer

Student Volunteer Group in Dongbu Foundation, Korea **February 2016 – February 2017**
Volunteer & Scholarship Holder

Global Engineering Program in Yonsei University, Indonesia **August 2016**
Student Volunteer & Assistant Manager

Seoul Junghwa Secondary School, Korea **September 2012 – December 2012**
Speech Tutor

Seoul Soongduck Primary School, Korea **March 2012 – July 2013**
Speech Tutor

Kyoto International School, Japan **August 2012**
Korean Tutor

REFERENCES

Available upon request.