CONTACT

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MORE

Website ([LINK])
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ABOUT

I am passionate about integrating machine learning, augmented reality, and virtual reality technologies into computational design research.

I am seeking to join an interdisciplinary team dedicated to developing innovative solutions to real-world design problems.

RESEARCH INTERESTS

Data-Driven Generative Design Models(AI):
Focusing on Diffusion Models, Markov Chain Monte Carlo Sampling, and Hybrid Bayesian Networks.

Interactive Design Representation:
Specializing in using Augmented Reality and Virtual Reality to create design presentations and innovative user experiences.

CURRICULUM VITAE

Woongki Sung

Ph.D. in Design and Computation

EDUCATION

Massachusetts Institute of Technology
Ph.D. in Design and Computation, 2024 (Minor in Artificial Intelligence)

- Thesis Topic: Data-driven approach in generating architectural designs – Developed a sampling-based generative framework to create architectural floor plan configurations.
- Committee: Takehiko Nagakura, Patrick H Winston, Dennis R. Shelden, Axel Kilian.

Massachusetts Institute of Technology
Master of Science in Architecture Studies in Design and Computation, 2013

- Thesis Topic: Spatial Sketching in 3D – Developed an interactive AR modeling tool for 3D sketching.
- Committee: Takehiko Nagakura, George Stiny.

Yonsei University
Bachelor of Science in Architectural Engineering, (Minor in Human Environment Design)

- Primary Areas of Design: Architecture, Product design, Web design.
- Academic Advisor: Sangjun Lee.

RESEARCH EXPERIENCE

MIT ARC Lab (2014 - Present), MA, USA
Lead developer / Designer / Research Assistant (Lab led by Prof. Takehiko Nagakura at MIT)

- Researching the integration of AI and AR/VR into design practice. Currently implementing an AI design generator with a symbolic graph structure.
- Developed a series of mobile AR applications and coordinated exhibitions including "AR Travel to Aalto House" in Tokyo, Japan, with art directors and construction partners.
- Implemented a context-free grammar based parser and generator to generalize spatial compositions of design components and to produce new possible compositions.
- Led and organized a series of workshops in US, Japan and China to teach university students software packages (Rhino3D, Unity and Autodesk Recap) to create AR/VR applications.

Design Heritage: MIT-SUTD IDC (2018 - 2019), Singapore
Lead developer / Research Assistant (Lab led by Prof. Takehiko Nagakura at MIT)

- Conducted a series of workshop to teach photogrammetry and AR/VR technology software packages to design students and professionals.
- Planned and executed large-scale photogrammetry scanning sessions to digitally document Borobudur Temple in Indonesia.
- Developed a mobile AR application prototype to present the digital model of Borobudur Temple in Indonesia.

VLSP (Very Large Scale Prototyping) project at MIT (2012 - 2013)
Lead developer / Research Assistant (Lab led by Prof. Lawrence Sass at MIT)

- Developed a software plug-in (Rhino 3D) that generated feasible assembly plans for a large scale physical models from 3D scanned point data of a real object.
- Planned and conducted large scale experiments to validate the proposed fabrication methodology to create a large scale physical model.

PUBLICATIONS AND EXHIBITIONS

"AI and Creativity in Sampling Designs (WIP)" Manuscript in preparation, Acadia 2025, Sung et al.

"Singapore GeAR" Exhibition at ACM SIGGRAPH 2024 Appy Hour, 2024, Nagakura et al. **[DEMO]**

"Design Contextualism by AI" In Proceedings of the 42nd Conference ACADIA, 2022, Sung et al.

"AR Travel to Aalto House" Exhibition at Aino and Alvar Aalto: Shared Visions in Tokyo, Japan, Nagakura, Takehiko et al. **[DEMO]**

"Spatial Typology for BIM' (Vol. 1, pp. 1–8). Presented at the eCAADe, 2017, Sung et al. **[DEMO]**

"AR Mail from Harbin," ACM SIGGRAPH 2017 VR Village, 2017, Nagakura et al. **[DEMO]**

"Ramalytique: Augmented Reality in Architectural Exhibitions" In Conference on Cultural Heritage and New Technologies 19th Proceedings, 2014, Nagakura et al.

"Sketching in 3D" Presented in Digital Media Design Exhibition, 2013 **[DEMO]**

"Surface Skeleton Generation Based on 360-Degree Profile Scan" SPIE Optical Metrology, 2013, Chen et al.

"Embodied Prototyping: Exploration of a Design-Fabrication Framework for Large-Scale Model Manufacturing." CAD and Applications 13, 2015, Sass et al.

TEACHING EXPERIENCE

Introduction to Building Information Modeling in Architectural Design (2014-2020)
Teaching Assistant, Class taught by Prof. Takehiko Nagakura at MIT

- Developed teaching materials and operated an office hours to educate Autodesk Revit software and associated parametric design tools (Dynamo and Design Script).
- Graded course assessments and supervised students with BIM-based project developments.

Advanced Visualization in Architecture (2014 - 2020)
Teaching Assistant, Class taught by Prof. Takehiko Nagakura at MIT

- Created instructional materials and conducted office hours to teach Unity3D, AR/VR packages to quickly assemble an interactive AR mobile application to present architectural spaces.
- Supervised and instructed students in developing unique AR applications that best suited individual design concepts and spatial ideas.

Digital Heritage (2015-2017)
Teaching Assistant, Class taught by Prof. Takehiko Nagakura at MIT

- Introduced a game engine, photogrammetry modeling, AR/VR toolkits and the basics of programming to create architectural digital application to represent and explore historical buildings and sites.

Digital Technology and Architecture (2016-2018)
Main Instructor / International Workshop / MIT-HIT workshop series

- Developed a software plug-in (Rhino 3D) that generated feasible assembly plans for a large scale physical models from 3D scanned point data of a real object.
- Planned and conducted real scale experiments to validate the proposed fabrication methodology to create a large scale physical model.

Digital Heritage in Kyoto (2017 - 2018)
Main Instructor / International Workshop / MIT-KIT workshop series

- Mentored student groups from MIT and Harvard, teaching foundational math and programming languages for machine learning applications in design.
- Guided students in the preparation and presentation of their research findings.

Materializing Shapes: Computing for cross scale fabrication (2013)
Teaching Assistant, Class taught by Prof. Larry Sass at MIT

- Taught parametric modeling tools and a scripting language (Grasshopper and Rhinoscript).
- Instructed CAD/CAM software and fabrication (CNC, 3D printing machines and robotic arms).

TECHNICAL SKILLS

Programming Language: Python, C++, C#, JavaScript, MATLAB, Java

3D CAD/Engineering: Rhino3D, 3D Max, AutoCAD, Revit

AR/VR Development: Unity3D with AR foundation

2D Designs: Photoshop, Illustrator, Premiere Pro, InDesign

PROFESSIONAL EXPERIENCE

JUNGLIM Architecture (2010)
Architectural Designer, Researcher

- Worked at NUDL(Non Uniform Design Lab) department in Junglim architecture.
- Participated in architectural design projects focusing on creating digital models and producing construction plans for curvilinear building forms..

Gansam Architects and Associates (2007 - 2009)
Architectural Designer, Researcher

- Worked at G.Lab, a research department established to apply new technologies into practice.
- Focused on experimenting new fabrication methods, such as CNC and FRP, and developing customized parametric modeling tools for real architectural projects.

HONORS AND AWARDS

The Presidential Fellowship
Department of Architecture, MIT
Awarded to the most outstanding students at the Institute

Arthur Rotch Special Prize
Department of Architecture, MIT
Awarded to a graduating Master of Science in Architecture Studies student with the Highest Academic Achievement

Merit-Based Fellowship
Department of Architecture, MIT
Awarded to a graduate student with an excellent academic performance

Tuition Support Grant
Department of Architecture, MIT
Awarded to new graduate students with an exceptional application

Honorable Mention at the International Competition for Culture House at BODO
Teamwork at Junglim Architects
Awarded at the architectural competition

Excellence Award in Graduation Exhibitions
Yonsei University
Awarded to a student with an excellent graduation project

Honor Student Award
Yonsei University
Awarded to a student with the highest academic performance