Hao **ZHENG**

Address: Suite 420, Festival Walk Office Tower, 80 Tat Chee Avenue, Kowloon Tong, Kowloon, Hong Kong
Phone: +852 98805634
Email: hazheng@cityu.edu.hk
Website: https://www.architecturalintelligence.group/

SHORT BIO

Dr. Hao Zheng currently serves as an Assistant Professor at the Department of Architecture and Civil Engineering, City University of Hong Kong. He graduated from the Ph.D. program at the University of Pennsylvania, specializing in machine learning, urban big data, data-driven design, digital fabrication, and mixed reality. He holds a Master of Architecture degree from the University of California, Berkeley, and Bachelor of Architecture and Arts degrees from Shanghai Jiao Tong University. Previously, Hao worked as a research assistant at Tsinghua University and UC Berkeley with a concentration on the robotic assembly, machine learning, and bio-inspired 3D printing. His teaching experience includes: workshop tutor at Tongji University; lecturer at the University of Pennsylvania; teaching fellow at Shanghai Jiao Tong University. Also, Hao serves as the co-organizer and reviewer for international conferences of ACADIA, CAADRIA, CDRF, and SCI/SSCI/AHCI journals. His publication includes around 30 papers in top international conferences and SCI/AHCI journals.

EDUCATION

2018 - 2022
University of Pennsylvania, PhD in Architecture
- Machine Learning in Architectural Design
- Fully-funded by PennDesign Fellowship

2016 - 2017
University of California, Berkeley, Master of Architecture
- Computational Design and Digital Fabrication
- GPA: 3.98/4

2011 - 2016
Shanghai Jiao Tong University, Bachelor of Architecture
- Architectural Design Major with Literature Minor
- GPA: 3.43/4

WORK EXPERIENCE

City University of Hong Kong
12/2022 – present
- Assistant Professor
- Department of Architecture and Civil Engineering

Tongji University
06/2022–07/2022|06/2021–07/2021|06/2020–07/2020|06/2019–07/2019
- Workshop Tutor
- DigitalFUTURES 2019/2020/2021/2022

Shanghai Jiao Tong University
09/2020 – 08/2021
- Teaching Fellow
- AR26003 - Parametric Design and Digital Construction

University of Pennsylvania
08/2020 – 12/2020 | 08/2019 – 12/2019
- Lecturer
- ARCH710 - Contemporary Theory

Tsinghua University
09/2017 – 04/2018
- Research Assistant
- Machine Learning and Digital Fabrication

University of California, Berkeley
01/2017 – 08/2017
- Research Assistant
- Machine Learning and Digital Fabrication

RESEARCH INTERESTS

- **Machine Learning**, Artificial Intelligence, Optimization;
- **Urban Big Data**, Data Mining and Analysis, Prediction and Simulation;
- **Data-Driven Design**, Computational Design, Parametric Design;
- **Digital Fabrication**, Robotic Construction, Additive Manufacturing;
- **Mixed Reality (MR)**, Virtual Reality (VR), Augmented Reality (AR).

REVIEWER EXPERIENCE

- Building and Environment (**SCI**)
- Buildings (**SCI**)
- Energies (**SCI**)
- Applied Sciences (**SCI**)
- IEEE Access (**SCI**)
- Cybernetics and Systems (**SCI**)
- International Journal of Environmental Research and Public Health (**SCI**) (**SSCI**)
- Sustainability (**SCI**) (**SSCI**)
- Cities (**SSCI**)
- Computers, Environment and Urban Systems (**SSCI**)
- Frontiers of Architectural Research (**AHCI**)
- International Journal of Architectural Computing (**EI**)
- The Association for Computer Aided Design in Architecture (**EI**)
- The Association for Computer-Aided Architectural Design Research in Asia (**EI**)
- Computational Design and Robotic Fabrication
- International Conference on Intelligent Computing in Engineering
- Technology | Architecture + Design
- Architectural Intelligence

PUBLICATIONS

Ph.D. Dissertation:

1. **Zheng, Hao**. "Geometry and Topology: Building Machine Learning Surrogate Models with Graphic Statics Method." *Publicly Accessible Penn Dissertations* 2022: 4713.

Journal Articles:

2. **Zheng, Hao**, Vahid Moosavi, and Masoud Akbarzadeh. "Machine Learning Assisted Evaluations in Structural Design and Construction." *Automation in Construction* 119 (2020): 103346. (SCI, IF: 10.517)
3. **Zheng, Hao**, and Philip F. Yuan. "A Generative Architectural Design Method Through Artificial Neural Networks." *Building and Environment* 205 (2021): 108178. (SCI, IF: 7.093)
4. He, Jingyi, and **Hao Zheng**. "Prediction of crime rate in urban neighborhoods based on machine learning." *Engineering Applications of Artificial Intelligence* 106 (2021): 104460. (SCI, IF: 7.802)
5. Zhang, Yecheng, Qimin Zhang, Yuxuan Zhao, Yunjie Deng, and **Hao Zheng**. "Urban spatial risk prediction and optimization analysis of POI based on deep learning from the perspective of an epidemic." *International Journal of Applied Earth Observation and Geoinformation* 112 (2022): 102942. (SCI, IF: 7.672)
6. Lu, Yijun, Wei Wu, Xuechuan Geng, Yanchen Liu, **Hao Zheng**, and Miaomiao Hou. "Multi-Objective Optimization of Building Environmental Performance: An Integrated Parametric Design Method Based on Machine Learning Approaches" *Energies* 2022; 15(19): 7031. (SCI, IF: 3.252)
7. **Zheng, Hao**, and Masoud Akbarzadeh. "The Dragonfly Wing Project." *Architectural Design* 92.3 (2022): 132-133. (AHCI)
8. Chen, Mengfan, **Hao Zheng**, and Jian Wu. "Computational Design of Multi-functional System Based on Generative Adversarial Networks: Taking the Layout Generation of Vocational and Technical College as an Example." *Architectural Journal* 2022 (S1): 103-108. (CSSCI)

Conference Proceedings:

9. Huang, Shuyi, and **Hao Zheng**. "Morphological Regeneration of the Industrial Waterfront Based on Machine Learning." *Proceedings of the 27th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Sydney, Australia*. 2022: 1.475-484.
10. Cao, Yu, **Hao Zheng**, and Shixing Liu. "Measurement of Spatial Openness of Indoor Space Using 3D Isovists Methods and Fibonacci Lattices." *Computer-Aided Architectural Design. Design Imperatives: The Future is Now.* 2022: 419-435.
11. Cao, Shicong, and **Hao Zheng**. "A POI-Based Machine Learning Method in Predicting Health." *Proceedings of the 41st Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA), Online, Global*. 2021: 160-169.
12. **Zheng, Hao**, Marton Hablicsek, and Masoud Akbarzadeh. "Lightweight Structures and the Geometric Equilibrium in Dragonfly Wings." *Proceedings of International Association for Shell and Spatial Structures Annual Symposia (IASS), Guildford, UK*. 2021: 1592-1603.
13. Cao, Shicong, and **Hao Zheng**. "A POI-Based Machine Learning Method for Predicting Residents' Health Status." *Proceedings of the 3rd*

International Conference on Computational Design and Robotic Fabrication (CDRF), Shanghai, China. 2021: 139-147.

14. Song, Jingwen, Yuetao Wang, Ping Chen, and **Hao Zheng**. "Ice Stereotomy - A Case Study of Free-Form Ice Shell." *Proceedings of the 26th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Hong Kong, China*. 2021: 1.311-320.
15. Shou, Xinyue, Pinyang Chen, and **Hao Zheng**. "Predicting the Heat Map of Street Vendors from Pedestrian Flow through Machine Learning." *Proceedings of the 26th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Hong Kong, China*. 2021: 2.569-578.
16. **Zheng, Hao**, Xinyu Wang, Zehua Qi, Shixuan Sun, and Masoud Akbarzadeh. "Generating and Optimizing a Funicular Arch Floor Structure." *Proceedings of the 40th Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA), Philadelphia, USA*. 2020: 208-217.
17. Sun, Yunjuan, Lei Jiang, and **Hao Zheng**. "A Machine Learning Method of Predicting Behavior Vitality Using Open Source Data." *Proceedings of the 40th Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA), Philadelphia, USA*. 2020: 160-168.
18. Ren, Yue, Jie Chu, and **Hao Zheng**. "Dynamic Symbiont." *Proceedings of the 38th International Conference on Education and research in Computer Aided Architectural Design in Europe (eCAADe), Berlin, Germany*. 2020: 1.383-392.
19. **Zheng, Hao**. "Form Finding and Evaluating through Machine Learning." *Architectural Intelligence* 2020: 207-217.
20. **Zheng, Hao**, and Yue Ren. "Machine Learning Neural Networks Construction and Analysis in Vectorized Design Drawings." *Proceedings of the 25th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Bangkok, Thailand*. 2020: 2.709-718.
21. **Zheng, Hao**, Keyao An, Jingxuan Wei, and Yue Ren. "Apartment Floor Plans Generation via Generative Adversarial Networks." *Proceedings of the 25th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Bangkok, Thailand*. 2020: 2.601-610.
22. **Zheng, Hao**, and Yue Ren. "Architectural Layout Design through Simulated Annealing Algorithm." *Proceedings of the 25th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Bangkok, Thailand*. 2020: 1.275-284.
23. Ren, Yue, and **Hao Zheng**. "The Spire of AI - Voxel-based 3D Neural Style Transfer." *Proceedings of the 25th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Bangkok, Thailand*. 2020: 2.621-630.
24. Shen, Jiaqi, Chuan Liu, Yue Ren, and **Hao Zheng**. "Machine Learning Assisted Urban Filling." *Proceedings of the 25th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Bangkok, Thailand*. 2020: 2.681-690.
25. Liu, Chuan, Jiaqi Shen, Yue Ren, and **Hao Zheng**. "Pipes of AI - Machine Learning Assisted 3D Modelling Design." *Proceedings of the 2nd International Conference on Computational Design and Robotic Fabrication (CDRF)*, Shanghai, China. 2020: 17-26.
26. **Zheng, Hao**, Vahid Moosavi, and Masoud Akbarzadeh. "Machine Learning Assisted Evaluations in 3D Graphic Statics." *Proceedings of International Association for Shell and Spatial Structures Annual Symposia (IASS),*

Barcelona, Spain. 2019: 1023-1024.

27. **Zheng, Hao**. "Form Finding and Evaluating Through Machine Learning: The Prediction of Personal Design Preference in Polyhedral Structures." *Proceedings of the 1st International Conference on Computational Design and Robotic Fabrication (CDRF), Shanghai, China.* 2019: 169-178.
28. **Zheng, Hao**, Zhe Guo, and Yang Liang. "Iterative Pattern Design via Decodes Python Scripts in Grasshopper." *Proceedings of the 18th International Conference on Computer-Aided Architectural Design Futures (CAAD Futures), Daejeon, Korea.* 2019: 526-537.
29. **Zheng, Hao**, Barrak Darweesh, Heewon Lee, and Li Yang. "Caterpillar - A Gcode Translator in Grasshopper." *Proceedings of the 24th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Wellington, New Zealand.* 2019: 2.253-262.
30. Huang, Weixin, and **Hao Zheng**. "Architectural Drawings Recognition and Generation through Machine Learning." *Proceedings of the 38th Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA), Mexico City, Mexico.* 2018: 156-165.
31. **Zheng, Hao**, and Simon Schleicher. "Bio-inspired 3D Printing Experiments." *Learning, Prototyping and Adapting, Short Paper Proceedings of the 23rd International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Beijing, China.* 2018: 65-70.
32. **Zheng, Hao**, and Weixin Huang. "Understanding and Visualizing Generative Adversarial Networks in Architectural Drawings." *Learning, Prototyping and Adapting, Short Paper Proceedings of the 23rd International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Beijing, China.* 2018: 233-238.
33. **Zheng, Hao**. "Digital Fabrication Using Mixed Reality Technology." *Learning, Prototyping and Adapting, Short Paper Proceedings of the 23rd International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Beijing, China.* 2018: 121-126.
34. **Zheng, Hao**. "Drawing with Bots: Human-computer Collaborative Drawing Experiments." *Learning, Prototyping and Adapting, Short Paper Proceedings of the 23rd International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Beijing, China.* 2018: 127-132.
35. **Zheng, Hao**, Yuanfang Lu, and Yuepeng Li. "Soft Rigidity." *Learning, Prototyping and Adapting, Poster Proceedings of the 23rd International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), Beijing, China.* 2018: 1.
36. Liu, Shixing, **Hao Zheng**, and Chunjiang Wang. "Sleeve roof: Generating a Membrane Structure." *Proceedings of the 16th Shanghai-Seoul Forum on Engineering Sciences, Shanghai, China.* 2014: 51-54.

TEACHING & SUPERVISION

- **Undergraduate Course**

  Innovative Thinking and Modern Design - ME903 - Shanghai Jiao Tong University - Spring 2021

  Construction Contract and Management - CA3686 - City University of Hong Kong - Spring 2023

  Innovations in Construction Technology - CA3171 - City University of Hong

Kong - Spring 2023

Structural Systems and Materials - CA29506 - City University of Hong Kong - Spring 2023

- **Graduate Course**

  Contemporary Theory - ARCH710 - University of Pennsylvania - Fall 2019

  Special Topic in Design Rendering - MADM26 - Macau University of Science and Technology - Spring 2020

  Contemporary Theory - ARCH710 - University of Pennsylvania - Fall 2020

  Parametric Design and Digital Construction - AR26003 - Shanghai Jiao Tong University - Spring 2021

- **Workshop & Studio**

  DigitalFUTURES 2019 Summer Workshop - Tongji University

  DigitalFUTURES 2020 Summer Workshop - Tongji University

  DigitalFUTURES 2021 Summer Workshop - Tongji University

  DigitalFUTURES 2022 Summer Workshop - Tongji University

  Hefei University of Technology 2021 Summer Workshop

- **Undergraduate Thesis**

  Transportation Architecture Joint Graduation Design - Shanghai Jiao Tong University - Spring 2021

- **Graduate Thesis**

  Shanghai Jiao Tong University - Class of 2021 - Anna Magenta

  Shanghai Jiao Tong University - Class of 2022 - Yu Cao

  Shanghai Jiao Tong University - Class of 2022 - Zijia Cui

  Shanghai Jiao Tong University - Class of 2022 - Mengfan Chen

- **Ph.D. Thesis**

  South China University of Technology - Class of 2024 - Zhe Lai

---

INVITED SPEECHES

- 2022.12.08, ***Shanghai Jiao Tong University***, Shanghai, China.
  Architecture + AI: Where the Future Stands.
- 2022.11.11, ***Syracuse University***, Syracuse, USA.
  Architecture + AI: Where the Future Stands.
- 2022.11.05, ***Huaqiao University***, Xiamen, China.
  Architecture + AI: Where the Future Stands.
- 2022.11.01, ***ACADIA Annual Conference***, Philadelphia, USA.
  Graphic Statics with Machine Learning.
- 2022.09.29, **T*singhua University***, Beijing, China.
  Geometry and Topology. (Ph.D. Thesis)
- 2022.07.04, ***ETH Zurich***, Zurich, Switzerland.
  Geometry and Topology. (Ph.D. Thesis)
- 2022.06.26, ***Tongji University***, Shanghai, China.
  AI + Urban Design Methods.
- 2022.06.25, ***Digital Futures Annual Conference***, Shanghai, China.

AI-based Prediction of Urban Spatial Risk.

- 2022.05.28, ***Tongji University***, Shanghai, China.
  Worlds in the brains of AI.
- 2022.04.12, ***CAADRIA Annual Conference***, Sydney, Australia.
  Morphological Regeneration on Machine Learning.
- 2022.02.04, ***University of Pennsylvania***, Philadelphia, USA.
  Machine Learning in Geometry and Topology.
- 2021.11.03, ***ACADIA Annual Conference***, Online, Global.
  A POI-Based Machine Learning Method.
- 2021.10.09, ***Shenzhen University***, Shenzhen, China.
  Architecture + AI: Where the Future Stands.
- 2021.08.23, ***IASS Annual Conference***, Guildford, UK.
  Lightweight Structures in Dragonfly Wings.
- 2021.07.16, ***CAAD Futures Annual Conference***, Los Angeles, USA.
  Measurement of Spatial Openness of Indoor Space.
- 2021.06.26, ***Digital Futures Annual Conference***, Shanghai, China.
  A POI-Based Machine Learning Method.
- 2021.05.13, ***South China University of Technology***, Guangzhou, China.
  Architecture + AI: Where the Future Stands.
- 2021.05.09, ***APT Talks***, New York, USA.
  Architecture + AI: Where the Future Stands.
- 2021.03.28, ***CAADRIA Annual Conference***, Hong Kong, China.
  Ice Stereotomy.
  Predicting the Heat Map of Street Vendors.
- 2020.12.23, ***TIANHUA Planning Ltd.***, Shanghai, China.
  Artificial Intelligence in Urban Design and City Planning.
- 2020.10.29, ***ACADIA Annual Conference***, Philadelphia, USA.
  Generating and Optimizing a Funicular Arch Floor Structure.
  A Machine Learning Method of Predicting Behavior Vitality.
- 2020.09.16, ***eCAADe Annual Conference***, Berlin, Germany.
  Dynamic Symbiont.
- 2020.08.06, ***CAADRIA Annual Conference***, Bangkok, Thailand.
  Machine Learning Neural Networks Construction and Analysis.
  Apartment Floor Plans Generation via GAN.
  Architectural Layout Design through Simulated Annealing.
  The Spire of AI - Voxel-based 3D Neural Style Transfer.
  Machine Learning Assisted Urban Filling.
- 2020.06.27, ***Digital Futures World 2020 Online Event***, Shanghai, China.
  Architecture without Architects.
- 2020.06.26, ***Digital Futures Annual Conference***, Shanghai, China.
  Machine Learning Assisted 3D Modelling Design.
- 2020.04.26, ***Tongji University***, Shanghai, China.
  Towards Machine Learning Methods of Architectural Design.
- 2019.10.18, ***University of Pennsylvania***, Philadelphia, USA.
  Towards Machine Learning Methods of Architectural Design.
- 2019.10.12, ***Medical Architectural Designers Forum***, Shanghai, China.
  Towards Machine Learning Methods of Architectural Design.

- 2019.10.09, ***IASS Annual Conference***, Barcelona, Spain.
  Machine Learning Assisted Evaluations in 3D Graphic Statics.
- 2019.07.08, ***Digital Futures Annual Conference***, Shanghai, China.
  Form Finding and Evaluating through Machine Learning.
- 2019.06.28, ***CAAD Futures Annual Conference***, Daejeon, South Korea.
  Iterative Pattern Design via Decodes Python Scripts.
- 2019.06.22, ***Beijing No.35 High School***, Beijing, China.
  Research Skills Development.
- 2019.06.15, ***Shanghai Jiao Tong University***, Shanghai, China.
  Towards Machine Learning Methods of Architectural Design.
- 2019.04.16, ***CAADRIA Annual Conference***, Wellington, New Zealand.
  Caterpillar - A GCode Translator in Grasshopper.
- 2018.10.20, ***ACADIA Annual Conference***, Mexico City, Mexico.
  Architectural Drawings Generation through Machine Learning.
- 2018.07.01, ***Digital Futures Young Seminar***, Shanghai, China.
  From Computer-Aided to Computer-Decided.
- 2018.05.17, ***CAADRIA Annual Conference***, Beijing, China.
  Bio-inspired 3D Printing Experiments.
  Digital Fabrication Using Mixed Reality Technology.
  Understanding and Visualizing GAN in Architectural Drawings.
  Human-computer Collaborative Drawing Experiments.
- 2017.09.29, **T*singhua University***, Beijing, China.
  Machine Learning for Architects.
- 2017.03.03, ***University of California, Berkeley***, Berkeley, USA.
  Soft Rigidity.
- 2016.09.12, ***University of California, Berkeley***, Berkeley, USA.
  Tutorial for Python in Architecture.
- 2016.04.05, ***Shanghai Jiao Tong University***, Shanghai, China.
  Tutorial for Rhino and Grasshopper.