Kian Wee Chen

Work Experience

Global Environmental Technologies Inc. (Sanken Setsubi Kogyo Co., LTD. U.S. Subsidiary) (2023 – Current)

- Environmental technology senior researcher
- Research on radiant heating and cooling panel technology
- Involve in Building Construction Authority of Singapore radiant panel demonstration space project

Princeton University, Andlinger Center for Energy and Environment (2018 – Current)

- Visiting research scholar (2023-Current)
- Associate research scholar (2020-2023)
- Distinguish postdoctoral fellow with Dr Forrest Meggers (2018-2020)
- Research on design prototyping with advanced digital technologies for the built environment

Cooper Union, The Irwin S. Chanin School of Architecture (2025)

- Assistant Professor Adjunct
- Involve in syllabus development of Environmental Technologies module

University of Pennsylvania, Weitzman School of Design (2020)

- Visiting scholar
- Research on the use of Geographic Information System (GIS) in the design process
- Involve in design studio, 'Bioclimatic Studio 2020: Climate-Adaptive Design for the Data Center of the Future'

National University of Singapore, Department of Architecture (2018)

- Research fellow with Dr Patrick Janssen
- Involve in "Parametric Urban Modeling Research Phase 2" and "Computational Thinking: Automated Formative Assessment of Parametric Modeling Assignments" projects

Singapore-MIT Alliance for Research and Technology (SMART) – Center for Modeling and Environmental Sensing (CENSAM) (2015 – 2018)

- Postdoctoral associate with Dr Leslie Norford
- Developed a design workflow with accompanying tools for the optimization of urban design in the early design stages

National University of Singapore, Department of Architecture (2017)

- Adjunct lecturer
- Developed "spatial computational thinking" course with Dr Patrick Janssen

Singapore Polytechnic, Department of Architecture (2017)

- Adjunct lecturer
- Developed a prototype tool for teaching design optimization in a studio environment

Education

Future Cities Laboratory, Singapore-ETH Centre, Department of Architecture, ETH Zurich (2011 – 2015)

- PhD research with Dr. Arno Schlueter and Dr. Patrick Janssen
- Dissertation: "Architectural Design Exploration of Low-Exergy (LowEx) Buildings in the Tropics" supervised by Dr. Arno Schlueter and Dr. Patrick Janssen
- Project 1: BubbleZERO Laboratory of the Low Exergy Module to experiment with novel systems for cooling, dehumidification and ventilation for the tropical climate
- Project 2: 3for2-Beyond Efficiency: propose to build 3 floors within the space of 2 through systems integration, hence 3for2, by eliminating the excesses, while achieving 2x performance.

National University of Singapore, Department of Architecture (2009 – 2010)

- M (Arch) – Specialization in Design Technology and Sustainability
- Dissertation: "The Design of Naturally Ventilated Atrium Space using Multi-Zone Airflow Simulation: The Architectural Implication on the Schematic Stage of the Design Process" supervised by Dr. Patrick Janssen

National University of Singapore, Department of Architecture (2005-2009)

- BA (Arch) (Hons)
- Areas of concentration: sustainable design, computational design tools

Teaching Experience

Cooper Union, The Irwin S. Chanin School of Architecture (2025)

- Co-lecturer of ARCH 134B Environmental Technologies
- Teach HVAC systems to architectural students in year 3

University of Pennsylvania, Weitzman School of Design (2020-2022)

- Teach Geographic Information System (GIS) for a design studio setting

National University of Singapore (2018)

- Co-lecturer of the elective: Spatial Computational Thinking
- Taught the application of computational thinking in architectural design

Singapore Polytechnic (2017)

- Co-instructor of 2-weeks intensive elective: Vertical Studio Elective, Parametric Solar Massing Design Exploration
- Students were able to successfully engage optimization algorithms in their design process with the prototype tool developed by me

Singapore MIT Alliance for Research and Technology (2016)

- Supervisor: Singapore-MIT Undergrad Research Fellowship program (SMURF)
- Guided undergraduates in conducting research

Awards

- CAADRIA Conference 2023, Best Paper Award – Runner Up, "Comparing Design Strategies: A System for Optimization-based Design Exploration" (2023)
- The Journal of Digital Landscape Architecture award 2020 on Scientific Merit, "Modelling the Built Environment in 3D to Visualize Data from Different Disciplines: The Princeton University Campus" (2020)
- CAADRIA Conference 2020, Best Paper Award – Runner Up, "Enabling Optimisation-Based Exploration for Building Massing Design - A Coding-free Evolutionary Building Massing Design Toolkit in Rhino-Grasshopper" (2020)
- Student Poster Competition – 4th Holcim Forum 3rd Prize "Beyond Efficiency" (2013)
- Young CAARDRIA Award 2013 "A Design Method for Multi-Criteria Optimisation of Low Exergy Architecture" (2013)

Open Source Projects

- geomie3d – Python geometry kernel [Link]
- yun2infinity – Software stack for digital twinning [Link]
- gis3d – QGIS plugin for generating 3D city mode [Link1][Link2]
- ifc2osmod – Python library to convert IFC to OpenStudio model [Link]
- gendgn – Python library to support generative design workflow [Link]
- py3dtileslib – Python library for reading and writing 3Dtiles [Link]
- gis4design – E-book on using geospatial data for urban design [Link]

Grants

- Princeton University, Andlinger Center for Energy and the Environment, Fund for Energy Reserach with Corporate Partners (2023-2026) – Re2Rad: Research of Renewables-powered Radiant Systems demonstrating next generation control of comfort, air-quality and emissions – from lab to testbed to industry to campus, Industry Collaborator, USD 600,000 [Link]
- Housing Development Board of Singapore (2021-2023) – Optimization Algorithm for Rapid Sustainable Planning and Design, Collaborator, USD 250,000 (SGD 349,200) [Link]
- Princeton University, Andlinger Center for Energy and the Environment (2018-2020) – Distinguished Postdoctoral Fellowship, USD 130, 000 [Link]
- SMART-CENSAM Research Initiative (2017-2018) – Processing Terrestrial LiDAR Scanned Trees for Multi-Disciplinary Analysis, Principal Investigator, USD 5000 (SGD 7000)

Publications

Journals

1. Li, J., Pantelic, J., Merchant, C.B., **Chen, K.W.**, Izuhara, I., Yuki, R., Meggers, F.M., Schiavon, S., (2024). Comparison of the environmental, energy, and thermal comfort performance of air and radiant cooling systems in a zero-energy office building in Singapore. *Energy and Buildings* 318, 114487. https://doi.org/10.1016/j.enbuild.2024.114487

2. **Chen, K.W.**, Janssen, P., Aviv, D., Ninsalam, Y., Meggers, F., (2022). A framework for considering the use of computational design technologies in the built environment design process. *ITcon* 27, 1010–1027. https://doi.org/10.36680/j.itcon.2022.049
3. Aviv, D., **Chen, K.W.**, Teitelbaum, E., Sheppard, D., Pantelic, J., Rysanek, A., Meggers, F., (2021). A Fresh (Air) Look at Ventilation for COVID-19: Estimating the global energy savings potential of coupling natural ventilation with novel radiant cooling strategies. *Applied Energy* 116848. https://doi.org/10.1016/j.apenergy.2021.116848
4. **Chen, K.W.**, Teitelbaum, E., Meggers, F., Pantelic, J., Rysanek, A., (2020). Exploring Membrane-Assisted Radiant Cooling for Designing Comfortable Naturally Ventilated Spaces in the Tropics. *Building Research & Information* 1–13. https://doi.org/10.1080/09613218.2020.1847025
5. **Chen, K.W.**, Meggers, F., (2020). Modelling the Built Environment in 3D to Visualize Data from Different Disciplines: The Princeton University Campus. *Journal of Digital Landscape Architecture* 227–234. https://doi.org/doi:10.14627/537690024
6. Teitelbaum, E., **Chen, K.W.**, Aviv, D., Bradford, K., Ruefenacht, L., Sheppard, D., Teitelbaum, M., Meggers, F., Pantelic, J., Rysanek, A., (2020). Membrane-assisted radiant cooling for expanding thermal comfort zones globally without air conditioning. *Proceedings of the National Academy of Sciences* 202001678. https://doi.org/10.1073/pnas.2001678117
7. Teitelbaum, E., **Chen, K.W.**, Meggers, F., Guo, H., Houchois, N., Pantelic, J., Rysanek, A., (2020). Globe thermometer free convection error potentials. *Scientific Reports* 10, 2652. https://doi.org/10.1038/s41598-020-59441-1
8. Wang, L., Janssen, P., **Chen, K.W.**, Tong, Z., Ji, G., (2019). Subtractive Building Massing for Performance-Based Architectural Design Exploration: A Case Study of Daylighting Optimization. *Sustainability* 11. https://doi.org/10.3390/su11246965
9. Velasco, E., **Chen, K.W.**, (2019). Carbon storage estimation of tropical urban trees by an improved allometric model for aboveground biomass based on terrestrial laser scanning. *Urban Forestry & Urban Greening*, 44, 126387. https://doi.org/10.1016/j.ufug.2019.126387
10. **Chen, K.W.**, Janssen, P., Schlueter, A., (2018). Multi-Objective Optimisation of Building Form, Envelope and Cooling System for Improved Building Energy Performance. *Automation in Construction*, 94, 449-457. https://doi.org/10.1016/j.autcon.2018.07.002
11. **Chen, K.W.**, Choo, T.S., Norford L, (2018). Enabling Algorithm-Assisted Architectural Design Exploration for Computational Design Novices. Computer-Aided Design and Applications. 16(2), 269–288. https://doi.org/doi: 10.14733/cadaps.2019.269-288
12. **Chen K.W.**, Norford L (2017). Evaluating Urban Forms for Comparison Studies in the Massing Design Stage. *Sustainability*, 9(6). https://doi.org/10.3390/su9060987
13. Schlueter, A., Rysanek, A., Miller, C., Pantelic, J., Meggers, F., Mast, M., Bruelisauer, M., **Chen, K.W.**, (2016). 3for2 realizing spatial material and energy savings through integrated design. *CTBUH Journal* 40–45.
14. Bruelisauer, M., **Chen, K.W.**, Iyengar, R., Leibundgut, H., Li, C., Li, M., Mast, M., Meggers, F., Miller, C., Rossi, D., Saber, E.M., Tham, K.W., Schlueter, A., (2013). BubbleZERO—Design,

Construction and Operation of a Transportable Research Laboratory for Low Exergy Building System Evaluation in the Tropics. *Energies* 6, 4551–4571. https://doi.org/10.3390/en6094551

Peer-Reviewed Conferences

15. **Chen, K.W**., Nishizawa, M., Izuhara, I., Meggers, F., (2024). Using an Open-Source Software Stack to Visualize Building Automation System Data in 3D, in: *The 5th Asia Conference of International Building Performance Simulation Association 2024*. Osaka, Japan, 237–244.
16. **Chen, K.W.**, Izuhara, I., Merchant, C., Meggers, F., Pantelic, J., (2023). Experimental study to understand the thermal environment of an office cooled by radiant ceiling panels and dedicated outdoor air system, in: *Cisbat 2023: The Built Environment in Transition*. Lausanne, Switzerland.
17. Meggers, F., Yazici, B., Kim, J., **Chen, K.W.**, Merchant, C., Izuhara, I., (2023). Unbalancing mean radiant temperature and air temperature. *Journal of Physics: Conference Series* 2600, 092030.
18. Wang, L., Janssen, P., Tung, D.P.B., **Chen, K.W**., (2023). Comparing Design Strategies: A System for Optimization-Based Design Exploration, in: '*HUMAN CENTRIC' - 28th International Conference of the Association for Computer-Aided Architectural Design Research in Asia*. Ahmedabad, India.
19. Wang, L., Janssen, P., **Chen, K.W.**, (2023). Evolutionary Optimization of Benchmarks: Parametric Typologies for Generating Typical Designs, in: Gero, J.S. (Ed.), *Design Computing and Cognition'22*. Springer International Publishing, Cham, 699–717.
20. Wang, L., Janssen, P., Tung, D.P., **Chen, K.W.**, (2022). A Rapid Design Optimization Framework - Strategies for the fast evaluation of design options, in: *Co-Creating the Future: Inclusion in and through Design - Proceedings of the 40th Conference on Education and Research in Computer Aided Architectural Design in Europe (ECAADe 2022)*. Ghent, Belgium, 619–628.
21. Wang, L., Janssen, P., **Chen, K.W.**, (2022). Evolutionary Design of Residential Precincts, A Skeletal Modeling Approach for Generating Building Layout Configurations, in: *POST-CARBON - Proceedings of the 27th CAADRIA Conference,*. Sydney, Australia, 415–424.
22. Sheppard, D., Rysanek, A., Teitelbaum, E., **Chen, K.W.**, Aviv, D., Bradford, K., Meggers, F., (2021). Predicted energy savings by adopting novel radiant cooling systems in combination with natural ventilation in the tropics, in: *Proceedings of Building Simulation 2021: 17th Conference of IBPSA, Building Simulation*. IBPSA, Bruges, Belgium, 621–628.
23. Wang, L., **Chen, K.W.**, Janssen, P., Ji, G., (2020). Enabling Optimisation-Based Exploration for Building Massing Design - A Coding-free Evolutionary Building Massing Design Toolkit in Rhino-Grasshopper, in: Proceedings of the 25th International Conference of the Association for Computer-Aided Architectural Design Research in Asia (CAADRIA) 2020. Bangkok, Thailand, pp. 255–264.
24. Wang, L., **Chen, K.W.**, Janssen, P., Ji, G., (2020). Algorithmic Generation of Architectural Massing Models for Building Design Optimisatio - Parametric Modelling Using Subtractive and Additive Form Generation Principles, in: *Proceedings of the 25th International Conference of the Association for Computer-Aided Architectural Design Research in Asia (CAADRIA) 2020*. Bangkok, Thailand, pp. 385–394.

25. Teitelbaum, E., Pantelic, J., Rysanek, A., **Chen, K.W.**, Meggers, F., (2019). Black Globe Free Convection Measurement Error Potentials, in: *2019 Proceedings of the Symposium on Simulation for Architecture & Urban Design*. Atlanta, Georgia, USA, pp. 143–146.
26. Janssen, P., Pung, D., **Chen, K.W.**, (2019). Visual Programming for Geo-Computation - Towards Tools for Tool Makers, in: *Proceedings of CAARDRIA 2019*. Wellington, New Zealand, pp. 665–674.
27. **Chen, K.W.**, Norford, L., (2017). Developing an Open Python Library for Urban Design Optimisation - Pyliburo, in: *Building Simulation 2017*. San Francisco, USA.
28. **Chen, K.W.**, Janssen, P., Norford, L., (2017). Automatic Generation of Semantic 3D City Models from Conceptual Massing Models, in: *Future Trajectories of Computation in Design – Proceedings of the 17th International Conference on Computer Aided Architectural Design Futures*. Istanbul, Turkey, 84–100.
29. **Chen, K.W.**, Janssen, P., Norford, L., (2017). Automatic Parameterisation of Semantic 3D City Models for Urban Design Optimisation, in: *Future Trajectories of Computation in Design – Proceedings of the 17th International Conference on Computer Aided Architectural Design Futures*. Istanbul, Turkey, 51–65.
30. **Chen, K.W.**, Norford, L.K., (2016). Workflow for Generating 3D Urban Models from Open City Data for Performance-Based Urban Design, in: *Asim 2016 IBPSA Asia Conference*. Jeju, Korea.
31. Janssen, P., **Chen, K.W.**, Mohanty, A., (2016). Automated Generation of BIM Models, in: *Proceedings of the 34th eCAADe Conference*. Oulu, Finland, 583–590.
32. **Chen, K.W.**, Janssen, P., Schlueter, A., (2015). Analysing Populations of Design Variants Using Clustering and Archetypal Analysis, in: Martens, B., Wurzer, G., Grasl, T., Lorenz, W., Schaffranek, R. (Eds.), *Real Time - Proceedings of the 33rd eCAADe Conference*. Vienna, Austria, 251–260.
33. Choo, T.S., **Chen, K.W.**, Janssen, P., (2014). Multi-Objective Optimisation of a Semi-Transparent Building Integrated Photovoltaic Facade Through the Use of Ant Colony Algorithm, in: *BSO 14 Building Simulation and Optimization Second IBPSA-England Conference in Association with CIBSE*. London, UK.
34. **Chen, K.W.**, Janssen, P., Schlueter, A., (2013). A Design Method for Multi-criteria Optimisation of Low Exergy Architecture, in: *Open Systems: Proceedings of the 18th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA 2013)*. Singapore, 117–126.
35. **Chen, K.W.**, Schlueter, A., Janssen, P., (2013). The Architectural Implications of Adopting Low Exergy Cooling Strategy: Separation of Sensible and Latent Cooling, in: *12th International Conference on Sustainable Energy Technologies Proceedings*. Hong Kong, China, 1215–1222.
36. Schlueter, A., **Chen, K.W.**, (2013). Leveraging Low Exergy Building Systems for Symbiotic Building Design in the Tropics, in: *Proceedings of SB13*. Singapore.
37. **Chen, K.W.**, Schlueter, A., Janssen, P., (2012). Optimisation of Low Exergy Architecture in the Tropics, in: Tan, K.S., Hing, P. (Eds.), *Sustainable Future Energy 2012 International Energy*

Conference 10th Sustainable Energy and Environment (SEE) Forum Proceeding. Brunei Darussalam, 410–418.

38. **Chen, K.W.**, Janssen, P., Schlueter, A., (2012). Performance Driven Design Optimisation with Scientific Workflow System, in: Peng, Z., Hainan, L., Jing, W., Hao, X. (Eds.), *Proceedings of the International Conference on Green Buildings and Optimization Design GBOD 2012*. Shengyang, China, 189–196.
39. Janssen, P., **Chen, K.W.**, Basol, C., (2011). Iterative Virtual Prototyping: Performance Based Design Exploration, in: *29th eCAADe Conference Proceedings*. Ljubljana, Slovenia, 253–260.
40. Janssen, P., **Chen, K.W.**, (2011). Visual Dataflow Modelling: A Comparison of Three Systems, in: *Proceedings of the 14th International Conference on Computer Aided Architectural Design Futures*. Liege, Belgium, 801–816.
41. Janssen, P., Basol, C., **Chen, K.W.**, (2011). Evolutionary Developmental Design for Non-Programmers, in: *29th eCAADe Conference Proceedings*. Ljubljana, Slovenia, 245–252.

Non Peer Reviewed Publications

42. Meggers, F., Aviv, D., Rysanek, A., **Chen, K.W.**, Teitelbaum, E., (2021). A Better Way to Cool Ourselves: A new technique doesn't deprive us of fresh air. And because it uses less energy, it's good for the climate as well. *Scientific American*.
43. **Chen, K.W.**, Mast, M., Rysanek, A., Schlueter, A., (2015). Improving Daylight. *FCL Magazine* 3, 48–55.

Presentations

National University of Singapore, College of Design and Engineering, Urban Analytics Laboratory (2022)

- Invited Speaker: Open Computational Design for Sustainable Developments

Singapore Building Construction Authority (BCA) Computational BIM Sharing and Discussion Sessions (2022)

- Invited Speaker: Algorithmic Architectural Design with Python Packages [Link]

ETH Zurich, Design++ Fall 2021 Seminar Series (2021)

- Invited Speaker: The Use of Algorithms, Models and Data in the Design Process [Link]

Singapore Building Construction Authority (BCA) International Building Design Competition Webinar (2021)

- Invited Speaker: Algorithm-Assisted Architectural Design with Python Packages [Link]

Royal Melbourne Institute of Technology (RMIT) Landscape Architecture Department, superterrestrial: emerging territories (2021)

- Invited Guest Lecture: Algorithm-Assisted Design: Supporting Integrative Design in the Built Environment.

Andlinger Center for Energy and the Environment, Princeton University, Distinguished Postdoctoral Fellow Seminar Series (2020)

- Public Lecture titled: Algorithm-Assisted Design: Supporting Integrative Design in the Built Environment [Link]

Singapore Polytechnic Lecture Series 01: Negotiating Architectural Boundaries Digital, Design and Fabrication (2018)

- Public lecture titled "Rapid Design Prototyping with Advanced Digital Technologies"

Fost Gallery Public Lecture (2018)

- Public lecture titled "The Application of Computational Tools in Form Generation"

Center for Environment Sensing and Modeling (CENSAM) Public Lecture (2016)

- Public seminar titled "An Open-Source Workflow for Urban Design Optimisation"

Committee Involvement

American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) (2024 - Current)

- Associate Member
- Provisional corresponding member, technical committee 6.5 radiant heating and cooling

ACADIA 2022 Hybrids and Haecceities

- Scientific committee member

ACADIA 2021 Realignments: Toward Critical Computation

- Scientific committee member

ACADIA 2020 Distributed Proximities

- Scientific committee member

Related Experience

Collaborate with FARM Design (2018)

- Generative modeling for design competition entry

Collaborate with Grace Tan from Kwodrent (2017)

- SYMMETRY, sculpture, for DUO, Singapore
- PLANES & CURRENTS, sculptures commissioned by M+S Pte Ltd, for Marina One, Singapore (2017)

Relevant Skills

City & Building Information Modeling

- Data Schema
  - Industry Foundation Class (IFC) – Open data standard for Building Information Modeling.
  - CityGML – Open data standard for City Information Modeling.

    - Shapefiles – Geospatial vector data format for GIS.
    - Geojson – JSON geospatial vector data format.
    - GIS Raster format (e.g. geotiff) – Geospatial raster data format.
    - 3Dtiles – Open data standard for visualizing 3D city model on the web.
- Software
    - QGIS – Open source GIS software.
    - FreeCAD – Open source 3D parametric modeling tool.
    - Sketchup – 3D modeling tool.
    - Rhinoceros3D & Grasshopper – 3D NURBS modeling tool.
- Databases
    - FROST-Server – A server implementation of the OGC SensorThings API.
- IoT Hardware
    - Particle.io – Internet of Things (IoT) devices for distributed environmental sensing.
    - HUZZAH32 – Espressif32 microprocessor for setting up IoT development.
    - SHT31 – Temperature and humidity sensor for IoT development.
    - Sensirion SCD30 – CO_2, temperature and humidity sensor for IoT development.
    - Ultrasonice Distance Sensor RCWL-1601 – Distance sensor for IoT development.
    - Amphenol GE2102 Thermistor – Temperature sensor for IoT development.
    - Digiten Flow Sensor FL408 – Flow sensor for IoT development.
    - MLX90614 – Infrared temperature sensor for IoT development.
    - TS2591 – Lighting (lux) sensor for IoT development.
    - Modern Device Wind Sensor Rev P – Air velocity sensor for IoT development.
    - Fluxteq Heatflux Sensor – Heatflux sensor for IoT development.

Graphics

- Gimp – Raster image manipulation software.
- Inkscape – Vector graphics manipulation software.

Building Performance Simulations

- Radiance – Lighting simulation.
- OpenStudio – Building energy modeling.

Programming languages

- Python
    - Numpy – Numerical computing library.
    - Pandas – Data science computing library.
    - Matplotlib – Graphing library.
    - Scikit-learn – Machine learning library.
    - Pyqtgraph – GUI library for rapid prototyping of scientific apps.
    - Django – Python framework for web development.
    - Ifcopenshell – Python binding for the ifcopenshell library to read and write IFC files
    - OpenStudioSDK – Python binding for the OpenStudio program.
- Javascript
    - CesiumJS – Web-based virtual earth 3D viewer.