**SEUNG HYUN CHA**

**Assistant Professor (Sep 2018 – Present),**

**Department of Interior Architecture Design, Hanyang University**

<https://www.ssdesignlab.org/>

**CEO, GalleryVair Corp. (Oct 2020 – Present),**

<https://galleryvair.com/>

**Address: 612, Human Ecology, Hanyang University, 222,**

**Wangsimni-ro, Seongdong-gu, Seoul, Republic of Korea, 04763**

**E-mail: chash@hanyang.ac.kr**

**Tel: (+82) 2 2220 1183**

**Research interests**

Future Cities, IoT/AR/VR, Digital Twin, Smart Space, Human Behavior

**Academic qualifications**

University of Cambridge Cambridge, UK PhD in Architecture November 2015

‘Dissertation title: Stochastic Space-use Prediction in light of Spatial Choice Behaviour:

Modelling Space Preference of Work-related Activities’

Stanford University Stanford, CA MS in Sustainable Design and Construction June 2011

Korea University Seoul, Korea BEng in Architectural Engineering August 2009

**Research and academic experience**

**The Hong Kong Polytechnic University, Department of Building Services Engineering,**

**Assistant Professor (November 2015 – August 2018) Hong Kong**

Nanyang Technological University, Nanyang Centre for Underground Space,

Research Associate (March 2015 – August 2015) Singapore

City University of Hong Kong, Department of Architecture and Civil Engineering,

Graduate teaching assistant (December 2013 – August 2014) Hong Kong

Stanford University, P5BL Lab, Department of Civil and Environmental Engineering,

Research assistant (September 2010 - January 2011) Stanford, CA

Stanford University, Department of Sustainability and Energy Management,

Research assistant (December 2009 – June 2010) Stanford, CA

**Refereed journals**

<international>

Jo, T., Ma, J. and ***Cha, S.*** (Corresponding author), "Elderly Perception on the Internet of things-based Integrated Smart-Home System," Sensors, MDPI, 21(4), 1284, 2021 [SCIe].

Gassar, A., and ***Cha, S.*** (Corresponding author)**,** "Review of geographic information systems-based rooftop solar photovoltaic potential estimation approaches at urban scales,” Applied Energy, Elsevier, in press, 2021 [SCIe].

Ma, J. and ***Cha, S.*** (Corresponding author), "A user-specific activity pattern generation framework for evidence-based ABW planning," Building and Environment, Elsevier, 189, 107519, 2021 [SCIe]

Jang, J., Ahn, J, ***Cha, S.***, Cho, K., Koo, C. and Kim, T., “Towards Productivity in Future Construction: Mapping Knowledge and Finding Insights for Achieving Successful Offsite Construction Projects,” Journal of Computational Design and Engineering, Oxford University Press, 8(1), 1-14, 2021 [SCIe].

Ma, J. and ***Cha, S.*** (Corresponding author), “A human data-driven interaction estimation using IoT sensors for workplace design,” Automation in Construction, Elsevier, 119, 103352, 2020 [SCIe].

***Cha, S.***, Zhang, S., and Kim, T., “Effects of Interior Color Schemes on Emotion, Task Performance, and Heart Rate in Immersive Virtual Environments,” Journal of Interior Design, Wiley, 45(4), 51-65, 2020 [A&HCI].

Gassar, A., and ***Cha, S.*** (Corresponding author)**,** "Energy prediction techniques for large-scale buildings towards a sustainable built environment: A review,” Energy and Buildings, Elsevier, 224, 110238, 2020 [SCI].

Li, W., Koo, C., Hong, T., Oh, J., ***Cha, S.*** and Wang, S., "A novel operation approach for the energy efficiency improvement of the HVAC system in office spaces through real-time big data analytics," Renewable and Sustainable Energy Reviews, Elsevier, 127, 109885, 2020 [SCIe].

***Cha, S.*** and Kim, T., “The role of space attributes in space-choice behaviour and satisfaction in an academic library,” Journal of Librarianship and Information Science, Sage, 52(2), 399-409, 2020 [SSCI].

Abbas, A., Choi, M., Seo, J., ***Cha, S.***, and Li, H., "Effectiveness of Immersive Virtual Reality-based Communication for Construction Projects," KSCE Journal of Civil Engineering, KSCE, 23(12), 4972-4983, 2019 [SCIe].

***Cha, S.***, Koo, C., Kim, T., and Hong, T., "Spatial perception of ceiling height and type variation in immersive virtual environments,” Building and Environment, Elsevier, 163, 106285, 2019 [SCI].

Kim, T. and ***Cha, S.*** (Corresponding author), “Empirical validation of the spatial-choice modeling approach to user simulation,” Architectural Science Review, Taylor & Francis, 62(4), 313-322, 2019 [A&HCI].

Chen, H., ***Cha, S.***, and Kim, T., “A framework for group activity detection and recognition using smartphone sensors and beacons,” Building and Environment, Elsevier, 158, 205-216, 2019 [SCI].

Zhang, S., Lu, L., Dong, C., and ***Cha, S.***, “Performance evaluation of a double-pipe heat exchanger fitted with self-rotating twisted tapes,” Applied Thermal Engineering, Elsevier, 158, 113770, 2019 [SCIe].

Baek, S., and ***Cha, S.*** (Corresponding author)***,*** “The trilateration-based BLE Beacon system for analyzing user-identified space usage of New Ways of Working offices,” Building and Environment, Elsevier, 149, 264-274, 2019 [SCI].

LI, W., Koo, C***., Cha, S.,*** Lai, H., and Lee, J., “A conceptual framework for the real-time monitoring and diagnostic system for the optimal operation of smart building: A case study in Hotel ICON of Hong Kong, “Elsevier, 158, 3107-3112, 2019 [Scopus].

Koo, C., Li, W., ***Cha, S.*** (Corresponding author), Zhang, S., "A novel estimation approach for the solar radiation potential with its complex spatial pattern via machine-learning techniques," Renewable Energy, Elsevier, 133, 575-592, 2019 [SCIe].

Zhang, S., Lu, L., Dong, C., and ***Cha, S.***, “Thermal characteristics of perforated self-rotating twisted tapes in a double-pipe heat exchanger,” Applied Thermal Engineering, Elsevier, 162, 114296, 2019 [SCIe].

Li, W., Koo, C., ***Cha, S.***, Hong, T., and Oh, J., “A novel real-time method for HVAC system operation to improve indoor environmental quality in meeting rooms,” Building and Environment, Elsevier, 144, 365-385, 2018 [SCI].

***Cha, S.,*** Seo J**.**, Baek, S., and Koo, C., “Towards a well-planned, activity-based work environment: Automated recognition of office activities using accelerometers,” Building and Environment, Elsevier, 144, 86-93, 2018 [SCI].

***Cha, S.***, Steemers, K., and Kim, T., “Modeling space preferences for accurate occupancy prediction during the design phase,”A utomation in Construction, Elsevier, 93, 135-147, 2018 [SCIe].

Oh, J., Koo, C., Hong, T. and ***Cha, S.***, “An integrated model for estimating the techno-economic performance of the distributed solar generation system on building façades: Focused on energy demand and supply,” Applied Energy, Elsevier, 228, 1071-1090, 2018 [SCI].

Kim, J., ***Cha, S.*** (Corresponding author), Koo, C. and Tang, S., “The effects of indoor plants and artificial windows in an underground environment,” Building and Environment, Elsevier, 138, 53-62, 2018 [SCI].

Kim, T., ***Cha, S.*** and Kim, Y., “Space choice, rejection, and satisfaction in university campus,” Indoor and Built Environment, Sage, 27 (2), 233-243, 2018 [SCIe]

***Cha, S.***, Steemers, K., and Kim, T., “Modelling building users’ space preferences for group work: A discrete choice experiment,” Architectural Science Review, Taylor & Francis, 60(6), 460-471, 2017 [A&HCI].

Koo, C., Jin, R., Li, B., ***Cha, S.***, and Wanatowski, D., “Case-based reasoning approach to estimating the strength of sustainable Concrete,” Computers and Concrete. Techno-press, 20 (6), 645-654, 2017 [SCIe].

Kim, T., ***Cha, S.*** and Kim, Y., “A framework for evaluating user involvement methods in architectural, engineering, and construction projects,” Architectural Science Review, Taylor & Francis, 59(2), 136-147, 2016 [A&HCI].

Kim, T., Kim, Y. ***Cha, S.*** (Corresponding author) and Fischer, M., “Automated updating of space design requirements connecting user activities and space types,” Automation in Construction, Elsevier, 50, 102-110, 2015 [SCIe].

***Cha, S.*** and Kim, T., “What matters for students’ use of physical library space?,” Journal of Academic Librarianship, Elsevier, 41(3), 274-279, 2015 [SSCI].

***Cha, S.*** and Kim, T., “A conceptual framework of agent-based space-use prediction simulation system,” Journal of Construction Engineering and Project Management, Korea Institute of Construction Engineering and Management, 5(4), 12-15, 2015.

***Cha, S.*** and Kim, T., “A conceptual framework for developing indoor spatial choice model,” International Journal of Engineering and Technology, IACSIT Press, 6(5), 386-391, 2014.

<domestic>

Ma, J. and ***Cha, S.*** (Corresponding author), “NWW 오피스 계획을 위한 BLE비컨 기반 공간사용정보 추정,” Korean Journal of Computational Design and Engineering, Society for Computational Design and Engineering, 25(3), 2020 [KCI].

**Refereed conferences**

<international>

Kim, K., Lee, J., Koo, C. and ***Cha, S.***, The effectiveness of HMD-based virtual environments through 3D camera for hotel room tour, The 8th International Conference on Construction Engineering and Project Management (ICCEPM 2020), Hong Kong SAR, 7-8 December, 2020.

Lee, J., Kim, K., ***Cha, S.*** and Koo, C., A Decision Support Model for Intelligent Facility Management through the Digital Transformation, The 8th International Conference on Construction Engineering and Project Management (ICCEPM 2020), Hong Kong SAR, 7-8 December, 2020.

Ma, J., and ***Cha, S.***, Challenges and opportunities for analyzing space usage data of NWW office users, International Conference on Smart Design, Construction IT and BIM 2019, Penang, Malaysia, 7-10 July, 2019.

Lee, J., Koo, C., and ***Cha, S.***, A Model for Integrated Analysis of Energy Consumption and Indoor Environmental Quality in Hotel Rooms, International Conference on Smart Design, Construction IT and BIM 2019, Penang, Malaysia, 7-10 July, 2019.

Abbas, A., Choi, M., Seo, J., ***Cha, S.***, and Li, H., Communication Effectiveness in Face-to-Face and Immersive Virtual Environment: An Initial Evaluation for Construction, The CIB World Building Congress 2019, Hong Kong, 17-21 June, 2019.

Ma, J., and ***Cha, S.***, The accuracy of BLE Beacon for analyzing space usage patterns of non-sedentary users in NWW office. The 7th International Conference on Architecture and Civil Engineering, Singapore, 27 - 28 May, 2019.

Kim, J., Chau, C., ***Cha, S.***, Seo, J., and Koo, C., The Use of Immersive Virtual Environments (IVEs) For a Collaborative and Interactive Education in the Architectural BIM Design, 2nd International Mobile Education and Learning Technologies, Singapore, 6-7 December, 2018.

LI, W., Koo, C***., Cha, S.,*** Lai, H., and Lee, J., A conceptual framework for the real-time monitoring and diagnostic system for the optimal operation of smart building: A case study in Hotel ICON of Hong Kong, 10th International Conference on Applied Energy (ICAE2018), Hong Kong, 22-25 August 2018.

Koo, C. and ***Cha, S.***, A conceptual framework for a real-time-based monitoring and diagnostics for building performance and occupant behavior, International Journal of Arts & Sciences (IJAS) conference, Vienna, Austria, 25-29 June, 2017.

Zhang, S., Kim, J., Shih, S, Koo, C., and ***Cha, S***., Immersive virtual environment (IVE) as a potential tool for interior colour study in office environments, The 34th International Symposium on Automation and Robotics in Construction (ISARC 2017), Taipei, Taiwan, 28 June – 1 July, 2017.

Kim, J., Koo, C., and ***Cha, S.,*** Immersive virtual environment as a promising tool for the elderly-friendly assistive robot, The 34th International Symposium on Automation and Robotics in Construction (ISARC 2017), Taipei, Taiwan, 28 June – 1 July, 2017.

***Cha, S.***, BIM-based immersive virtual environments as a tool for efficient space planning. The 34th International Symposium on Automation and Robotics in Construction (ISARC 2017), Taipei, Taiwan, 28 June – 1 July, 2017.

***Cha, S.***, Integration of choice modelling theory with immersive virtual environments for modelling space preference toward more accurate space utilisation prediction. The 5th International Conference on Architecture and Civil Engineering, Singapore, 8 - 9 May, 2017.

***Cha, S.*** and Kim, T. Towards more accurate space-use prediction: A conceptual framework of an agent-based space-use prediction simulation system. The 6th International Conference on Construction Engineering and Project Management (ICCEPM), Busan, Korea, 11 - 14 October, 2015.

Kim, T. and ***Cha, S.***, Evaluating space-use prediction approaches towards sustainable buildings. The 10th International Symposium on Architectural Interchanges in Asia, Hangzhou, China, October 14 - 17, 2014.

<domestic>

Kim, K. and ***Cha, S.***, "가상환경에서 비언어적 커뮤니케이션 효과에 대한 고찰의 필요성," Society for Computational Design and Engineering annual conference, Jeju, Korea, 26 November 2020.

Kim, K. and ***Cha, S.***, "빅데이터 기반 고객 맞춤형 온라인 VR갤러리 플랫폼 '갤러리 브이에어,” Society for Computational Design and Engineering annual conference, Jeju, Korea, 26 November 2020.

Jo, T., Ma, J., and ***Cha, S.***, Proposal for an Integrated IoT-based Smart Home Environment to Monitor the Healthcare of Older Adults for Aging in Place, Society for Computational Design and Engineering annual conference, Seoul, Korea, 18 July, 2020.

Kim, K., Ma, J., and ***Cha, S***., "파노라믹 VR과 3D VR 가상 전시관에서의 사용자 현존감에 대한 직접 비교연구의 필요성," Society for Computational Design and Engineering annual conference, Seoul, Korea, 18 July, 2020.

***Cha, S.***, IoT-based indoor positioning and activity recognition system, KIBIM annual conference, Seoul, Korea, 13 June, 2019.

Lim, J. and ***Cha, S.***, The Role of Tactile and Olfactory Sense in Design Review Using Virtual Reality, KIBIM annual conference, Seoul, Korea, 13 June, 2019.

Lee, J., Koo, C., and ***Cha, S.***, A Real-Time Management Framework for the Energy Efficiency in a Room of Building via IoT-based Sensor Network: Focused on Hotel Guestroom, Korea Institute of Construction Engineering and Management (KICEM) annual conference, Seoul, Korea, 9 November, 2018.

**Non-refereed publications**

Lee, J. and ***Cha. S.***, “벽면녹화 기법 및 적용 사례소개,” Korean Institute of Architectural Sustainable Environment and Building Systems, 15(2), 2021

Ma, J. and ***Cha. S.,*** “Research Trend of Space Use Data Estimation for Applying NWW Office Planning,” Korea Institute of Building Information Modelling (KIBIM), 9(2), 16-22, 2019

Baek, S. and ***Cha, S.***, “Research Trends in measuring occupant behavior towards for the application of activity-based working environment,” Construction Engineering and Management, Korea Institute of Construction Engineering and Management (KICEM), 18(6), 53-55, 2017.

***Cha, S.*** and Kim, T., “Global Research Trends in Prediction of Occupancy schedules for Building Simulations,” Construction Engineering and Management, Korea Institute of Construction Engineering and Management (KICEM), 15(5), 52-54, 2014.

**Invited talks**

“인간 중심 공간 디자인,” Seoul National University, 24 July, 2020

“Smart office design: New ways of working,” BuildingSmart Forum, 16 April, 2019.

“User-centered design and evaluation,” Korea Unversity, 4 December, 2018

“홍콩 건설환경 및 메가 프로젝트,” 고려대학교 건설경영최고위과정, 15 May, 2018

“User experience design and evaluation,” Chosun University, 3 January, 2018.

“Pre-occupancy Evaluation of Building Design,” Yonsei University, 29 December, 2017

**Research projects (Ongoing)**

​인공지능 기반의 건축설계 자동화 기술 개발, 국토교통과학기술진흥원, 2021-2026 (KRW279,656,000).

빅데이터 기반 고객 맞춤형 온라인 VR 갤러리 플랫폼 ‘갤러리 브이에어’, Principle investigator, 중소벤처기업부, 2020-2021 (KRW48,000,000).

Multi-Intelligent (MI) 공간재생디자인 인재양성팀, Co-investigator,한국연구재단, 2020-2027 (KRW2,100,000,000).

​최적 공간 계획을 위한 인공지능 기반 활동인지 프레임워크 개발, Principal Investigator, 한양대학교, 2020-22 (KRW52,000,000).

데이터기반 오피스 계획을 위한 IoT센서·인공지능 적용 자동 활동패턴 정보 생성 시스템, Principal Investigator, 한국연구재단, 2020-23 (KRW137,500,000).

확장형 리빙랩을 통한 노인 맞춤형 주거복지 통합서비스 개발, Co-investigator, 한국연구재단, 2019-22 (KRW450,000,000).

몰입형 가상환경과 초이스 모델링이론 기반 공간선호도 모델링, Principal Investigator, 한국연구재단, 2019-21 (KRW60,000,000).

**Research projects (Completed)**

건축 디자인 리뷰 단계에서 촉각과 후각을 접목한 가상현실 공간 경험, Principal Investigator, 한양대학교, 2020-21 (KRW30,000,000).

Smart 오피스를 구현을 위한 IoT 기반 건물 사용자 행동 데이터 측정∙예측 시스템 개발, Principal Investigator, 한국연구재단, 2018-20 (KRW60,000,000).

미래 기후 및 인구 변화 대응형 건물재생디자인 창의인재양성팀 [6-8차년], Co-investigator, 한국연구재단, 2018-2020 (KRW250,000,000).

HMD 기반 몰입형 가상현실 (Immersive Virtual Environment)을 이용한 엔드 유저 (End-user)의 건축 디자인 참여 가능성 검토, Principal Investigator, 한양대학교, 2018-19 (KRW20,000,000).

Interdisciplinary and Collaborative Learning through a BIM-based Immersive Virtual Environment in AEC Education, External Co-investigator, University Grants Committee, 2017-19, (HK$ 492,600).

The Effectiveness of Interactive 3D Virtual Environments for Pre-Experience of Hotel Rooms, External Co-investigator, Hotel ICON R&D, 2017-19, (HK$ 49,749).

Implementation of Food Waste Collection System for Catering Services, External Co-investigator, Recycling Fund, Hong Kong Productivity Council, 2018 – 2020, (HK$ 2,709,050).

A Real-Time Monitoring and Diagnostics for energy efficiency and indoor environmental quality in Hotel ICON, External Co-investigator, Hotel ICON R&D, 2018-19, (HK$ 50,000).

Integration of discrete-choice modeling theory with immersive virtual environments for modeling space preferences toward more accurate space utilization prediction, Principal Investigator, University Grants Committee, 2018-20, (HK$466,667).

Development of Internet of Things (IoT) - based Multi-Function Smart Window by Integrating Solar PV Blind and Active Ventilation System toward Zero Energy Building, External Co-investigator, Ministry of Land, Infrastructure and Transport (South Korea), 2017-18, (KRW 70,000,000).

Understanding Activity-Based Working: A Framework for Integrating Indoor Positioning System and Automated Office Activity Recognition, Principal Investigator, Internal grant, The Hong Kong Polytechnic University, 2017-19 (HK$105,000).

An Experimental Investigation of the Energy Saving Potential by Implementing the Real-Time Sensor and Actuator: Focused on the Indoor Environmental Quality and Smart Thermostat, Co-investigator, The Hong Kong Polytechnic University, 2017-18 (HK$105,000).

Development of an Agent-Based Space-Use Prediction Simulation System, Principal Investigator, Start-Up Grant for New Faculty, The Hong Kong Polytechnic University, 2016-19, (HK$500,000).

User Preference-based Space-use Probability Generation, Principal Investigator, Internal Grant, The Hong Kong Polytechnic University, 2016-18, (HK$500,000).

Development of a Learning Package for Students to Appreciate the High-Performance Building Development, Co-investigator, DLTC Fund, The Hong Kong Polytechnic University, 2016-17, (HK$116,000).

**University service**

Partnership committee member, Hong Kong Polytechnic University

New program planning committee member “Building Ecology Engineering”, Hong Kong Polytechnic University

Department representative of CIC Building Information Modelling education

**Teaching experience**

<Undergraduate>

Architectural Modeling I; Digital Design and BIM; FM and Space; FM Research Project; Light, Man, and Environment; Engineering Management

<Graduate>

IoT-based Space Design; Low Carbon Building Design; Facility Management Professional Practice; Economics for Facility Management; Indoor Environmental Quality Assessment; Building Carbon Footprint Assessment; Post-Occupancy Evaluation

**Research postgraduate advisees**

Kim, Kyung Eun, Integrated MS/Ph.D., Principal supervisor, 09/2020 – present.

Kim, Ki Han, Ph.D. student, Principal supervisor, 09/2020 – present.

Jo, Tae Hee, MS student, Principal supervisor, 03/2021 – present.

Ma, Jae Hoon, MS student, Principal supervisor, 03/2019 – present.

Zhang, Shuzhen, Ph.D. student, External co-supervisor, 07/2018 – present.

**Alumni**

Lee, Byunghee, Postdoctoral Fellow, Principal supervisor (Current: Researcher, LH Institute)

Baek, Seunghyo, Postdoctoral Fellow, Principal supervisor (Current: Assistant Professor, Mokwon University)

Kim, Jeonghwan, Postdoctoral Fellow, Principal supervisor (Current: Assistant Professor, Korea National University of Transportation)

Zhang, Shaojie, Ph.D. student, External co-supervisor, 07/2016 – completed.

Whenzhuo, Li, Ph.D. student, External co-supervisor, 04/2018 – completed.

Peng, You, Visiting Ph.D. student, Eindhoven University of Technology, Host supervisor, 08/2016 – 12/2016.

**Honors and certificates**

신진연구자상, 한양대학교, 2021

11월 이달의 연구자상, 한양대학교, 2020

신진연구자상, 한양대학교, 2020

학술봉사상, 한국실내디자인학회, 2019

Best work award, KIID International exhibition, 2019

Best paper award, I3CDE, 2019

Best paper award, KIBIM annual conference, 2019

Best paper award, KICEM annual conference, 2018

Dean’s award for Outstanding Achievement in Academic Programme Development, 2016

Introduction to University Teaching, EDC, the Hong Kong Polytechnic University, 2016

LEED AP O+M (Operation & Maintenance), U.S. Green Building Council, 2010

Lundgren research awards, University of Cambridge, 2014

Kettle’s Yard travel grant, University of Cambridge, 2014

Fieldwork research grant, University of Cambridge, 2012-2014

Erasmus grant, European Commission, 2012-2013

USGBC Greenbuild scholarship, United States Green Building Council, 2010

CMAA scholarship, CMAA, North California Chapter, 2010

**Contribution to professional/community service**

한국BIM학회논문집, 부편집장

건축환경위원회 위원, 대한건축학회

한국CDE학회 하계학술대회 조직위원, 한국CDE학회

한국CDE학회 학회지 편집이사, 학술이사, 한국CDE학회

The BIM 매거진 부편집장, 빌딩스마트협회

한국생태환경건축학회 연구이사, 한국생태환경건축학회

13대 학술부(학술활동) 이사, 한국건축친환경설비학회

스마트 건축위원회 부위원장, 한국건축시공학회

스마트건축/건설 특별위원회 위원, 대한건축학회

제주국제자유도시개발센터 기술자문위원

건설사업관리사(CMP) 자격검정출제위원, 한국 CM협회

Review Editor, Frontiers in Psychology

Topic Editor, Sustainability, MDPI

Guest Editor, Special issue “Sustainable Urban Environment and Building Energy Efficiency”, Sustainability, MDPI, 2020

Guest Editor, Special issue “Advances in Materials, Technologies and Controls for Sustainable Building”, Energies, MDPI, 2020

Technical Theme Chair, 8th International Conference on Construction Engineering and Project Management (ICCEPM 2020).

Scientific Advisory Board at the 3rd International Conference on the Human Factors in Communication of Design track, 24-28 July, 2019, Washington Hilton, Washington D.C., USA.

Scientific Advisory Board at the 9th International Conference on Applied Human Factors and Ergonomics (AHFE 2018) for the Human Factors in Communication of Design track, 22 - 26 July, 2018, Orlando, Florida, USA.

Session Chair of Construction Robotics (IV) / Design session at the 34th International symposium on Automation and Robotics in Construction (ISARC 2017), 28 June 28 - 1 July, Taipei, Taiwan.

Reviewer, Building Simulation, Springer.

Reviewer, Journal of Interior Design, Wiley.

Reviewer, Automation in Construction, Elsevier.

Reviewer, Applied Energy, Elsevier.

Reviewer, Building and Environment, Elsevier.

Reviewer, Resources, Conservation and Recycling, Elsevier.

Reviewer, Indoor and Built Environment, Sage.

Reviewer, Architectural Engineering and Design Management, Taylor & Francis.

Reviewer, Journal of Toxicology and Environmental Health, Taylor & Francis.

Reviewer, International Journal of Geo-information, MDPI.

Reviewer, Sensors, MDPI.

Reviewer, Journal of Computational Design and Engineering, Elsevier.

Reviewer, Frontiers in Psychology, Frontiers Media.

Reviewer, Renewable & Sustainable Energy Reviews, Elsevier.

Reviewer, Advanced Engineering Informatics, Elsevier.

Reviewer, KSCE Journal of Civil Engineering, Springer.

Reviewer, IEEE Access, IEEE.

Reviewer, Sustainable Cities and Society, Elsevier.

Reviewer, Journal of Management in Engineering, ASCE.

Reviewer, 한국CDE학회 논문집

Reviewer, 한국방재학회 논문집

Reviewer, 한국디자인학회 논문집

Reviewer, 한국생태환경건축학회 논문집