



*Department of Architecture*  
*College of Design and Engineering*  
*National University of Singapore*

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**Professor Khee Poh LAM** *Ph.D., FRIBA, FIBPSA*



*Academic and Professional Qualifications*

Ph.D. (Architecture) Carnegie Mellon University, USA. 1994.  
Bachelor of Architecture (Hons) University of Nottingham, UK. 1982.  
Bachelor of Arts (Architecture & Environmental Design)(Hons),  
University of Nottingham, UK. 1979.  
Registered Architect, Architects Registration Board, UK. 1984.  
Chartered Member, Royal Institute of British Architects, UK. 1984.  
Fellow, Royal Institute of British Architects, UK. 2016.  
Fellow, International Building Performance Simulation Association. 2019.

*Appointments*

|           |                                                                                                                        |
|-----------|------------------------------------------------------------------------------------------------------------------------|
| 2025-2027 | Professor of Architecture and the Built Environment.                                                                   |
| 2016-2025 | Provost's Chair Professor of Architecture and the Built Environment.                                                   |
| Aug, 2018 | Professor Emeritus<br>College of Fine Arts, Carnegie Mellon University.                                                |
| 2003-2018 | Professor (Tenured)<br>School of Architecture, Carnegie Mellon University.                                             |
| 1998-2003 | Associate Professor (joint appointment in the Department of Architecture and Department of Building, NUS since 2000.   |
| 1984-1998 | Lecturer/Senior Lecturer School of Architecture, NUS.                                                                  |
| 1982-1984 | Architect, Nottinghamshire County Council Architects Department, County Hall, West Bridgford, Nottingham, NG2 7QP, UK. |
| 2024-2026 | Global Fellow, Ewha Womans University, Seoul, Korea.                                                                   |
| 2015      | Visiting Professor<br>School of Design & Environment, National University of Singapore.                                |
| 2009-2015 | Adjunct Professor<br>School of Architecture, Chinese University of Hong Kong.                                          |
| 2011-2014 | Visiting Professor, Tsinghua University, Beijing, P R China.                                                           |
| 2007-2010 | Adjunct Professor, Xian Jiaotong University, P R China.                                                                |

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## NATIONAL UNIVERSITY OF SINGAPORE

### ADMINISTRATIVE RESPONSIBILITIES

|           |                                                                |
|-----------|----------------------------------------------------------------|
| 2023-2025 | Director, NUS Cities Advisory                                  |
| 2016-2021 | Dean, School of Design and Environment                         |
| 2000-2002 | Head, Department of Building, School of Design and Environment |
| 1998-2000 | Acting Dean, Faculty of Architecture, Building & Real Estate   |
| 1998-1999 | Director, Graduate School of the Built Environment             |

### APPOINTMENTS AND SERVICES

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| 2017-2027 | <b>National University of Singapore</b><br><br>Member of the University Sustainability and Climate Action Council. (June 2021 – June 2025).<br>Member of the Management Board, Institute of Real Estate Studies, NUS (Jan 2017 – 31 May 2023).<br>Member of the Board, Institute of Systems Science (formerly Interactive and Digital Media Institute, NUS (Jan 2017 - )).<br>Member of the College of Design and Engineering. Promotion and Tenure Committee (1 Jul 2023 – 30 Jun 2027). |
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#### School of Architecture

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1996-1998 | Director of B.Arch/M.Arch Degree Programme.<br>Member of School Management.<br>Committee Member of School Corporate Planning Committee.<br>Chairman of Dissertation Committee.<br>Year 5 Design Course Leader.<br>Chairman of B.Arch/M.Arch. Admission Committee.<br>Chairman of Academic Review Committee.<br>Chairman of RIBA 2000 Visitation Committee.<br>Member of Career Guidance Committee.<br>Member of Editorial Board for the international refereed Journal of Southeast Asian Architecture. |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Faculty of Architecture, Building and Real Estate

Vice-Dean, Faculty of Architecture and Building.  
Member of Faculty Strategic Planning Team.  
Member of Research and Postgraduate Committee.  
Member of Board of Selection for the Faculty of Architecture and Building.

Designed and procured the construction of the Faculty booth at the NUS Exhibition – University of the 21<sup>st</sup> Century held on Alumni Day. Also conceptualized and coordinated the fabrication of a sculpture made of scrap material contributed by various departments in the University. (September 1996).

#### National University of Singapore

Member of the Building & Technical Planning Committee, Tropical Marine Science Institute, NUS (April - December 1998).

|         |                                                                                                                                                                                                                                                                                                   |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1995-97 | Represent Faculty in the following University Committees:<br>Alumni UEF Committee.<br>Committee for Seminar on teaching Methodology.<br>PS21 Committee.<br>University Foundation Module Committee.<br>University Modular Committee.<br>Member of Senate sub-committee on Entrance Examination for |
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|         | <p>Special Candidates.</p> <p>Member of the panel of assessors for the NUS Centre for the Arts logo design competition organised by the School of Architecture and CFA.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1995-96 | <p><b>School of Architecture</b></p> <p>Director of Bachelor of Architecture Degree Programme.</p> <p>Member of School Management.</p> <p>Chairman of Dissertation Committee.</p> <p>Year 5 Design Course Leader.</p> <p>Chairman of B.Arch Admission Committee.</p> <p>Chairman of Academic Review Committee.</p> <p>Chairman of RIBA 2000 Visitation Committee.</p> <p>Practical Training Advisor.</p> <p>School Handbook Editor.</p> <p>Member of Career Guidance Committee.</p> <p>Member of Aptitude Test Committee.</p> <p>Member of Editorial Board for the international refereed Journal of Southeast Asian Architecture.</p> <p>Member of the panel of assessors for the Harley Davidson Bike Centre design competition organised by the School of Architecture and Harley Davidson, Singapore (November 1995).</p> <p><b>Faculty of Architecture, Building and Real Estate</b></p> <p>Vice-Dean, Faculty of Architecture and Building.</p> <p>Member of Board of Selection for the Faculty of Architecture and Building.</p> |
| 1994-95 | <p><b>School of Architecture</b></p> <p>Building Construction Course Leader.</p> <p>Building Technology Course Leader.</p> <p>Building Services Course Leader.</p> <p>Member of School Management Committee.</p> <p>Coordinator of BA(AS) Construction Courses.</p> <p>Chairman of Academic Review Committee, School of Architecture.</p> <p>Member of Editorial Board for the international refereed Journal of Southeast Asian Architecture.</p> <p>Chairman of Eco-Architecture Design Competition Committee.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 1988-89 | <p><b>School of Architecture</b></p> <p>Coordinator for BA(AS) Building Construction and Building Structure Courses.</p> <p>Member of School Management Committee.</p> <p>Member of the Working Committee for the RIBA Visit in Sept. 1990.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1987-88 | <p><b>School of Architecture</b></p> <p>Coordinator of BA(AS) Building Construction and Building Structure Courses.</p> <p>Member of School Management Committee.</p> <p>Member of organising Committee for the Inter-Faculty Conference on "Towards Excellence in the Built Environment".</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1986-87 | <p><b>School of Architecture</b></p> <p>Coordinator of BA(AS) Building Construction and Structure Courses.</p> <p>Member of School Management Committee.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|                                        | 1985-86                                                                                                                                                                                                                           | <b>School of Architecture</b><br>Editor, School of Architecture Newsletter.                                                    |
|                                        | <b>CARNEGIE MELLON UNIVERSITY</b>                                                                                                                                                                                                 |                                                                                                                                |
| <b>ADMINISTRATIVE RESPONSIBILITIES</b> | 2012-2015                                                                                                                                                                                                                         | Chair, PhD (Building Performance & Diagnostics) Program.                                                                       |
|                                        | 2008-2012                                                                                                                                                                                                                         | Chair, MS (Architecture) Program.                                                                                              |
|                                        | 2003-2007                                                                                                                                                                                                                         | Director, Graduate Programs.                                                                                                   |
| <b>APPOINTMENTS AND SERVICES</b>       | 2014-2017                                                                                                                                                                                                                         | University Research Review Committee.                                                                                          |
|                                        | 2011-2014                                                                                                                                                                                                                         | College of Fine Arts Council / College Review Committee.                                                                       |
|                                        | 2008                                                                                                                                                                                                                              | University International Strategic Planning Committee.<br>S08-48405: 4th Year Architecture Design Studio Coordinator.          |
|                                        | 2007                                                                                                                                                                                                                              | School of Architecture Promotion & Tenure Review Committee Chair.<br>Carnegie Mellon University Presidential Review Committee. |
|                                        | 2007-2008                                                                                                                                                                                                                         | Carnegie Mellon Fulbright Scholars Program Committee.                                                                          |
|                                        | 2005-2007                                                                                                                                                                                                                         | University Committee on Tenure Appointments.                                                                                   |
|                                        | 2004-2005                                                                                                                                                                                                                         | Presidential Appointee, Faculty Senate.                                                                                        |
|                                        | <b>SINGAPORE</b>                                                                                                                                                                                                                  |                                                                                                                                |
| <b>APPOINTMENTS AND SERVICES</b>       | <b>Industry</b>                                                                                                                                                                                                                   |                                                                                                                                |
|                                        | Fellow, Centre for Liveable Cities, Ministry of National Development, Singapore (1 Apr 2026 – 31 Mar 2028).                                                                                                                       |                                                                                                                                |
|                                        | Member of the National Arts Council Singapore Industry Advisory Panel for a Distinctive City (1 Oct 2024 – 30 Sep 2026).                                                                                                          |                                                                                                                                |
|                                        | Member of the Centre for Liveable Cities Advisory Panel, Ministry of National Development, Singapore (1 May 2022 – 31 Mar 2024, 1 Apr 2024 – 31 Mar 2026).                                                                        |                                                                                                                                |
|                                        | Executive Committee Member of the Urban Land Institute (ULI) Singapore (1 Jul 2022 – 30 Jun 2025).                                                                                                                                |                                                                                                                                |
|                                        | Director, Centre for Liveable Cities Limited (1 Jan 2021 – 30 Apr 2022).                                                                                                                                                          |                                                                                                                                |
|                                        | Expert panel member for The Study on Future Workplaces - commissioned by the Monetary Authority of Singapore (MAS) and the Association of Banks in Singapore's (ABS) Return to Onsite Operations Taskforce (Sep 2020 – Mar 2021). |                                                                                                                                |
|                                        | Reappointed Member of the Future Economy Council (FEC) Urban Systems (US) Cluster Sub Committee (1 May 2021 to 31 March 2023).                                                                                                    |                                                                                                                                |
|                                        | Member of the judging panel for the Singapore Facilities Management Awards 2018 (27 August 2018).                                                                                                                                 |                                                                                                                                |
|                                        | Member of the Future Economy Council (FEC) Built Environment (BE) Cluster Sub Committee (1 June 2018 – 31 May 2020).                                                                                                              |                                                                                                                                |
|                                        | Member of judging panel, CDL-E Generation Challenge 2017, 30 September 2017.                                                                                                                                                      |                                                                                                                                |
|                                        | Member of the judging panel for the Singapore Facilities Management Awards 2017                                                                                                                                                   |                                                                                                                                |

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(18 September 2017).

Member of the Centre for Liveable Cities Advisory Board, Ministry of National Development, Singapore (1 Jul 2017 – 30 Jun 2020).

Member of judging panel, Energy Innovation Challenge 2017, National Engineers Day, July 2017.

Member of the Advisory Board, Singapore Sustainability Academy, City Developments Limited, Singapore (May 2017 - ).

Member of the Jurong Town Corporation Design Review Committee (2000-2002).

Member, Housing and Urban Design Committee, Singapore Institute of Architects. 1995/96, 1996/97, 1997/8, 1998/99.

Appointed by the Council of the Singapore Institute of Architects as a member of the Panel of Jury for the inaugural "SIA GOLD MEDAL AWARD for Lifetime Contribution to Architecture", to be awarded to an architect in Singapore. (From January 1998 for two terms)

Member of the Committee for the Outstanding Architectural/Engineering Firms Awards 1999, Society of Project Managers, Singapore. (October 1998)

Member of the Panel of Judges for the 1998 Singapore Institute of Landscape Architects Professional Award Competition. (November 1998)

Member of the panel of assessors for the Eco-Building Architectural Design Competition organised by the Singapore Institute of Architects, Estate Developers' Association of Singapore and the Faculty of Architecture and Building, NUS. (October 1995)

Member of the multi-disciplinary study team from Jurong Town Corporation to visit industrial developments in Japan (28 May - 8 June 1995).

#### ***Academic***

Ministry of Community Development - The Institute of Policy Studies. Conference on "Ageing in Singapore: Facing Challenges, Seizing Opportunities, Orchard Hotel, Singapore Chairman, Parallel Workgroup on Housing and Land Use Policies. (24-25 September 1999).

URA - The Institute of Policy Studies.  
World Conference on Model Cities, Westin Stamford, Singapore. Moderator, Sectorial Session on "Identity and the City". (19-21 April 1999).

Appointed as a member of the Validation Panel for the Diploma in Architectural Technology Course at Singapore Polytechnic (December 1997)

### **USA and INTERNATIONAL**

#### **APPOINTMENTS AND SERVICES**

#### ***Industry***

Member, International Well Building Institute Global Commission on Healthy Indoor Air. (Sep 2025 - ).

Jury Member, Alt Urban Housing Challenge 2025, Development Alternatives, B-32, Tara Crescent, Qutub Industrial Area  
New Delhi 110016, India. June 2025. ISBN 978-93-95152-35-8.

World Health Organization South East Asia Region Expert Panel Member on Urban Health and Healthy City Network. (Nov 2022 – Oct 2025).

Co-Chair, International Well Building Institute WELL City Advisory, a global network to advance human health and equity in cities. (20 Apr 2022 – 13 Nov 2024).

Member of the World Economic Forum Global Future Council on Clean Electrification, (Oct 2020 – Sep 2021).

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Co-Chair, International Well Building Institute Task Force on COVID-19 and other Respiratory Infections: Prevention and Preparedness, Resilience and Recovery. (6 Apr 2020 – Aug 2021).

Member of the World Economic Forum Special Policy Study Expert Panel for the China Council for International Cooperation on Environment and Development (CCICED) on Major Green Technology Innovation and Realization Mechanisms in the context of green urbanization. (Feb – May 2020).

Member of the World Economic Forum Global Future Council on Energy Technologies, (Oct 2019- Sep 2020).

Juror, Hong Kong Green Building Award 2019, Hong Kong Green Building Council (7 – 8 Sep 2019).

Co-Chair for the Well Living Lab China, Delos China. (01 Jul 2019 – 30 Jun 2023, 01 Oct 2025 – 30 Jun 2027).

Member of the judging panel for the 2018 World Green Building Council Asia Pacific Leadership in Green Building Awards (February 2018).

Member of the Advisory Board, Delos LLC, USA (Sep 2017 - )

Advisory Board of the Asia-Pacific Economic Cooperation Sustainable Energy Centre (APSEC), (Sep 2017 – Sep 2023).

International Energy Agency (IEA) Annex 66: Definition and Simulation of Occupant Behavior in Buildings. Co-Leader of Subtask E: Applications in building design and operations (2013 – 2017).

Invited to participate in the USA President's Council of Advisors on Science and Technology (PCAST) Workshop on Technology and the Future of Cities. 12 Feb 2015, Palo Alto, CA. Final report presented to President Obama on 23 Feb 2016.

Reviewer for the Natural Sciences and Engineering Research Council of Canada (NSERC) – Discovery Grant proposal (Nov 2014).

Reviewer for the National Science Foundation Environmental Sustainability Program (Sustainable Buildings) – research proposals, at the NSF (June 24-25, 2014).

Reviewer for the U.S. Department of Energy's Building Technologies Office (BTO) – Program Peer Review, Double Tree Crystal City Hotel, Arlington, VA. (April 22 – 25, 2014).

Member of the Board of Directors, Global Buildings Performance Network (2012 – 2015).

Member of the Board of Directors, The Energy Foundation (2008 – 2017).

Consultant to The Energy Foundation – China Sustainable Energy Program (2008 – 2017)

Member, Protocol Committee of the International Performance Measurement and Verification Protocol (IPMVP), USA. (2002 – 2004)

Member of the Dupont (Asia) Advisory Council (2001)

### *Academic*

Member, Scientific Committee, The 5th Asia Conference of the International Building Performance Simulation Association 2024, Osaka, Japan, 8-10 Dec 2024. <https://asim2024.org/committee/>

Honorary Editorial Board Member, Journal of Building Performance Simulation, Taylor and Francis, UK, (2024 - ).

Member, Scientific Committee, Simulation for Architecture and Urban Design 2015 (SimAUD), Washington DC, USA (12-15 April 2015).

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Member, Editorial Board, Buildings, MPDI AG, Basel, Switzerland, (2013-2024).

International Referee, iNTA-SEGA 2009: Bridging Innovation, Technology and Tradition. Bangkok, Thailand (2-4 December 2009).

Member, inaugural Editorial Board, Journal of Building Performance Simulation, Taylor and Francis, UK, (2008 – 2017).

Member, inaugural Editorial Board, Building Simulation: An International Journal, Springer and Tsinghua University Press, (2007 - )

International Reviewer, 24<sup>th</sup> international conference on Passive and Low Energy Architecture (PLEA), 22 – 24 November 2007, Singapore.

External Examiner for a PhD thesis, Department of Civil & Environmental Engineering, University College Cork, Ireland. (September 2006)

Member, EuroPIA.10 International Advisory Board, 10<sup>th</sup> International Conference on Design Sciences and Technology, Damascus, Syria (13-15 September 2005).

Member, International Advisory Board, International Journal of Lighting Research and Technology, published by Edward Arnold (Publishers) Ltd, London, UK. (June 2000-June 2003)

Appointed by the President of Carnegie Mellon University as Co-Chairman of the Advisory Board to the School of Architecture at CMU (May 2001)

External Examiner for a PhD thesis, Faculty of Architecture, Delft University of Technology (June 2001)

Member of the International Scientific Committee for the CIB World Building Congress 2001, Wellington, New Zealand. (September 2000)

Member, International Program Committee, 17<sup>th</sup> International Symposium on Automation and Robotics in Construction, 18-20 September 2000, Taipei, Taiwan

External Examiner for the Architecture Program at the Faculty of Architecture, University Teknologi Mara, Shah Alam, Malaysia (2000 – 2002)

Member, Editorial Board, The Real Estate Times. (International Refereed Journal by Pidemco Land Research, Singapore). (November 1998 – 2003)

Member of the Scientific Committee, Building Simulation '99 International Conference, organized by the International Building Performance Simulation Association, to be held in Kyoto, Japan. Also provided service as a reviewer. (13-15 September 1999).

Member, Editorial Board, Journal of Southeast Asian Architecture. (International Refereed Journal published by the School of Architecture, NUS). (1997 – 1999)

Founding member of the Board of Editors, The International Journal of Corporate Real Estate. (International Refereed Journal of the Institute of Corporate Real Estate, NACORE, USA, published by Henry Stewart Publications, UK). (November 1997 – 2003). Also provided service as reviewer.

## ACADEMIC and INDUSTRY AWARDS

International Well Building Institute 2025. Global Educator Award. 10 Feb 2026.  
<https://www.wellcertified.com/iwbi-individual-award-winners-2025>.

Best Paper Awards of Energy and Buildings published in the period from 2018 to 2022. One of the ten best research papers. 28 Aug 2023.  
<https://www.sciencedirect.com/journal/energy-and-buildings/about/awards/best-paper-awards-of-energy-and-buildings-published-in-the-period-from-2018-to-2022>

Zhang Z., Chong A., Pan Y., Zhang C., Lam K.P. Whole building energy model for HVAC optimal control: A practical framework based on deep reinforcement learning. 2019.  
<https://www.sciencedirect.com/science/article/abs/pii/S0378778818330858?via%3Dihub>

Education 2.0 Outstanding Leadership Award, Dubai, UAE, 19 Jun 2023.  
<https://www.education2conf.com/past-awardees-dubai-spring-2023>

Singapore Ministry of National Development (MND) Medallion, in recognition of

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service as Board member of the Centre for Liveable Cities Ltd (1 Nov 2022).

International Well Building Institute Community Award 2020. 17 Dec 2020.  
<https://resources.wellcertified.com/press-releases/iwbi-recognizes-outstanding-leaders-in-advancing-health-and-wellness-in-buildings-communities-and-organizations-across-the-globe/>

Singapore Ministry of National Development (MND) Medallion, in recognition of service as Board member of the Centre for Liveable Cities (24 Nov 2020).

Conferred as an inaugural iBuildSG LEAD Distinguished Fellow by the Building and Construction Authority for contribution to the Built Environment Sector in Singapore (19 June 2020).

International Well Building Institute Leadership Award 2019 - to Asia-based leaders who have demonstrated outstanding achievement in advancing health and well-being for people through WELL projects. (22 Oct 2019).  
<https://resources.wellcertified.com/press-releases/iwbi-recognizes-outstanding-leaders-in-asia/>

Outstanding Paper Award:

Zhang, Z, C L Zhang and K P Lam, A Deep Reinforcement Learning Method for Model-based Optimal Control of HVAC Systems, 7<sup>th</sup> International Building Physics Conference, Syracuse, NY, USA. (23-26 September 2018).

Best Innovative Workflow Award, ASHRAE LowDown Showdown Modeling Challenge sponsored by the Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL). (1 October 2015).  
<https://designbuilder.co.uk/lowdown-showdown-competition-at-ashrae-energy-modelling-conference-2015>

Phipps Conservatory & Botanical Gardens Center for Sustainable Landscapes:

- (a) 2014 Innovative Star Award from the Alliance to Save Energy, for exceeding four of the highest green construction standards - a feat that has never been achieved before - and achieving net-zero annual energy usage through its energy-efficiency Center for Sustainable Landscapes.
- (b) 2014 Engineering News-Record's Best Global Green Project Award.

2013 Alexander Schwarzkopf Prize for Technological Innovation from the National Science Foundation "for exemplary research contribution to technology innovation and positive impact on technology, industry and the society as a whole".

2010 IBM Faculty Award

Autodesk APPHACK 2.0 International Competition, Dec. 2013- 3<sup>rd</sup> Place Winner: Urban Energy Modeling.

National Library Building, Singapore – awarded the ASEAN Energy Efficiency Award (1<sup>st</sup> Prize) in 2007.

Urban Redevelopment Authority Building, Singapore – awarded ASEAN Energy Efficiency Award (2<sup>nd</sup> Prize) in 2002.

## PATENTS

### METHODS AND SYSTEMS FOR DIGITAL INFORMATION MODELING FOR CODES AND STANDARDS COMPLIANCE

**Application number:** 20140372859

**Abstract:** This invention describes methods and systems to efficiently map and extract information from digital representations of buildings for use for a variety of purposes, including but not limited to the performance of dynamic simulations of building performance, and for codes and standards compliance.

**Type:** Application

**Filed:** June 13, 2014

**Issued:** December 18, 2014

**Assignee:** CARNEGIE MELLON UNIVERSITY, a Pennsylvania Non-Profit Corporation

**Inventors:** Khee Poh Lam, Jie Zhao, Rongpeng Zhang, Omer T. Karaguzel

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## OPTIMAL SELECTION OF BUILDING COMPONENTS USING SEQUENTIAL DESIGN VIA STATISTICAL BASED SURROGATE MODELS

**Application number:** 20140365180

**Abstract:** A surrogate model to a building simulation model is built and used for finding a combination of building components that optimize energy use in a building. The surrogate model may be built iteratively using design points comprising a different combination of building product properties that maximize a predefined expected improvement function.

**Type:** Application

**Filed:** June 5, 2013

**Issued:** December 11, 2014

**Assignees:** Carnegie Mellon University, International Business Machines Corporation

**Inventors:** Khoo Poh Lam, Young Min Lee, Fei Liu, Jane L. Snowden, Jeah Yang, Rui Zhang.

### DESIGN PROJECT CITATIONS

National Library Board, Singapore Building Project

Visions of the National Library. The Straits Times, 2 October 1999

A Quiet Revolution. Cover story in Experience Singapore, Issue 13, April 2002. (A newsletter of the Singapore Cooperation Program)

National Library bid to save power rewarded. News published in all 4 major language newspaper in Singapore: The Straits Times, Lianhe Zaobao, Berita Harian, Tamil Murasu, (12 May 2005)

The Urban Redevelopment Authority (URA) Centre, Singapore citation in:

Distinctively modern... The URA Centre. Skyline, Nov/Dec 1999  
U R an A. The Straits Times, 27 November 1999.

Shanghai Jiahui International Hospital

Urban Oasis – Shanghai Jiahui International Hospital. Healthcare Design, Vol. 18, No. 4, April 2018. HCDMAGAZINE.COM.  
<http://www.nxtbook.com/nxtbooks/healthcaredesign/201804/index.php#/12>

Shanghai Jia Hui International Hospital: Award Winning Project from China. First LEED Gold Hospital in China, (19 Mar 2018)  
<https://healthcaredesignmagazine.com/projects/acute-care/photo-tour-shanghai-jiahui-international-hospital/#slide-2>

### INTERNATIONAL BIBLIOGRAPHIC CITATION

Marquis Who's Who in Science and Engineering, since 7th Edition, 2003-2004  
Marquis Who's Who in America, since 59th Edition, 2005  
Marquis Who's Who in the World, since 22nd Edition, 2004  
Marquis Who's Who in American Education, since 2007-2008

### RECOGNITION OF SERVICE

Certificate of appreciation from the International Performance Measurement & verification Protocol Inc., for valuable contributions to the development of International Performance Measurement and Verification Protocol (11 Dec 2003)

Certificates of Appreciation from the Singapore Institute of Architects (SIA) for contribution and services rendered as:  
SIA Gold Medal Award Jury Panel (2002 - 2003)  
SIA Gold Medal Award Jury Panel (1999 - 2000)  
SIA Housing & Urban Design Committee (1995 - 1998)

### LIST OF RESEARCH PROJECTS UNDERTAKEN

CARNEGIE MELLON UNIVERSITY

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### As Principal Investigator

1. Computational Method for the Calibration of a Whole Building Energy Model – A Japanese Case Study. Toshiba Corporation, Japan. \$460,000.00 (17 Aug 2015 – 16 Aug 2017).
2. The DOE Energy-Efficient Building Systems Design Hub: Greater Philadelphia Innovation Cluster for Energy Efficient Buildings. US Department of Energy. \$4.96 million (Oct 2010 - Apr 2016).
3. Dynamic Life-cycle Digital Information Modeling of Building Industry Products and Processes for Codes and Standards Compliance. Carnegie Mellon University Gap Funding \$25,000.00 and Innovation Works \$39,975.00. (Apr 2013 – Mar 2014).
4. Development of a decision support tool for the selection of optimum glazing systems applicable to high-performance and energy efficient commercial office buildings in different climatic conditions. PPG Industries, Pittsburgh, PA, USA. \$35,000.00. (Mar 2012 - Jan 2013).
5. Simulation-based Performance Assessment of the Pingry School Headmaster's Residence, NJ. The Stone House Group. \$10,000.00 (Apr- Aug 2010)
6. Development of a Web-based Information Technology Infrastructures and Regulatory Repository Frameworks for Green Buildings in China. The Energy Foundation. \$190,000.00 (Sep 2009 - Aug 2011).
7. Impact of Shading Control Strategies on Heating and Cooling Loads of a "Typical" Office Building in Different Climatic Contexts in the USA. Somfy SAS, France. \$24,000.00. (Feb - Aug 2007).
8. Assessment of Physical and Computational Airflow Analysis and Evaluation Tools for Building Design. Konstrukt (on behalf of Northwest Alliance for Energy Efficiency. \$10,100. (Nov - Dec 2005).
9. Guidelines and Goals for Green and Healthy Hospital Operations. Children's Hospital of Pittsburgh Foundation, with support from Heinz Foundation. \$25,000 (Sep 2004 - Feb 2005)
10. Energy Modeling Tools Assessment for Early Design Phase. Northwest Alliance for Energy Efficiency. \$27,000 (Mar. - Dec. 2004)
11. Integrated Concurrent Design of High Efficiency Commercial Buildings. United Technologies Research Center. NIST ATP Program. \$431,078.00. (Oct 2004 - Nov 2007)

### As Co-Principal Investigator

1. Integrated Web-based Platform for Lifecycle Building Energy Modelling. Ng Teng Fong Charitable Foundation Research Funding. SGD\$395,036.00. (Jun 2018 – Dec 2020).
2. NSF RCN-SEES: Predictive Modeling Network for Sustainable Human-Building Ecosystems (SHBE). \$62,500.00 (out of \$652846.00). (Sep 2013 – Aug 2018).  
[https://nsf.gov/awardsearch/showAward?AWD\\_ID=1664881&HistoricalAwards=false](https://nsf.gov/awardsearch/showAward?AWD_ID=1664881&HistoricalAwards=false)
3. BUILD- Barriers, Understanding, and Integration - Life Cycle Development. NSF EFRI SEED. \$430,229.00 (out of \$2 million). (Oct 2010- Oct 2014).
4. Modeling the Performance of Energy Recovery Technology for Packaged, Rooftop HVAC Equipment. United Technologies Research Center. \$70,000. (Jan - Oct 2004)

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## Research Gifts/Fellowships

1. The Future of Building Energy Management Systems. Autodesk. \$30,000.00 (Sep 2015 – Dec 2015).
2. Whole Building Energy Modeling and Calibration – A Carnegie Mellon University Building Case Study. Toshiba Corporation, Japan. \$92,871.00 (May 2014 – Mar 2015).
3. Multiple Environmental Sensing Strategies for Determining Occupancy in Building. Robert Bosch Corporation. \$99,290.00 (Dec 2006 - Jun 2008).
4. Information Technology Enabled Sustainable Testbed (ITEST). Siemens Corporation. \$75,880.00 (Dec 2006 – Jun 2008).
5. Residential Building Energy Modeling. IBACOS, Pittsburgh, PA. \$23,000.00. (Sep 2005 – Aug 2006).

## NATIONAL UNIVERSITY OF SINGAPORE

### As Co-Principal Investigator

1. Aerosol Infection Control in Buildings: Temperature, Humidity, Airflow and Ventilation. NUS COVID-19 Research Seed Grant. S\$95,000.00. (Apr 2020-Mar 2021).
2. Integrated Web-based Platform for Lifecycle Building Energy Modelling. Ng Teng Fong Charitable Foundation Research Funding. S\$395,036.00. (Jun 2018 – Dec 2020).
3. BCA RID 94.17.2.6. Lifecycle BIM Integration with Energy MM&V for Net Zero Energy Building. S\$963,800.00. (01 Jan 2016 – 30 Jun 2018).

### As Principal Investigator

1. Contract for Services - To support the Abu Dhabi Department of Municipalities and Transport (DMT) with site visit, exploratory and co-creation workshop, and assessment study. SGD1,626,300.00. (16 Jan 2025 – 15 Jan 2028).
2. Provision of Research Consultancy Services to Conduct Ventilation Study for Healthcare Facilities. Contract No. MOH ITT B31/22. Ministry of Health, Singapore. S\$1,096,000.00. 2 May 2023 – 1 Aug 2024.
3. R-296-000-068-112 *Integration of CAD and Thermal Simulations Through Industry Foundation Class (IFC) Product Model*, in collaboration with NovaCITYNETS, Singapore, and Temasek Polytechnic. (NUS funded S\$52,000.00). (1 Mar 2003 -29 Feb 2004)
4. R-296-000-052-112 *Mapping of Industry Building Product Model for Detailed Thermal Simulation and Analysis*. (NUS funded S\$29,350.00), in collaboration with NovaCITYNETS, Singapore. (1 Jan - 30 Jun 2002)
5. RP3982110 *SEMPER II - Digital Building Models for Intranet Collaborative Design Computing*. The project was awarded a research grant of S\$1,105,600.00, to be co-funded by NSTB (50%) and NUS & TP (50%). This arose from a Memorandum of Understanding for collaborative research between NUS, Carnegie Mellon University, USA and Temasek Polytechnic, under the SingAREN - vBNS high-speed network link between USA and Singapore. (13 May 1999 -13 May 2002).
6. RP950050 *The Establishment of Architectural and Technical Standards and Guidelines for the Design and Maintenance of Marine Mammal Facilities*. (NUS funded S\$152,400.00). (23 Feb 1996 - 23 Feb 1998)
7. RP950015 *Mapping of the Sky Luminance Distribution and Computational Prediction of Daylighting Performance in Singapore*. (NUS funded S\$125,700.00). (26 August 1995 - 25 August 1997).

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#### As Collaborator

1. RP 991020 *To Plan and Design an Innovative Housing Project (32 Acre) at Dondra, Sri Lanka, Integrating Relevant Development Potentials Within and Around the Site*. (NUS funded S\$ 30,000.00). (16 June 1999 - 16 June 2001).
2. *A Pilot Study into the Feasibility of Applying an Integrated and Total Building Performance Method to the Evaluation of School Buildings in Hong Kong*. (Funded by the Chinese University of Hong Kong). (Oct. 1999 - Oct. 2000).
3. RP982073 *A study of the Use of Performance Based Simulation Tools for Building Design and Evaluation in Singapore*. (NUS funded S\$8,200.00). (7 Dec 1998 - 31 Jul 1999).
4. This research produced an important IRJ paper that documented for the first time the status of the use of computer simulation tools for building performance evaluation in the Singapore building industry. This work also provided an important foundation for subsequent research activities in this field.
5. RP3981040 *Study of Daylight Attenuation Through Windows in Urban Environments*, in collaboration with Prof. Peter Tregenza, School of Architectural Studies, University of Sheffield, UK (NUS funded \$169,600.00). (1 Oct 1998 - 1 Oct 2000)
6. Established a Memorandum of Understanding between the Faculty of Architecture & Building and Pidemco Land Limited for research collaboration in the field of *Total Building Performance and Building Services/Automation Systems*. (Funding from Pidemco Land Limited - \$118,000.00). (February 1998 - February 2000)
7. RP972051 *An Integrated Building Assessment Method Using the Total Building Performance Approach*. (NUS funded \$177,300.00). (February 1998 - January 2000)
8. RP960019 *Applying Advanced Lighting Visualization Techniques to Architectural Design in the Local Context*. (NUS funded S\$62,780.00). (15 August 1996 - 1 June 1998).

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## TEACHING

### PH.D. THESES ADVISING

## CARNEGIE MELLON UNIVERSITY

Primary Ph.D. advisor of the following students

| Year      | PhD Student           | Project                                                                                                                                                                         |
|-----------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2016-2019 | Zhiang Zhang          | A Reinforcement Learning Approach for Whole Building Energy Model Assisted HVAC Supervisory Control                                                                             |
| 2012-2017 | Weili Xu              | An Energy and Cost Performance Optimization Platform for Commercial Building System Design                                                                                      |
| 2012-2017 | Chao Ding             | CFD Based Coupled Indoor and Outdoor Interactions (CIOI) for Building Natural Ventilation in Urban Environment                                                                  |
| 2012-2017 | Adrian Zhun Min Chong | Bayesian Calibration of Building Energy Models for Large Datasets                                                                                                               |
| 2012-2017 | Shalini Ramesh        | Urban Energy Information Modeling: A framework to quantify the thermodynamic interactions between the natural and the built environment that affect building energy consumption |
| 2010-2015 | Jie Zhao              | Design-build-operate Energy Information Modeling For Occupant-oriented Predictive Building Control                                                                              |
| 2009-2014 | Rongpeng Zhang        | Dynamic Optimization of Integrated                                                                                                                                              |

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|-----------|-----------------|-------------------------------------------------------------------------------------------------|
|           |                 | Active-Passive Strategies for Building Enthalpy Control                                         |
| 2008-2013 | Omer Karaguzel  | Simulation-Based Parametric Analysis of Building Systems Integrative Solar Photovoltaics (SIPV) |
| 2006-2012 | Rui Zhang       | Advanced Building Thermal Simulation Coupling of Finite Volume Method and Nodal System          |
| 2005-2011 | Bing Dong       | Integrated Building Heating, Cooling and ventilation Control                                    |
| 2004-2009 | Yun Shang Chiou | An Occupant-Driven Integrative Household System for Residential Building Energy Simulation      |
| 2003-2011 | Yi Chun Huang   | An Integrated Scalable Lighting Simulation Tool                                                 |
| 2003-2008 | Chaoqin Zhai    | Performance Modeling of Desiccant Wheel Design and Operation                                    |

Ph.D. Advisory Committee Member for the following students

| Year      | Ph.D. Student | Project                                                                                                                                                 |
|-----------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2010-2012 | Xuesong Liu   | Applying A Self-Managing Approach to Improve the Energy Efficiency in Operating and Maintaining HVAC Systems                                            |
| 2009-2014 | Erica Cochran | Sustainable Schools and Neighborhoods: Impact of School Building Physical Characteristics and Neighborhood Attributes on Student Performance and Health |
| 2005-2006 | Vipul Singhvi | Machine Learning based Building Control Strategy (Lighting)                                                                                             |
| 2003-2008 | Ming Qu       | Model-based Design and Operation of Advanced Solar Cooling and Heating System                                                                           |

#### MASTER THESES ADVISING

Primary Master Thesis advisor of the following students

| Year      | Master Student | Project                                                                              |
|-----------|----------------|--------------------------------------------------------------------------------------|
| 2013-2015 | Xuan Luo       | Performance Evaluation and Enhancement of a Probabilistic Occupancy Simulation Model |
| 2013-2015 | Liming Zhang   | Urban Microclimate Modeling Integrating ENVI-met and GIS Platform                    |
| 2011-2013 | Boyuan Li      | Building Ventilation Control system Design and simulation                            |

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**NATIONAL UNIVERSITY OF SINGAPORE**

**PH.D. THESES  
ADVISING**

Primary Ph.D. advisor of the following student

| Year      | Ph.D. Student | Project                                                                                |
|-----------|---------------|----------------------------------------------------------------------------------------|
| 2020-2025 | Eikichi Ono   | Occupant-Centric Design for Functional and Thermal Zoning at Activity-Based Workspaces |

**DESIGN THESES  
SUPERVISED**

Primary Design Thesis advisor

| Year                                | Student                   | Project                                                                                             |
|-------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------|
| 2025-26<br>AR5805/AR5806/<br>AR5807 | Andre Lim Jiang Fan       | Care Without Walls:<br>Care Threaded Through Daily Life                                             |
|                                     | Sze Zo Ey                 | Restoration within Movement:<br>Reimagining Intersection of Mobility as<br>Landscape of Nourishment |
| 2024-25<br>AR5805/AR5806/<br>AR5807 | Joyann Ong Si Ya          | FIKA: Lost Treasures: Co-Production<br>Waste                                                        |
|                                     | Tan Wen Xuan              | EDEN – Mental Refuge in a Digitalised<br>Urban Society                                              |
|                                     | Tan Yue Ren               | Human - Nature Symbiosis: Breathing<br>Life into Industrial Zone                                    |
| 2023-24<br>AR5806/AR5807            | Hou Xinyao                | Possibility of Urban Farming in Future<br>HDB                                                       |
|                                     | Ling Wei                  | The Soundscape of Queenstown -<br>Addressing Hearing Loss and Acoustic<br>Comfort                   |
|                                     | Wang Zheng                | Food Factory – From Farm to Table                                                                   |
| 2022-23<br>AR5806/AR5807            | Jermaine Ho Jia Hui       | A New Typology of Neighbourhood in<br>Nature                                                        |
|                                     | Lyu Meng Jie              | Community Renewal Strategies for<br>Ageing-in-Place in the Context of an<br>Ageing Society          |
| 1997/98                             | Cho Wee Bin, Jeffrey      | Project Delphinus                                                                                   |
|                                     | Leong Mei Mei             | Recycling and the Urban Built<br>Environment                                                        |
|                                     | Ong Tso Sheng             | Neighbourhood Tele-commuting Centre                                                                 |
|                                     | Seow Lee Koon             | Experimental Arts Station                                                                           |
|                                     | Siah Yeow Kia,<br>Desmond | Re-examining the Neighbourhood<br>Kindergarten-Space for the Child's<br>Imagination                 |
|                                     | Wong Kien Meng            | MTV Factory                                                                                         |
|                                     | Yeo Lee Pin               | A Primary School for the Year 2000                                                                  |
| 1996/97                             | Chan Hwang Ling,<br>Fanny | Day-care Centre for the Elderly                                                                     |

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|---------|-----------------------|--------------------------------------------------------------------|
|         | Kam Leong Heng        | Architecture for Information Accessibility - A Library Network     |
|         | Loo Chee Choon        | Redefining the Community Centre - A Place for the Elderly          |
|         | Sian Chong Ping       | Bridge-hotel                                                       |
|         | Soh Kee Swee, Maureen | Marine Science Interpretive Centre                                 |
| 1995/96 | Chum Tun Jang         | Senai Regional Airport (Growth Triangle Singapore, Johor and Riau) |
|         | Lee Chiow Hon         | Proposed Headquarters for the Singapore Coast Guard                |
|         | Lew Kok Wai           | Kuala Lumpur Heritage Centre                                       |
|         | Loh Hai Yew           | Marine Ecology Research Centre                                     |
|         | Tan Mui Jee, Eleanor  | Botanical Centre in the Park                                       |
| 1994/95 | Chan Beng Kiat        | An Interpretive Centre on Ecology                                  |
|         | Koh Chin Chye         | The Information and Auction Centre for the Arts                    |
|         | Ooi Sean Yin          | The City Gate - Ferry Terminal Penang                              |
|         | Sam Shyan Yee         | Infotech Park                                                      |

## DISSERTATIONS SUPERVISED

Supervised the following Master of Architecture and Bachelor of Architecture dissertations

### Master of Architecture dissertations

| Year    | Author            | M. Arch. Dissertation Title                                                                                         |
|---------|-------------------|---------------------------------------------------------------------------------------------------------------------|
| 2001/02 | Low Soon Meng     | Being comfortable in flats - Use of CFD in the analysis of comfort in flats                                         |
| 2001/02 | Tham Ban Fatt     | Impact of computer technology on architectural representation                                                       |
| 2000/01 | Foo Wan Ching     | Assessment and prediction of daylight efficiency in side-lit space in Singapore.                                    |
| 2000/01 | Lim Tian Ping     | Morphology of skyscrapers - Balanced environment of the interior and exterior - A concept of total building         |
| 2000/01 | Low Lee Onn, Mark | Thermal comfort in office spaces - Investigation into the parameters of design for thermal comfort in office spaces |

### Bachelor of Architecture dissertations

| Year    | Author       | B. Arch. Dissertation Title                                                         |
|---------|--------------|-------------------------------------------------------------------------------------|
| 1998/99 | Low Sok Hwee | Spatial determinism of social interaction patterns in public housing blocks design. |
| 1998/99 | Tse Pek Mun  | Empirical study: Design intentions and                                              |

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|---------|---------------------------|---------------------------------------------------------------------------------------------------------------|
|         |                           | experiential reality in Atria.                                                                                |
| 1997/98 | Leong Mei Mei             | (Media) Representation of place: An extensions and limitations of place in private condominiums in Singapore. |
| 1997/98 | Lim Chiong Lew<br>Bernice | Commodification and consumption of the past in the built heritage and heritage tourism.                       |
| 1997/98 | Ong Tso Sheng             | An alternative to the office tower.                                                                           |
| 1996/97 | Chua Ter Yui Dawn         | Evolution of the building envelope: its impact on the environment and on the quality of the interiors.        |
| 1996/97 | Fatimah Akhtar            | Inquiry into the role of specifications for total building performance.                                       |
| 1996/97 | Kam Leong Heng            | Architecture for the pre-school children.                                                                     |
| 1996/97 | Lee Sze Kai               | River cities and their relationship to the rivers - a comparative study of Singapore and Perth.               |
| 1996/97 | Liam Wai Tak              | Changing office physical environment in response to the impact of office automation.                          |
| 1996/97 | Sim Choon Heok            | Photo-graphically speaking on architecture and its represented image.                                         |
| 1996/97 | Soh Ken Swee Maureen      | Role of the structural frame in the architecture of the Barcelona Pavilion & Villa Savoye.                    |
| 1996/97 | Yeo Kwang Teck            | Technology, the green issue, and architecture.                                                                |
| 1995/96 | Chia Teck Giap            | Nature: The lifeblood of a sustainable built environment.                                                     |
| 1995/96 | Lee Chiow Hon             | Architecture and the art of war.                                                                              |
| 1995/96 | Loh Hai Yew               | Sequest: Concept of sea-based development as an alternative to land-based development.                        |
| 1995/96 | Lee Kok Wai               | Kuala Lumpur: a study of a post-colonial city.                                                                |
| 1995/96 | Lim Li Kiang              | Image of technology in Nicholas Grimshaw's British Pavilion Expo 1992.                                        |

**Bachelor of Science (Building) dissertations supervised**

| Year    | Candidate             | B. Sc. Dissertation Title                                                                                                                  |
|---------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 2025/26 | Lionel Tiong Jun Mian | Integrating Renewable Energy Strategies into Healthcare Facility Design: A Framework for Sustainable and Resilient Hospital Infrastructure |
| 2025/26 | Chin Hong Yi          | Risk Management in Public Sector Projects in Singapore                                                                                     |

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|---------|----------------------------|------------------------------------------------------------------------------------------|
| 2024/25 | Audris Poon Li Yi          | Application of digital twin in the conservation of heritage buildings in Singapore       |
| 2024/25 | Giselle Toh Yu Xin         | Evaluating energy efficiency of control systems within building management systems (BMS) |
| 2023/24 | Ang Jin En                 | Waste management process of Asian airports                                               |
| 2022/23 | Cheok Jun Hao, Brendan Ian | The effects of radiant temperature affecting thermal comfort in commercial buildings     |
| 2022/23 | Chong Yu Quan, Ryan        | Facility management in Nursing Homes for Dementia Patients                               |
| 2002/03 | Koh Yaik Meng              | The value of architectural design competitions in Singapore                              |
| 2002/03 | Lee Sze Yong               | Foreign workers and main-year entitlement                                                |
| 2002/03 | Lee Tse Choon, Paul        | Effect of HDB upgrading on its occupants                                                 |
| 2002/03 | Leong Chan Tong            | Performance-based codes for fire safety in Singapore                                     |
| 2002/03 | Tan Shin Hui, Denise       | Urban heat island - a comparison of ambient temperatures                                 |

## THESES EXAMINED

Examined the following graduate research theses

### Master of Science (Building Science) theses examined

| Year | Candidate    | Master Thesis Title                                                       |
|------|--------------|---------------------------------------------------------------------------|
| 2001 | Liaw Wee Lin | Daylight distribution in Housing and Development Board residential blocks |
| 1998 | Lim Kok Hee  | Lighting conditions and lighting power budget of offices in Singapore     |

### Master of Arts (Architecture) theses examined

| Year | Candidate     | Master Thesis Title               |
|------|---------------|-----------------------------------|
| 2007 | Soon Lay Kuan | Daylighting of Atria in Singapore |

### Ph.D. theses examined

| Year            | Candidate           | Ph.D. Thesis Title                                                                                   |
|-----------------|---------------------|------------------------------------------------------------------------------------------------------|
| 2014 (TU Wien)  | Sokol Dervishi      | Habilitation Commission- Architectural Lighting: Boundary Conditions and Computational Applications. |
| 2006 (UC Cork)  | Monjur Mourshed     | Interoperability-based Optimization of Architectural Design                                          |
| 2001 (TU Delft) | Bay Joo Hwa, Philip | Cognitive biases in design: the case of tropical architecture                                        |
| 1999 (NUS)      | Ling Yean Yng,      | Multi-attribute decision making model for                                                            |

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|            |                |                                                                                                  |
|------------|----------------|--------------------------------------------------------------------------------------------------|
|            | Florence       | evaluation and selection of consultants for Design-and-Build projects in Singapore               |
| 1999 (NUS) | Tan Chin Chong | Solar induced ventilation                                                                        |
| 1999 (NUS) | Zhong Qi       | Building process modelling using product modelling methodology and its application to scheduling |

## COURSES TAUGHT

### CARNEGIE MELLON UNIVERSITY

|             |                                                                                                                                  |
|-------------|----------------------------------------------------------------------------------------------------------------------------------|
| Fall 2015   | 48722 Building Performance Modeling<br>48116 Building Physics                                                                    |
| Fall 2014   | 48722 Building Performance Modeling<br>48116 Building Physics                                                                    |
| Spring 2015 | 48721 Building Controls and Diagnostics<br>48744 Computational Fluid Dynamics in Building Design                                 |
| Fall 2013   | 48722 Building Performance Modeling<br>48116 Building Physics                                                                    |
| Spring 2014 | 48721 Building Controls and Diagnostics                                                                                          |
| Fall 2012   | 48722 Building Performance Modeling<br>48116 Building Physics                                                                    |
| Spring 2013 | 48721 Building Controls and Diagnostics                                                                                          |
| Fall 2011   | 48722 Building Performance Modeling<br>48116 Building Physics                                                                    |
| Spring 2012 | 48721 Building Controls and Diagnostics                                                                                          |
| Fall 2010   | 48722 Building Performance Modeling<br>48410 Environment II-Lighting<br>48413 Building Acoustics                                 |
| Spring 2011 | 48410 Environment II-Lighting<br>48116 Building Physics<br>48599 Undergraduate Independent Study                                 |
| Fall 2009   | 48722 Building Performance Modeling<br>48410 Environment II-Lighting<br>48413 Building Acoustics                                 |
| Spring 2010 | 48405 Architecture Design Studio: Systems Integration                                                                            |
| Fall 2008   | 48722 Building Performance Modeling                                                                                              |
| Spring 2009 | 48413 Building Acoustics<br>48721 Building Controls and Diagnostics<br>48405 Architecture Design Studio: Systems Integration     |
| Fall 2007   | 48722 Building Performance Modeling                                                                                              |
| Spring 2008 | 48410 Acoustics and Lighting<br>48721 Building Controls and Diagnostics<br>48405 Architecture Design Studio: Systems Integration |
| Fall 2006   | 48722 Building Performance Modeling<br>48410 Acoustics and Lighting                                                              |

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|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Spring 2007 | 48721 Building Controls and Diagnostics                                                                                                           |
| Summer 2007 | 48505 Summer Study Abroad – Design Studio in Hong Kong, China                                                                                     |
| Fall 2005   | 48722 Building Performance Modeling<br>48410 Acoustics and Lighting                                                                               |
| Spring 2006 | 48721 Building Controls and Diagnostics                                                                                                           |
| Summer 2006 | 48505 Summer Study Abroad – Design Studio in Hong Kong, China                                                                                     |
| Fall 2004   | 48722 Building Performance Modeling<br>48410 Acoustics and Lighting                                                                               |
| Spring 2005 | 48721 Building Controls and Diagnostics<br>48405 Architectural Design Studio (Gates Center, Carnegie Mellon University)                           |
| Fall 2003   | 48722 Building Performance Modeling                                                                                                               |
| Spring 2004 | 48721 Building Controls and Diagnostics<br>48405 Architectural Design Studio – Labs 21 Design Competition (Georgetown University, Washington DC.) |

#### NATIONAL UNIVERSITY OF SINGAPORE

|           |                                                                                                                                                                                                                                                                                                            |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2025/2026 | PF4502 Green Development<br>PF4101 Dissertation<br>AR5805 Advanced Architecture Design (Thesis Part 1)<br>AR5806 Architectural Design Research Report (Thesis Part 1)<br>AR5807 Architectural Design Thesis (Thesis Part 2)<br>AR5323 Well and Green Built Environment                                     |
| 2024/2025 | PF4502 Green Development<br>PF4101 Dissertation<br>AR5805 Advanced Architecture Design (Thesis Part 1)<br>AR5806 Architectural Design Research Report (Thesis Part 1)<br>AR5807 Architectural Design Thesis (Thesis Part 2)<br>AR5323/AR5953E Well and Green Built Environment                             |
| 2023/2024 | PF4502 Green Development<br>PF4101 Dissertation<br>AR5805 Advanced Architecture Design (Thesis Part 1)<br>AR5806 Architectural Design Research Report (Thesis Part 1)<br>AR5807 Architectural Design Thesis (Thesis Part 2)<br>AR5953C Net Zero Carbon Building<br>AR5323 Well and Green Built Environment |
| 2022/2023 | PF4502 Green Development<br>PF4101 Dissertation<br>AR5806 Architectural Design Research Report<br>AR5807 Architectural Design Thesis                                                                                                                                                                       |
| 2002/2003 | BS5203 Computational Design Support Tools<br>BS5216 Lighting Design and Technology<br>BU4102 Integrated Construction Technology<br>AR3102 Architectural Design (studio consultation)<br>AR6102 Architectural Design Thesis (studio consultation)                                                           |
| 2001/2002 | AR6141 M. Arch. Dissertation<br>BS5203A Computational Design Support Tools                                                                                                                                                                                                                                 |
| 2000/2001 | AR6141 M. Arch. Dissertation<br>BS5216 Lighting Design and Technology                                                                                                                                                                                                                                      |

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BS5203A Computational Design Support Tools

|           |                                                                                                                                                                  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1999/2000 | AR5318 Intelligent Buildings<br>AR4203 Research Methodology<br>AR5513 Computational Design Support Tools                                                         |
| 1998/99   | AR4203 Research Methodology<br>MBS206 Lighting and Technology                                                                                                    |
| 1997/98   | AR501 Architecture and Urban Design 2<br>AR503 Dissertation<br>AR4203 Research Methodology                                                                       |
| 1996/97   | AR501 Architecture and Urban Design 2<br>AR503 Dissertation<br>MBS206 Lighting and Technology                                                                    |
| 1995/96   | AR401 Architecture and Urban Design 1<br>AR501 Architecture and Urban Design 2<br>AR402 Building Technology<br>AR503 Dissertation<br>AR305 Building Construction |
| 1994/95   | AR401 Architecture and Urban Design 1<br>AR501 Architecture and Urban Design 2<br>AR402 Building Technology                                                      |
| 1988/89   | AR105 Building Structures 1<br>AR305 Building Structures 3<br>AR304 Building Construction 3<br>AR201 Architecture Design 2                                       |
| 1987/88   | AR105 Building Structures 1<br>AR305 Building Structures 3<br>AR304 Building Construction 3<br>AR301 Architecture Design 3                                       |
| 1986/87   | AR105 Building Structures 1<br>AR304 Building Construction 3<br>AR301 Architecture Design 3                                                                      |
| 1985/86   | AR105 Building Structures 1<br>AR304 Building Construction 3<br>AR201 Architecture Design 2                                                                      |
| 1984/85   | AR105 Building Structures 1                                                                                                                                      |

**OTHER TEACHING  
AND ADVISORY  
APPOINTMENTS**

Senior Fellowship in Public Service (SFPS) Programme, Technology and Innovation Module, Lee Kuan Yew School of Public Policy, NUS. “Urban Science”. 18 Nov 2021.

MND-NUS Professional Certificate in Sustainability for the Built Environment. Module 3: Operational Carbon And Smart Facilities Management. “The Concept of Total Building Performance and Diagnostics”, 08 May 2023; 16 May 2024; 17 Nov 2025.

World Business Council for Sustainable Development (WBCSD) LEAP Programme, School of Continuing and Lifelong Education, NUS. “NUS As A Living Lab”. 23 Oct 2024; 28 Oct 2025

Inaugural Distinguished Senior Fellowship Programme, NUS. “Greener and Healthier Futures by Design: The Human-Centric Built Environment”. 03 Sep 2025.

**CONSULTANCY  
SERVICES**

**NBBJ, New York, NY 10006**  
Jiahui International Hospital, Shanghai, China (October 2013 – October 2014).

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**Syska Hennessy Group, New York 10036**

Jiahui International Hospital, Shanghai, China. (April – October 2014).

<https://healthcaredesignmagazine.com/projects/acute-care/photo-tour-shanghai-jiahui-international-hospital/>

**Tiong Seng Properties Pte. Ltd., Singapore**

Tianjin Eco-City Residential Development – Plot 12a – Park Tower, Jingshan Yuan. (September 2009 - July 2010).

<https://www.propertyguru.com.sg/property-management-news/2010/5/39778/tiong-seng-signs-4-5b-yuan-contract-for-tianjin-eco-city-development>  
<https://mr.ke.com/3dmvp/#/562279/305851?source=RESBLOCK>

**NBBJ, Columbus, OH 43204**

Koo Foundation Dr. Sun Yat-Sun Cancer Center, Taipei, Taiwan. (January – December 2009).

[https://www.cchsu.com.tw/c13\\_en.html](https://www.cchsu.com.tw/c13_en.html).

**Phipps Conservatory, Pittsburgh, PA 15213**

Review of building performance modeling of the Center for Sustainable Landscape (CSL) project. (September 2007).

<https://www.phippsconservatory.org/green-innovation/at-hipps/center-for-sustainable-landscapes-greenest-building-museum-garden-in-the-world>

**Imbue Technology Solutions Inc., Pittsburgh, PA 15108**

Building Energy Modeling of McDonald's Restaurant, Kennywood, Pittsburgh, PA. (July - August 2005).

**Corning Inc., Corning, NY.**

Design charrette team - W C Decker Engineering Building, Corning, New York. (July 2005).

**National Library Board, Singapore**

Won the international design competition with T R Hamzah & Yeang/Swan and Maclaren Architects team to design and building the new National Library Board (NLB) Building. (May 1999 - January 2000).

Appointed Consultant by the National Library Board on Total Building Performance evaluation of the design of the NLB Building as well as Coordinator of the technical evaluation team comprising 5 other consultant firms appointed by NLB in the tender evaluation process. (February 2000 -July 2003).

**Singapore Cricket Club**

Assessment of Proposed Remedial Works to the Premises of the Singapore Cricket Club. February 2001.

**Pidemco Land Ltd., Singapore**

A Total Building Performance Study of the CAPITAL TOWER (POSBank Tower). November 1998 - May 1999.

**Allegro Investments Pte Ltd, Singapore**

Investigation of Moisture and Mildew Problems at a Private Condominium Development. 18 September - 18 October 1998.

**C&S Construction Pte Ltd, Singapore**

Consultant on External Floor Finishes for Pierce Villa Project. 24 June - 21 July 1997.

**May Oh and Wee Advocates and Solicitors, Singapore**

Consultant and Expert Witness on DC Suit - Water Leakage Through Skylights at a Private Residential Property. 14 January - 7 February 1997.

**Cathay Organisation Pte Ltd., Singapore**

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Collaborator on the "Cathay Building Redevelopment" Project. 24 May - 24 October 1996.

**Jurong Town Corporation, Singapore**

Consultant on the "Design Evaluation of the 'Model A' Prototype Multi-level Factory Complex". 9 September 1996 - 15 January 1997.

**Urban Redevelopment Authority, Singapore**

Consultant on the proposed URA Headquarters Building Project: (a) Specification of the concept of Total Building Performance in the Design & Build tender documentation. 15 August - 30 September 1995. (b) Tender evaluation, with specific reference to the implementation of Total Building. 18 January - 30 April 1996.

<https://www.nas.gov.sg/archivesonline/data/pdfdoc/1999112001.htm>

[https://eservice.nlb.gov.sg/flipviewer/data/booksg\\_publish/e/ed74dd3b-cc34-470a-9e3c-](https://eservice.nlb.gov.sg/flipviewer/data/booksg_publish/e/ed74dd3b-cc34-470a-9e3c-43fd2ec942c6/web/html5/index.html?opf=tablet/BOOKSG.xml&launchlogo=tablet/BOOKSG_BrandingLogo_.png&pn=9)

[43fd2ec942c6/web/html5/index.html?opf=tablet/BOOKSG.xml&launchlogo=tablet/BOOKSG\\_BrandingLogo\\_.png&pn=9](https://eservice.nlb.gov.sg/flipviewer/data/booksg_publish/e/ed74dd3b-cc34-470a-9e3c-43fd2ec942c6/web/html5/index.html?opf=tablet/BOOKSG.xml&launchlogo=tablet/BOOKSG_BrandingLogo_.png&pn=9)

**RSP Architects Planners and Engineers, Singapore**

Preparation of Technical Manual on Good Architectural Detailing Practice. 1 March - 30 April 1989.

Analysis of the Performance of Existing Architectural Details in the Office and preparation of a Technical Manual of Good Detailing Practice. 15 June - 30 June October 1988.

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