

## J. Alstan Jakubiec

Assistant Professor at the Singapore University of Technology and Design

E-mail: [john\\_jakubiec@sutd.edu.sg](mailto:john_jakubiec@sutd.edu.sg)

Lab URL: <http://asd.sutd.edu.sg/dcc/>

Telephone: +65 6499 4530

8 Somapah Road #1.702.02, Singapore 487372

## Education

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- January 2012–June 2014 **PhD in Building Technology**  
Massachusetts Institute of Technology (MIT), Department of Architecture  
Advisor: Christoph Reinhart  
Thesis: *The Use of Visual Comfort Metrics in the Design of Daylit Spaces*
- September 2010–January 2012 **Coursework towards Doctor of Design in Sustainable Design**  
Harvard University, Graduate School of Design  
Studied towards Doctor of Design degree before transferring to MIT.
- September 2008–May 2010 **Master of Architecture**  
University of Pennsylvania, School of Design
- August 2004–May 2008 **Bachelor of Science in Architecture**  
Georgia Institute of Technology, School of Architecture  
Graduated with highest honors.

## Experience

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- September 2014–Present **Assistant Professor**  
Singapore University of Technology and Design  
Architecture and Sustainable Design Pillar
- January 2012–Present **Chief Technology Officer**  
[Solemma, LLC](#)  
Lead developer of the DIVA sustainable daylighting and energy analysis plugin for Rhinoceros with over 25,000 downloads from over 20 countries.
- January 2013–2016 **Chief Technology Officer**  
[Mapdwell, LLC](#)  
Mapdwell is an academic collective dedicated to disseminating information about sustainable building. I guide development of GIS and simulation technology to advance sustainable principles on an urban scale.

- December 2009  
–May 2010
- Research Assistant in Optimization of Architectural Form**  
University of Pennsylvania  
Developed and tested an interface between the Rhinoceros 3D modeling software and EnergyPlus, which used genetic algorithms for the optimization of façade shape based on urban context and climate. The software was used in several workshops for the class, “Simulation and Design”.
- May–August 2008
- Interim Program Manager and Energy Modeling Intern**  
Southface Energy Institute  
Interim manager in charge of reviewing home credentials of the Earthcraft House regional green building program. Modeled home energy rating system (HERS) scores for EnergyStar Qualified Homes certification.
- May–August 2007
- Construction Leader, Solar Decathlon**  
Georgia Institute of Technology  
Supervised the design and construction of the translucent roof, structure, and building envelope of the Georgia Tech Solar Decathlon competition home.

## Teaching

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- Fall 2014–2016
- Architectural Energy Systems**  
*Singapore University of Technology and Design*  
A required course in SUTD’s Architecture and Sustainable Design pillar where students are required to learn the basic tenets of low-energy, high-comfort architectural design and apply these concepts to a final design project. Lighting, natural ventilation, thermal comfort, building systems, renewable resources and zero-energy building concepts are covered.
- Ongoing since 2015
- Introduction to Daylighting and HDR Photography Workshop**  
A recurring 3-day workshop on daylighting buildings and lighting measurement hosted at BCA Academy in Singapore and at SUTD.
- Spring 2016
- Advanced Topics in Performative Design: Urban Sustainability**  
*Singapore University of Technology and Design*  
A vertically integrated PhD, master and undergraduate-level course on designing sustainable urban areas as well as the building within them. The course goes deep into thermal building performance simulations by making calibrated energy models of the SUTD campus buildings. Urban environmental concerns such as energy, daylighting potential, urban heat island and outdoor thermal comfort, transportation, walkability, water and livability are covered within the course.

- Spring 2015 **Advanced Topics in Performative Design: Daylight and Electric Lighting**  
*Singapore University of Technology and Design*  
Teaching an elective on natural and electric lighting in an architectural context. Investigations focused on the relationship between quantifiable measures of light and human perception in order to develop new lighting concepts. Individual activities and lectures focused on lighting measures and metrics, calibrated high dynamic range photography, daylight simulations, material properties, visual comfort and perception, electric lighting design, lighting energy consumption, scale model building and human behavior.
- Spring 2014 **Instructor, Environmental Design II: Daylight and Acoustics**  
*Rhode Island School of Design*  
Teaching masters-level architecture students the fundamentals of natural daylighting, electric lighting and acoustics in an architectural context.
- Spring 2014 **Teaching Assistant, Integrated Design Studio**  
*University of Pennsylvania*  
Introducing daylighting simulation techniques to second year M.Arch students as part of a team specializing in daylighting, natural ventilation and rapid prototyping.
- Summers 2010–2013 **Instructor, Executive Education on Daylighting Buildings**  
*Harvard University, Executive Education Program with Christoph Reinhart*  
Instructed architecture and engineering professionals in three-day workshops on the use of daylight simulation programs in designing and predicting the performance of buildings.
- September–December 2011 **Teaching Assistant, Modeling Urban Energy Flows**  
*Harvard University, Graduate School of Design*  
Developed the Urban Modeling Interface (Umi) software tool for studying energy consumption of city blocks in context. Worked with students to build detailed single-building and Umi thermal models and to evaluate their designs.
- January–May 2011 **Teaching Assistant, Daylighting Buildings**  
*Harvard University, Graduate School of Design*  
Instructed students in using Radiance and the DIVA-for-Rhino interface in order to support design analysis.

January–May 2010

**Teaching Assistant, Sophomore Studio, Digital Design and Energy**

*University of Pennsylvania*

Instructed in digital design processes, fabrication methods and energy modeling techniques using Rhinoscript, Grasshopper and Ecotect.

September–  
December 2009

**Teaching Assistant, Construction Technology**

*University of Pennsylvania*

Led drawing review sessions emphasizing construction details on projects such as green roofs, windows and retaining walls.

## Publications

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### In Progress

J.A. Jakubiec. *Parametric analysis as a driver for daylighting certification and rapid design feedback applied in the tropical context of Singapore*. In preparation for submission to Building Simulation 2017.

P. Balakrishnan and J.A. Jakubiec. *Spectral composition of daylight—Comparison between sky models and measured data*. In preparation for submission to Building Simulation 2017.

E.L. McCormick, J.A. Jakubiec and M. Budig. Analysis of architectural façade elements in tropical climates for daylight, thermal comfort and passive climatization. In preparation for submission to Building Simulation 2017.

### Refereed Journal Papers

J.A. Jakubiec, M. Doelling, O. Heckmann, R. Thambiraj, V. Jathar. *Dynamic Building Environment Dashboard: Spatial Simulation Data Visualization in Sustainable Design*. Accepted for publication in the Journal of Technology, Architecture, and Design.

J.A. Jakubiec and C.F. Reinhart. 2015. *A Concept for Predicting Occupants' Long-Term Visual Satisfaction with Daylit Spaces*. LEUKOS. <http://dx.doi.org/10.1080/15502724.2015.1090880>

J.A. Jakubiec and C.F. Reinhart. 2014. *Assessing Disability Glare Potential of Reflections from New Construction*. Transportation Research Record: Journal of the Transportation Research Board 2449.1. <http://dx.doi.org/10.3141/2449-13>

J.A. Jakubiec and C.F. Reinhart. *A Method for Predicting City-Wide Electric Production from Photovoltaic Panels Based on LiDAR and GIS Data Combined with Hourly Daysim Simulations*. Solar Energy, vol. 93 (C): 127-43, 2013. <http://dx.doi.org/10.1016/j.solener.2013.03.022>  
Work implemented in the City of Cambridge Solar Potential Map (<http://cambridgema.gov/solar/>).

J.A. Jakubiec, C.F. Reinhart, *The 'Adaptive Zone' – A Concept for Assessing Discomfort glare Throughout Daylit Spaces*. Lighting Research & Technology. Lighting Research and Technology, vol. 44 (2): 149-70, 2012. <http://dx.doi.org/10.1177/1477153511420097>

Work implemented in the DIVA-for-Rhino sustainable design plugin and the Daysim simulation engine.

## Peer-Reviewed Conference Papers

- P. Balakrishnan and J.A. Jakubiec. 2016. *Measuring light through trees for daylight simulations: A photographic and photometric method*. Proceedings of Building Simulation and Optimization (BSO). Newcastle, England.
- J.A. Jakubiec. 2016. *Building a database of opaque materials for lighting simulation*. Proceedings of Passive and Low Energy Architecture (PLEA). Los Angeles, CA, USA.
- J.A. Jakubiec, M. Inanici, K. Van Den Wymelenberg and A. Mahic. 2016. *Improving the accuracy of measurements in daylight interior scenes using high dynamic range photography*. Proceedings of Passive and Low Energy Architecture (PLEA). Los Angeles, CA, USA.
- J.A. Jakubiec, K. Van Den Wymelenberg, M. Inanici and A. Mahic. 2016. *Accurate measurement of daylight interior scenes using high dynamic range photography*. Proceedings of the 2016 CIE conference on lighting quality and energy efficiency. Melbourne, Australia.
- J.A. Jakubiec, C.F. Reinhart and K. Van Den Wymelenberg. 2015. *Towards an integrated framework for predicting visual comfort conditions from luminance-based metrics in perimeter daylight spaces*. Proceedings of Building Simulation. Hyderabad, India.
- J.A. Jakubiec and C.F. Reinhart. 2014. *Assessing disability glare potential due to reflections from new constructions: Case study analysis and recommendations for the future*. Proceedings of the 2014 Annual Meeting of the Transportation Research Board. Washington, DC, USA.
- J.A. Jakubiec and C.F. Reinhart. 2013. *Predicting visual satisfaction in a large daylight space based on long-term occupant evaluations*. Proceedings of Building Simulation. Chambéry, France.
- C.F. Reinhart and J.A. Jakubiec and D. Ibarra. 2013. *Definition of a reference office for standardized evaluations of dynamic façade and lighting technologies*. Proceedings of Building Simulation. Chambéry, France.
- C.F. Reinhart, T. Dogan, J.A. Jakubiec, T. Rakha and A. Sang. 2013. *Umi – an urban simulation environment for building energy use, daylighting and walkability*. Proceedings of Building Simulation. Chambéry, France.
- J.A. Jakubiec and C.F. Reinhart. 2012. *Towards validated urban solar radiation maps based on LiDAR measurements, GIS data, and hourly DAYSIM simulations*. Proceedings of Simbuild. Madison, WI, USA.
- J.A. Jakubiec and C.F. Reinhart. 2011. *The 'adaptive zone' – a concept for assessing discomfort glare throughout daylight spaces*. Proceedings of Building Simulation. Sydney, Australia.
- J.A. Jakubiec and C.F. Reinhart. 2011. *DIVA 2.0: integrating daylight and thermal simulations using Rhinoceros 3D, DAYSIM and EnergyPlus*. Proceedings of Building Simulation. Sydney, Australia.
- A. Bakshi and J.A. Jakubiec. 2011. *A simple cost-benefit estimation for daylighting design and analysis during the design process*. Proceedings of Building Simulation. Sydney, Australia.

## Patents

U.S. Patent Application No. 14/160,658 – “Urban mapping technique for photovoltaic potential of rooftops”

Inventors: J. Alstan Jakubiec and Christoph F. Reinhart

Filed on 22/01/2014. Published on 24/07/2014, no. US20140207431 A1.

## Projects Overseen

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2016–Present

### **Daylighting in Singapore: Establishing Lighting Preferences, Design Guidelines and Predictive Methods**

A two-year project re-writing daylighting guidelines for the tropical band based on post-occupancy studies of between 45 and 90 commercial and residential buildings.

Funded S\$487,594.20 by the Building and Construction Authority (BCA) Green Buildings Innovation Cluster R&D (GBIC-R&D) grant.

*Role:* Principal Investigator

2016–Present

### **Analysis of Architectural Elements for Tropical Climates**

A two-year project undertaking detailed measurement and analysis of façade types and exploring their potential for passive climatization.

Funded S\$100,000.00 by the Ministry of Education Tier 1 Academic Research Fund.

*Role:* Principal Investigator

*Collaborators:* Michael Budig

2016–Present

### **Sustainable Futures: Cooling**

A collaboration with the Lee Kuan Yew Centre for Innovative Cities. The cooling portion of the project, analyzes how individuals operate their spaces in buildings through monitoring and statistical analysis of air-conditioning, window shading, and electric lighting use.

Funded S\$95,381.25 by the Land and Livability National Innovation Challenge (L2NIC) grant.

*Role:* Co-Principal Investigator

*Collaborators:* Dawn Tan, Lyle Fearnley, Kwan Wei Lek, Quek Ri An

- 2016 **#showerthoughts**  
A selected student competition entry into the Singapore Night Festival's open call for art installations, #showerthoughts was a fully immersive infinite reflection room with choreographed LED lighting and music.  
Funded S\$10,000 by the National Heritage Board and S\$4,500 by the SUTD provost's office.  
*Role:* Faculty Advisor  
<http://asd.sutd.edu.sg/dcc/portfolio/showerthoughts/>
- 2015–2016 **Performative Typologies**  
Development of new spatial-environmental performance tools and metrics. These are applied to the analysis of natural ventilation potential, daylighting, thermal comfort, and energy consumption of historical, free-running building designs.  
Funded S\$91,923.46 by the SUTD-MIT International Design Centre.  
*Role:* Co-Principal Investigator  
*Collaborators:* Oliver Heckmann, Max Doelling
- 2015 **Designing for Outdoor Thermal Comfort**  
An undergraduate research opportunities (UROP) project investigating how useful urban microclimate models such as ENVI-met are when compared to measured data and analyzing thermal comfort at SUTD's new campus.  
*Role:* Project Head  
*Collaborators:* Andre Chaszar, Kim Hyungkyoo  
*Students:* Liu Sidian, Chiew Jia En and Cynthia Tong Wan Ling  
*Graduate researchers:* Priji Balakrishnan and Ramanathan Subramanian
- 2015 **Cataloging Visual Properties of Materials**  
Students measured reflective properties of architectural finish materials and utilized them to calibrate and validate lighting simulation models. The project resulted in a publication and the development of a material properties database, <http://www.lighting-materials.com/>  
*Role:* Project Head  
*Students:* Caroline, Kevin Josiah Neo
- 2014 **IDC Infrastructure Development Grant**  
Funded S\$50,000 for purchase of laboratory-quality lighting sensors for future research projects by the SUTD-MIT International Design Centre.

## Students Supervised

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### Ongoing

*Priji Balakrishnan*

Thesis Supervisor

Singapore University of Technology and Design, PhD Student

*Ramanathan Subramanian*

Thesis Chairman and Co-supervisor

Singapore University of Technology and Design, PhD Student

*Azadeh Omidfar*

Thesis Co-supervisor

University of Michigan, PhD Student

### Graduated Students

*Master of Architecture Students Supervised at SUTD*

- Yeo Song Pei, 2016 (Winner: Best Thesis Award)
- Ao Chinwen, 2016
- Tracy Chow Man Yee, 2016
- Timothy Lum Jing Liang, 2016

*Dorothea von Herder*

Thesis Co-supervisor

Harvard School of Liberal Arts, Master of Liberal Arts in Sustainability and Environmental Management

Thesis: Peak Load Reduction through Solar PV for municipal buildings



## Professional Affiliations and Service

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### Professional Memberships

International Building Performance Simulation Association (IBPSA)  
USA and Boston Chapters

Illuminating Engineering Society (IES)

### Journal Reviews Performed

2011–2016 Lighting Research and Technology

2014–2016 Solar Energy

2015–2016 LEUKOS

2015 Architectural Science Review

2015 Buildings

2015 Indoor and Built Environment

2014–2015 Energies

2013–2014 Building Simulation

2013–2014 Applied Energy

### University Service

2016–Ongoing Director, Architecture and Sustainable Design PhD Program

### Scientific Committees Served

2016 Advisory board member of the journal of Technology | Architecture + Design  
(<http://www.tadjournal.org/>)

2016 PLEA, IBPSA-World Building Simulation

2015 SimAUD

2015 CAADRIA

2014 IBPSA-USA SimBuild

2014 IBPSA-Canada eSim

## Presentations

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- October 2016      Invited presentation given at the **IBPSA Boston Daylight Simulation: Research & Practice** on current research involving daylighting, data visualization, and occupant comfort.
- September 2016      Invited presentation given at the **Sustainable Built Environment Conference Singapore 2016** on designing for occupant comfort.
- September 2015      Invited presentation given at the **International Green Building Conference** in Singapore on comfort and perception in high-performance architectural design workflows.
- August 2015      Presentation given at the **14th International Radiance Workshop** in Philadelphia, PA, USA on quantifying material properties in daylighting simulations.
- June 2015      Invited lecture given at the **BCA Research and Innovation Workshop on Driving Energy Efficiency for the Built Industry** on the relationship between visual comfort, occupant behavior and energetic performance of buildings.
- December 2014      Invited lecture given at the **Saint Gobain International Daylighting Community Day** on integrating visual comfort, occupant behavior and energy calculations into the design process.
- October 2014      Delivered a lecture and hosted a panel discussion on the new IES Daylight Metrics Committee measures for lighting controls at the third **DIVA Day** symposium.
- December 2013      Invited lecture given to a graduate class on simulation and design at the **University of Pennsylvania**.  
*Daylight simulations in design: Research and projects.*
- July 2013      Presentation given at the second **DIVA Day** on evaluating occupant's visual satisfaction with daylit spaces.
- March 2013      Invited panelist and lecturer at the **Interdisciplinary Student Sustainability Summit** hosted by Harvard and Cornell.  
*The Cambridge, MA solar potential tool.*
- November 2012      Invited lecture given to a graduate class on simulation and design at **Harvard University, Graduate School of Design**.  
*Visual comfort: current research.*
- November 2012      Presentation given at the **ArchitectureBoston Expo** on integrating sustainable analysis in the BIM process.  
*IDP, IPD and BIM: tools, skills, methods and mindsets.*

- November 2012 Invited lecture given to the **Illuminating Engineering Society of North America Daylight Metrics Group** on the development of adaptive visual comfort metrics.  
*The 'adaptive zone' – a concept for assessing discomfort glare throughout daylit spaces.*
- October 2012 Presentation given at the first **DIVA Day at MIT** in Cambridge, MA on the development of a new module for dynamic automated and occupant control of simulated shading devices.  
With Jeff Niemasz.
- October 2012 Invited lecture given to a user groups meeting of the **International Building Performance Simulation Association, Boston Chapter** on daylight simulation in research and practice.
- September 2012 Presentation given at the **11th International Radiance Workshop** in Copenhagen, Denmark on large daylight simulations in research and practice.
- September 2012 Invited workshop session given at the **11th International Radiance Workshop** in Copenhagen, Denmark on new research developments in DAYSIM.  
*Introduction to DAYSIM and latest research developments.*
- May 2012 Presentation given at **LIGHTFAIR International 2012** in Las Vegas, Nevada.  
*New modeling methods in daylighting design.*  
With Kera Lagios and Jeff Niemasz.
- April 2012 Invited lecture given to a graduate class on daylighting analysis at **Northeastern University**.  
*Advanced dynamic daylight simulations in design.*
- February 2012 Invited lecture given to a special interest meeting of the **International Building Performance Simulation Association, Boston Chapter** on daylight simulation in design.  
*The New Jurong Church, Singapore.*  
With Azadeh Omidfar and Thomas Schröpfer.
- July 2011 Invited lecture given to a graduate architecture class at the **Technische Universität Berlin** on using daylight analysis as design feedback and new research developments in DIVA-for-Rhino.
- September 2010 Presentation given at the **9th International Radiance Workshop** in Freiburg, Germany.  
*The use of glare metrics in the design of daylit spaces: recommendations for practice.*
- September 2010 Invited workshop session given at the **9th International Radiance Workshop** in Freiburg, Germany on the DIVA-for-Rhino Radiance interface.

## Awards

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- Fall 2013                    **Martin Family Fellowship for Sustainability**  
The Martin Family fellowship provides funding for graduate research and education in sustainability.
- Fall 2013                    **MIT Energy Education Task Force Grad Student Travel Award**  
Awarded funds to attend the Building Simulation conference in Chambéry, France.
- Fall 2011–  
2013                        **IBPSA-USA Student Scholarship**  
Awarded funds to attend Building Simulation 2013 in Chambéry, France, SimBuild 2012 in Madison, WI, USA and Building Simulation 2011 in Sydney, Australia.
- Fall 2009                    **Takenaka Corporation Portfolio Competition**  
Awarded Summer internship in Osaka, Japan while studying at UPenn.
- Spring 2008                **Lewis Lanter Memorial Award**  
Awarded after graduation for academic and studio performance.
- Summer 2007               **Georgia Tech Solar Decathlon**  
Placed sixth place overall and fourth place in architecture in the US Department of Energy's Solar Decathlon international competition.