



# Brian Y. Lim

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## EDUCATION

**Carnegie Mellon University, Pittsburgh, PA** 09/2007 – 05/2012  
Ph.D. in Human-Computer Interaction  
M.S. in Human-Computer Interaction  
GPA: 3.93 / 4

**Cornell University, Ithaca, NY** 08/2003 – 05/2006  
B.S. in Engineering Physics, Minor in Computer Science  
Summa Cum Laude, GPA: 4.00 / 4

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## RESEARCH INTERESTS

*Research Areas: Applied machine learning, data analytics and visualization, ubiquitous computing, context-aware computing, internet-of-things, human-computer interaction, mobile computing, toolkits and platforms, user experience, intelligibility, explanations.*

I design, develop, and evaluate needs-driven infocomm technologies to address new societal challenges in areas such as urban systems, sustainability and energy management, healthcare and well-being. Research methods include:

- i. **User-centered design** of technologies driven by deep requirement analysis with traditional and sensor-based methods.
- ii. **Development of new technologies** by defining frameworks, and developing *toolkits* and platforms for rapid prototyping of AI- and machine learning-driven applications.
- iii. **Implementation** of *hardware sensors* to acquire context-awareness of users and the environment, *machine learning models* to interpret higher level semantics, and *intelligible user interfaces* and *visualizations* to provide effective insights and services.
- iv. **Validation** of real-world applications to evaluate technologies in *lab* and *field* studies.

I have conducted research in intelligent systems across multiple modalities (IoT sensors, mobile interfaces, web and dashboards) and multiple scales (smartphones, smart homes, and smart cities). This allows me to develop impactful technological solutions for multiple domains, and to translate these innovations from the lab to society.

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## SKILLS

Computing and Algorithms	Java, J2EE, XML, HTML5, Javascript, Android, C/C++, SQL, R, Python, PHP, Linux, Wordpress, MATLAB, LabVIEW, LaTeX; Machine Learning, WEKA; SVN, Git; Hadoop
Hardware Prototyping	Arduino/ATmega, Raspberry Pi, PICAXE, 3D Printing, Laser Cutting, PCB Design
Behavioral Science	Surveys, Interviewing, Grounded theory coding, Statistical analysis, RStudio, JMP
Design / HCI	User interface design, Usability studies, Think aloud protocol

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## PROFESSIONAL EXPERIENCE

**Assistant Professor | Department of Computer Science, National University of Singapore** Oct 16 – Present

**Scientist | Institute for Infocomm Research (I2R), A\*STAR, Singapore** Jul 14 – Oct 16

- Mentors: Ng See Kiong, Ph.D., Ng Wee Siong, Ph.D.
- Project lead for developing the Urban Visual Analytics Toolkit to facilitate rapid prototyping of interactive visual analytics applications for a wide range of urban domains (sensor networks, transportation, building energy efficiency, etc.).

- Project lead for developing TasteHealthy, a mobile app for photo-based food logging and personalized food recommendation, to promote scalable dietetic support for diabetes and preventative health management. The project aims to provide targeted healthcare intervention through user-centered design and machine learning, and support population healthcare management through data analytics.
- Initiated and led data analysis project on Health Promotion Board's National Step Challenge to investigate how participants' walking is influenced by behavioral interventions using wearable data.
- Lead a team to develop an award winning Narrative Visualization for the 2014 IDA "Data in the City" Data Visualization Challenge. Press and public exhibitions: 2014 IDA National Infocomm Awards, IDA iExperience Centre, Singapore Science Centre, ArtScience Museum – 2016 Big Bang Data Exhibition, Channel News Asia – Singapore Tonight.
- Committee member on two Taskforces on Benchmarking and on Publications.
- Diverse expertise gained in urban systems and population healthcare domains and markets.

**Post-Doc | Fraunhofer Center for Sustainable Energy Systems (CSE)**

**Jul 12 – Jun 14**

- Mentor: Kurt Roth, Ph.D., Director of the Buildings Energy Technology Group
- Launched and led the Building Energy Management Systems Lab at CSE to extend the capabilities of the Buildings Energy Technology Group beyond behavioral psychology to include hardware-software management systems.
- Initiated and developed a hardware-software research platform, *FRESH*, to facilitate innovation and evaluation of home energy management systems (HEMS). The *FRESH* platform includes extensible sensor nodes for a wide range of applications, customizable Android-based user interfaces, modular software architecture, and message-based communications API. Led all aspects of conceptualization, design and implementation of hardware and software, business development, and marketing.
- Developed a novel in-cab Android-based Elevator Energy Display (EED) and installed metering and in-cab Wi-Fi infrastructure to instrument the power systems of elevators and display energy consumption data and other ride information of an elevator with a regenerative drive motor.
- Collaborated with Enertiv start-up company to instrument building test bed data acquisition and data visualization of power consumption.
- Developed a visualization dashboard to display building management system (BMS) and HVAC data of the CSE Living Lab.
- Performed market analysis and econometric modeling to quantify energy consumption and usage of consumer electronics in all U.S. households for the Consumer Electronics Association (CEA).
- Familiarized with clean-tech, energy, and connected home start-up and utility markets.

**User Experience Researcher | CrowdComfort Inc.**

**Feb 13 – Jun 14**

- Advised the founding team of CrowdComfort, an energy-efficiency start-up company, on building energy efficiency, user experience, participatory sensing, and persuasive design.

**Graduate Research Assistant | Carnegie Mellon University**

**Aug 07 – Jun 12**

- Advisor: Prof. Anind K. Dey
- Thesis research focused on making *intelligible* context-aware applications, by providing explanations of their inferences, so as to improve user trust and understanding.
- Designed, implemented, and evaluated a smartphone context-aware application, *Laksa*, which automatically infers Availability, Location, Sound, Motion activity, using rules and machine learning.
- Developed algorithms and implemented a generalizable *Intelligibility Toolkit* that can automatically generate explanations from context-aware rules and machine learning inference models.
- Implemented and evaluated on-body wearable electronics, *Firefly* and *Pediluma*, which use small lights (LEDs) to influence user attention and promote health behavior.
- Co-organized 1<sup>st</sup> and 2<sup>nd</sup> workshops on *Pervasive Intelligibility*, seeding and bringing together international researchers working on intelligibility and control in context-aware applications.

**Summer Intern | Palo Alto Research Center (PARC)**

**Jun – Sep 09**

- Mentors: Oliver Brdikzca, Ph.D., Victoria Bellotti, Ph.D., Bo Begole, Ph.D.
- Implemented and evaluated *ActivitySpotter*, a content-based awareness display that automatically infers coworkers' interruptibility based on document topic modeling of their desktop activity.

**Research Officer | Institute for Infocomm Research (I<sup>2</sup>R), A\*STAR, Singapore**

**Jul 06 – Jul 07**

- Developed the *Spontaneous Interactions Framework* to support location-based service discovery and invocation for mobile devices in heterogeneous smart environments.

**Undergraduate Research Assistant | HCI Lab, Cornell University**

**Aug 05 – Jul 06**

- Mentor: Prof. Geri Gay
- Developed AOL Instant Messenger chat bot and web dashboard for *Groupmeter*, a groupware application to support group collaborations by providing peer and automatic linguistic feedback.
- Developed the Geographical Information System (GIS) server to serve maps to the mobile clients for the *Hidden Treasures* virtual campus tour guide for Cornell University.

**Summer Intern | Institute for Infocomm Research (I2R), A\*STAR, Singapore**

**Jun – Aug 04**

- Developed *Pointus*, a mobile platform to allow remote controlling of mouse and keyboards of desktop computers in a smart room.

**42 Singapore Armoured Regiment, Singapore Army**

**Jan 01 – May 03**

- Operated and maintained a main battle tank during my military service.

**AWARDS AND SCHOLARSHIPS**

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2016	MOE Science Mentorship Programme (SME) – Outstanding Mentor Award
2015	IDA Hackathon@SG 2015: 3 <sup>rd</sup> Place out of 100+ teams
2015	Smart Health coLAB Prize Winning Team
2014	IDA Data-in-the-City Visualization Challenge 2014: 3 <sup>rd</sup> Place
2009	CHI 2009: Best long paper nomination <i>Seminal paper which introduced intelligibility to the CHI community</i>
2007 – 2012	A*STAR NSS(Ph.D.) Scholarship
2004, 2006	A*STAR Chairman's Honour List
2003 – 2006	Cornell University Dean's list (every semester)
2003 – 2006	A*STAR NSS(BS) Scholarship
2000	XXXI International Physics Olympiad, Honorary Mention
1999	12 <sup>th</sup> Singapore Physics Olympiad, Honorable Mention
1999	Technology and Engineering Research Programme, NTU – 1 <sup>st</sup> Runner-Up Project Team

**GRANT AWARDS**

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2015	ETPL MedMAX Med-Tech Accelerator, \$25k
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**PUBLICATIONS**

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Google Scholar – 423 citations since 2009, h-index: 8 (retrieved on 28 May 2016)

**Peer reviewed conferences**

- [C.16] Urban, B., Shmakova, V., **Lim, B.**, Roth, K. 2015. Residential Consumer Electronics Energy Consumption in the United States. In *Energy Efficiency in Domestic Appliances and Lighting 2015*.
- [C.15] **Lim, B. Y.**, Roth, K., Nambiar, S., Rayakota, H. 2014. Rapid Prototyping of Energy Management Applications with FRESH. In *ACEEE Summer Study 2014*.
- [C.14] Roth, K., Shmakova, V., Urban, B., **Lim, B. Y.** 2014. Residential Consumer Electronics Energy Consumption in 2013. In *ACEEE Summer Study 2014*.
- [C.13] **Lim, B. Y.** & Dey, A. K. 2013. Evaluating Intelligibility Usage and Usefulness in a Context-Aware Application. *HCI 2013*.
- [C.12] **Lim, B. Y.** & Dey, A. K. 2011. Investigating Intelligibility for Uncertain Context-Aware Applications. In *Proceedings of the 13th international conference on Ubiquitous computing (UbiComp '11)*. ACM, New York, NY, USA, 415-424.
- [C.11] **Lim, B. Y.** & Dey, A. K. 2011. Design of an Intelligible Mobile Context-Aware Application. In *Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services (MobileHCI '11)*. ACM, New York, NY, USA, 157-166.
- [C.10] **Lim, B. Y.**, Shick, A., Harrison, C., & Hudson, S. E. 2010. Pediluma: motivating physical activity through contextual information and social influence. In *Proceedings of the fifth international conference on Tangible, embedded, and embodied interaction (TEI '11)*. ACM, New York, NY, USA, 173-180.

- [C.9] **Lim, B. Y.**, Brdiczka, O., Bellotti, V. 2010. Show me a good time: using content to provide activity awareness to collaborators with activityspotter. In Proceedings of the 16th ACM international conference on Supporting group work (GROUP '10). ACM, New York, NY, USA, 263-272.
- [C.8] **Lim, B. Y.** & Dey, A. K. 2010. Toolkit to Support Intelligibility in Context-Aware Applications. In Proceedings of the 12th ACM international Conference on Ubiquitous Computing (Copenhagen, Denmark, September 26 - 29, 2010). Ubicomp '10. ACM, New York, NY, 13-22.
- [C.7] **Lim, B. Y.** & Dey, A. K. 2009. Assessing Demand for Intelligibility in Context-Aware Applications. In Proceedings of the 11th international Conference on Ubiquitous Computing (Orlando, Florida, USA, September 30 - October 03, 2009). Ubicomp '09. ACM, New York, NY, 195-204.
- [C.6] **Lim, B. Y.**, Dey, A. K., & Avrahami, D. 2009. Why and why not explanations improve the intelligibility of context-aware intelligent systems. In Proceedings of the 27th international Conference on Human Factors in Computing Systems (Boston, MA, USA, April 04 - 09, 2009). CHI '09. ACM, New York, NY, 2119-2128.
- [C.5] Harrison, C., **Lim, B. Y.**, Shick, A., & Hudson, S. E. 2009. Where to locate wearable displays?: reaction time performance of visual alerts from tip to toe. In Proceedings of the 27th international Conference on Human Factors in Computing Systems (Boston, MA, USA, April 04 - 09, 2009). CHI '09. ACM, New York, NY, 941-944.
- [C.4] **Lim, B. Y.**, Zhang, D., Zhu, M., & Zheng, S. 2007. Context-Aware Framework for Spontaneous Interaction of Services in Multiple Heterogeneous Spaces. Proceedings of ICME 2007.
- [C.3] Zhu, M., Zhang, D., Zhang, J., & **Lim, B. Y.** 2007. Context-Aware Informative Display. Proceedings of ICME 2007.
- [C.2] **Lim, B. Y.**, Zhang, D., Zhu, M., & Zheng, S. 2007. Context-Aware Spontaneous Interaction Framework to Aggregate and Access Services in Multiple Heterogeneous Spaces. Proceedings of UIC 2007.
- [C.1] Zhang, D., **Lim, B.**, Zhu, M., & Zheng, S. 2007. Supporting Impromptu Service Discovery and Access in Heterogeneous Assistive Environments. In Proceedings of ICOST 2007.

#### **In Submission / Preparation**

- [S.3] **Lim, B. Y.**, Ng, W. S., Ng, S. K. 2016. Urban Visual Analytics Toolkit for Spatio-Temporal Data. Manuscript in preparation.
- [S.2] Yu, L., **Lim, B. Y.**, Ng, W. S., Ng, S. K. 2016. Interactive Visual Learning for Location Categorization using Transportation Big Data. Submitted.
- [S.1] Wang, L., Zhang, D., Yang, D., **Lim, B. Y.**, Xiong, H., Mhamed, A. 2016. Differential Location Privacy for Sparse Mobile Crowd-Sensing with Data Quality Loss Reduction.

#### **Technical Reports**

- [TR.3] Urban, B., Shmakova, V., **Lim, B.**, Roth, K. 2014. Energy Consumption of Consumer Electronics in U.S. Homes in 2013. Final Report to the Consumer Electronics Association (CEA) by Fraunhofer USA.
- [TR.2] **Lim, B. Y.**, Dey, A. K. 2012. Field Evaluation of an Intelligible Context-Aware Application. CMU-HCII Technical Report.
- [TR.1] **Lim, B. Y.**, Dey, A. K. 2012. Evaluating Intelligibility Usage and Usefulness in a Context-Aware Application. CMU-HCII Technical Report.

#### **Workshops**

- [W.3] **Lim, B. Y.** & Dey, A.K. 2012. Weights of Evidence for Intelligible Smart Environments. Ubicomp 2012 Workshop on Adaptable Service Delivery in Smart Environments.
- [W.2] Vermeulen, J., **Lim, B. Y.**, & Kawsar, F. 2011. Pervasive Intelligibility: Workshop on Intelligibility and Control in Pervasive Computing. Pervasive 2011 Workshop on Intelligibility and Control in Pervasive Computing.
- [W.1] **Lim, B. Y.**, Shick, A., & Harrison, C. Personal-Public Displays: Motivating Behavior Change through Ambient Information and Social Pressure. CHI 2008 Workshop on Ambient Persuasion.

#### **Works-in-Progress**

- [WIP.3] **Lim, B. Y.**, Liau, B., Khoo, E. H., Shekaran, A. 2015. TasteHealthy: Personalized Recommendation Mobile App for Tasty, Healthy Food. MedMAX pitch and exhibition, Media Exploits 2015.
- [WIP.2] **Lim, B. Y.**, Roth, K., Nambiar, S., Rayakota, H. 2013. FRESH: The Fraunhofer Experimental Smart Home Research Platform for Home Energy Management Applications. MIT Energy Night 2013.
- [WIP.1] Diamant, E. I., **Lim, B. Y.**, Echenique, A., Leshed, G., and Fussell, S. R. 2009. Supporting intercultural collaboration with dynamic feedback systems: preliminary evidence from a creative design task. In

Proceedings of the 27th international Conference Extended Abstracts on Human Factors in Computing Systems (Boston, MA, USA, April 04 - 09, 2009). CHI EA '09. ACM, New York, NY, 3997-4002.

### Doctoral Colloquiums

[DC.1] **Lim, B.Y.** Improving trust in context-aware applications with intelligibility. In Proceedings of the 12th ACM international Conference Adjunct Papers on Ubiquitous Computing (Copenhagen, Denmark, September 26 - 29, 2010). Ubicomp '10. ACM, New York, NY, 477-480.

### ORGANIZATIONS

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Mar 08 – present    ACM Member  
Apr 07 – Dec 07    IEEE Member  
2005                *Tau Beta Pi* Honor Society, Cornell Chapter, Life Member

### PROFESSIONAL SERVICE

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2016 **Technical paper reviewer:** IEEE Human-Machine Systems  
2015 **Technical paper reviewer:** CHI 2016, Ubicomp 2015, MobileHCI 2015, IEEE SMC 2015, IEEE Pervasive  
2014 **Technical paper reviewer:** Ubicomp 2014, ChineseCHI 2014, ACEEE Summer Study 2014, ICCE 2014  
2013 **Technical paper reviewer:** EICS 2013, Pervasive Health 2013, TiiS Journal, CHI 2014  
**Program Committee:** IUI 2013 Workshop on Interactive Machine Learning, AmI 2013  
**Session Chair:** HCI International 2013  
2012 **Technical paper reviewer:** Ubicomp 2012, Mobile HCI 2012, UIST 2012, NordiCHI 2012, CSCW 2013, Pervasive and Mobile Computing journal  
**Program Committee:** AmI 2012  
**Workshop co-organizer:** 2<sup>nd</sup> Workshop on Pervasive Intelligibility  
2011 **Technical paper reviewer:** CHI 2011 (work-in-progress), IUI 2012, CHI 2012, CSCW 2012, Ubicomp 2011  
**Poster reviewer:** Ubicomp 2011  
**Workshop co-organizer:** 1<sup>st</sup> Workshop on Pervasive Intelligibility  
**Student volunteer:** CHI 2011  
2010 **Program committee:** IUI 2011  
**Technical paper reviewer:** TiiS Journal, CHI 2010  
2009 **Technical paper reviewer:** CHI 2009, CSCW 2009  
2008 **Student volunteer:** CHI 2008  
2007 **Technical paper reviewer:** Ubicomp 2007

### TEACHING EXPERIENCE

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Jan 10 – May 10    **Programming Usable Interfaces (05-630), Teaching Assistant, CMU**  
Conducted tutorials, office hours, and lectured on introduction to Adobe Flex and Flash, and on Context-Aware Computing. Graded various assignments.  
Aug 09 – Dec 09    **Human-Computer Interaction Methods (05-610), Teaching Assistant, CMU**  
Conducted tutorials, office hours, and lectured on the Model Human Processor. Developed grading schemes and graded assignments and exams.  
Dec 06 – May 07    **Introduction to Programming (in Java), Anderson Junior College, Singapore**  
Conducted a 4-week workshop under the Scientist-in-School Programme by the Ministry of Education, Singapore.

### MENTORING / MANAGEMENT EXPERIENCE

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May 16 – Present    Martinus Alexander, Simran Khare — NTU Undergraduate CS student interns  
Jan 16 – Present    Chandrasekaran AKASH, Daniel LAU Yew En, Owen LEONG Song Zhu; Dejoy Shastikk KUMARAN, Darryl CHAN Shi Hau, SOH Jing Ren — NUS High School students  
Dec 15 – Feb 16    Ailin LIM, Shi Gen ANG, Melody FONG — SIM Global Education, Undergraduate CS students  
Aug 15 – Apr 16    Xinni CHNG — National University of Singapore, Undergraduate CS student  
- *NUS Final Year Project Innovation Award finalist.*  
- *Google UX Intern in Summer 2016.*  
Feb 15 – Oct 15    Leye WANG — Institut Mines-Télécom/Télécom SudPais, Ph.D. student

Jun 13 – May 14 Sainath NAMBIAR — Fraunhofer CSE Intern (Masters in Electrical Engineering)  
 Oct 12 – Mar 13 Haritha RAYAKOTA — Fraunhofer CSE Intern (Masters in Electrical Engineering)  
 Aug 12 – Nov 12 Erich TUSCH — Fraunhofer CSE Intern (Masters in Psychology)  
 Jan 10 – May 10 Kanupriya TAVRI — Carnegie Mellon University, Masters Student  
 Mar 08 – Aug 08 Andreas MÖLLER — Institut für Informatik, Ludwig-Maximilians Universität München,  
 Undergraduate Student  
 - *PhD candidate at Technische Universität München.*

## OTHER PROJECTS AND ACTIVITIES

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Apr 16 – ***A\*STAR App Programming Competition*** — Planning committee  
 Apr 2016 ***Institute for Infocomm Research (I<sup>2</sup>R) Leadership Advance***  
 Mar 2015 ***A\*STAR Autonomous Vehicle Video Showcase***  
 Sep 08 – Jun 12 ***Oakland International Fellowship website*** — Webmaster; developed church website.  
 Mar 2007 ***A\*STAR Scholarship Poster Ads***  
 Jan – Aug 07 ***A\*STAR Scholarship Video 2007*** — Director and Producer; managed cast and crew.  
 Oct 06 – Jul 07 ***A\*STAR SERC Fusionopolis Publicity*** — Publicity Committee  
 Mar 07 – 2010 ***Emmanuel Baptist Fellowship website*** – Webmaster; developed church website.  
 Mar 07 ***A\*STAR Junior College Science Award*** — Interview Panel  
 Nov 06 – Feb 07 ***A\*STAR Corporate Planning Exercise 2007*** — Participant and Emcee  
 Nov 06 – Mar 07 ***A\*STAR EXPLOSION Publication*** — Scientific Resource Panel; advised on Human Factors  
 Engineering.  
 Aug 2004 ***A\*STAR Scholarship Award Ceremony*** — Emcee  
 Apr 04 – May 05 ***Cornell Society of Physics Students*** — Webmaster  
 2002 ***Softwaterworks.com*** — Developed 3-tier architecture website to publicize ShapeShifter.  
 May 01 – Dec 03 ***ShapeShifter*** — Created graphing plotting software and learned software engineering.  
 Dec 1999 ***National Junior College Physics Department website*** — Webmaster and developer

## REFERENCES

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### **Anind K. Dey**

Associate Professor, Human Computer Interaction Institute  
Carnegie Mellon University  
5000 Forbes Ave.  
Pittsburgh, PA 15213, USA  
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### **Scott Hudson**

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### **Margaret Burnett**

Professor, School of Electrical Engineering and Computer Science  
Oregon State University  
Corvallis, OR 97331-5501, USA  
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### **Kurt Roth**

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### **Ng See Kiong**

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