Robert S. Brewer

Curriculum Vitae

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Education

5/2013 **Ph.D. Computer Science**, ***University of Hawai'i at Mānoa***, Honolulu.

5/2000 **M.S. Info. and Computer Sciences**, ***University of Hawai'i at Mānoa***, Honolulu.

5/1992 **B.A. Physics**, ***Reed College***, Portland, OR.

Honors and Awards

2013 Graduate Student Research on Campus Sustainability Award, from Association for the Advancement of Sustainability in Higher Education (AASHE)

2012 Revolutionary Project award for Kukui Cup, from University of Hawai'i's Sustainable UH

2010–2012 Precourt Center Student Fellow at the Behavior, Energy and Climate Change Conference

2004 Hawaii's Top High Technology Leader award from Pacific Technology Foundation

1991 & 1992 Commended for Excellence in Scholarship by Reed College

Research

8/2013–8/2015 **Postdoc**, *Ubiquitous Computing and Interaction group*, Aarhus University, Denmark.

In this position, I work on two projects: EcoSense, and Virtual Power Plant for Smart Grid Ready Buildings and Customers (VPP4SGR). The goal of the EcoSense project is to develop novel collective sensing systems, macroscopic analysis and visualization methods to determine whether energy reduction strategies work, and to identify new ways to reduce carbon emissions. There are several cases in EcoSense, and I manage a case based on the Grundfos Dormitory Lab (GDL). The GDL is a dormitory for university students living in Aarhus that has been turned into a "living laboratory", where each of the 159 apartments has sensors installed that monitor indoor climate, electricity, heating, and water use. This rich sensor data is supplemented by qualitative data gathered through surveys and interviews. The VPP4SGR project is also situated at the GDL, but this Aarhus University Engineering-led project focuses on how to shift the time of day that electricity is used. My work has focused on how to motivate individuals through IT to shift their electricity use to times that are better for the grid.

8/2009–5/2013 **Research Assistant**, *Renewable Energy and Island Sustainability project*, University of Hawai'i at Mānoa.

I developed WattDepot, an open source system for energy data storage and analysis. I co-developed the Kukui Cup, a residence hall energy competition involving real-time energy data, a multi-faceted web-based educational game, and real world events and activities. The Kukui Cup has been held multiple times at the University of Hawai'i, as well as at Hawai'i Pacific University and the East-West Center.

7/2007–11/2008 **Research Assistant**, *Laboratory for Interactive Learning Technologies*, University of Hawai'i at Mānoa.

I designed and implemented SocialSense, a wearable computing system to display social network profiles of nearby individuals on a heads-up display.

1/1998–12/1999 **Research Assistant**, *Collaborative Software Development Laboratory*, University of Hawai'i at Mānoa.

I developed MCS, a system for improving mailing list archives through condensation. I also contributed to Project LEAP, a system for recording and analyzing software development metrics.

Teaching

8/2014–1/2015 **Instructor**, *CS Department*, Aarhus University.

I am co-teaching a course called the IT Bachelor Project. This is a mandatory class for students in the IT Product Development specialization of Computer Science, taking place over two quarters. This year there are 50 students, organized into 15 groups of 2-4 members. Each group picks a research topic, explores the existing literature on that topic, builds a physical IT protoype, and then evaluates the prototype to gain insight into their research questions. The research topics this year were required to address a broader societal goal such as health, environment, education, or crime. Students are evaluated through deliverables created as a group (a 10 page report, a poster, and a video of their prototype in action), a short written individual reflection, and an exhibition of all the projects.

10/2013-present **Internal Examiner**, *CS Department*, Aarhus University.

In the Danish educational system, students are often evaluated primarily by an oral examination at the end of the course. To ensure fairness, these oral examinations require the presence of an additional examiner other than the instructor. I have served as such an examiner for a variety of classes: Pervasive Positioning, Context Aware Computing, Augmented Reality, Social and Collaborative Computing, and Peer to Peer Networking. As an examiner, along with the instructor, I listen to a short presentation by each student, ask the student questions related to the course material, and then come to a consensus on a grade with the instructor.

3/2014 **Guest Lecturer**, *CS Department*, Aarhus University.

I gave a guest lecture on Social Interaction for an Interaction Design course in the department.

8/1993–5/1994 **Teaching Assistant**, *ICS Department*, University of Hawai'i at Mānoa.

I oversaw a programming lab section for ICS 111 and ICS 211 (introductory programming for ICS majors), using Pascal. I graded assignments, assisted students with programming questions, and held office hours.

9/1992–12/1993 **Substitute Teacher**, Punahou Academy.

During this period I occasionally served as a substitute high school teacher. The subjects I taught were: computer science, honors physics, algebra, and chemistry.

Academic Supervision

9/2014–4/2015 **Student Programmer Supervisor**, *CS Department*, Aarhus University.

As part of the EcoSense project, I supervised two student programmers that have been hired to develop software to export and import sensor data from the backend system used by the Grundfos Dormitory Lab. The supervision involves setting tasks, designing systems to be implemented, and reviewing source code.

8/2014–6/2015 **Masters Thesis Co-Supervisor**, *Engineering Department*, Aarhus University.

I co-supervised "Jenny" Jung Min Kim, a masters thesis student in Communication Technology in the Aarhus School of Engineering who is working on a conceptual framework for electricity load shifting applications in the Smart Grid. The framework explores what options a designer has in combining metrics such as environmental impact or price with electricity usage to design systems intended to encourage consumers to shift their energy use away from peak periods.

6/2014–12/2014 **Masters Thesis Co-Supervisor**, *CS Department*, Aarhus University.

I co-supervised Thomas Holst, a master's thesis student in Computer Science who worked on a casual mobile game for encouraging changes in electricity and water usage, incorporating real-world electricity and water use along with forecasts of the CO_2 intensity of the Danish electrical grid.

Service

10/2013-present **Committee Member**, *Postdoc Committee*, Aarhus University, Computer Science.

I am a member of the AU CS Postdoc committee, supporting initiatives to improve working conditions for postdocs. I chaired the judging of a poster competition for AU CS PhD students at the PhD student retreat.

2015 **Paper Reviewer**, *CSCW 2016*.

I reviewed papers for the ACM Conference on Computer-Supported Cooperative Work and Social Computing.

2011-2015 **Paper Reviewer**, *CHI 2015-2012*.

I reviewed papers for the ACM SIGCHI Conference on Human Factors in Computing Systems.

2014 **Paper Reviewer**, *NordiCHI 2014*.

I reviewed papers for the 8th Nordic Conference on Human-Computer Interaction.

5/2011 **Committee Member**, *Strategic Hiring Committee*, University of Hawai'i at Mānoa.

I was an active member of the committee reviewing departmental proposals for cluster faculty hires in Sustainability and Hawai'ian Studies as representative of the Graduate Student Organization (GSO).

11/2009–2/2012 **Member**, *GSO Campus Greening Committee*, University of Hawai'i at Mānoa.

I was a member of this committee (and spent 18 months as chair) that awards grants to graduate student-lead projects to 'green' the campus. I developed the application procedures as well as the necessary forms, oversaw the review of applications, and presented the recommendations to the GSO General Assembly. The committee has awarded grants totalling over $47,000.

1/2010–5/2011 **Member**, *GSO Executive Council*, University of Hawai'i at Mānoa.

I served as a member of the GSO Executive Council, which sets the agenda for the GSO and draws up the annual budget. I was appointed to attend UH Faculty Senate meetings to provide GSO perspective and report back to GSO on issues affecting graduate students.

7/2010 **Paper Reviewer**, *HICSS 44*.

I reviewed a paper for the Hawaii International Conference on System Sciences.

8/2009–4/2010 **GSO Representative**, *ICS Department*, University of Hawai'i at Mānoa.

I served as the ICS department representative in the Graduate Student Organization (student government). I reviewed travel & research grant applications as part of the Grants & Awards committee.

1/2007–12/2009 **Energy Team Member**, *Sustainable Saunders*, University of Hawai'i at Mānoa.

I worked with this student group to make Saunders Hall more sustainable by removing excess fluorescent lighting from rooms, and conducting a survey of occupant comfort before a planned change to the air conditioning schedule. I also helped install solar panels as a pilot project, and assisted with the setup of a rooftop weather station with automated data collection.

8/2009–10/2009 **Peer Reviewer**, *Broadband Technology Opportunities Program*, National Telecommunications and Information Administration.

I served as a volunteer expert reviewer of grant applications to this ARRA-funded program, based on my experience at LavaNet, an ISP I co-founded.

Industry

7/1994–10/2005 **Co-founder**, *LavaNet, Inc.*, Honolulu, HI.

I co-founded LavaNet, a successful Internet Service Provider. LavaNet had over 30 employees, over 10,000 customers, and generated over $3M in annual revenue. Over this period I held several positions:

- **Board member**: 1994–2004, **board chair** from 1998–2004. I reviewed financial statements, oversaw reviews of the president, and acted as shareholder liaison.
- **Vice President**: 1994–1997. I designed and implemented LavaNet's network and server infrastructure, managed the System and Technical Support departments, and was on-call 24x7 for first year of operation. I also gave public presentations about LavaNet and related Internet topics, was interviewed by local media outlets on several occasions, and helped to organize and staff trade shows booths.
- **Senior System Administrator**: 2000–2005. I rebuilt a heavily customized core BSD/OS server after a security compromise, and upgraded LavaNet's collocation infrastructure including power, network, and racks. I developed and managed a program for internal technical training, and developed a new procedure to streamline problem escalation.

LavaNet has won a variety of awards:

- Pacific Business News awards: Best in Business (less than $10 million category) Award winner (11/2002), Fastest 50 Award (1999, 2000)
- Oahu's Consumer Guide (03/2002): Members' Choice for Web Hosting
- Honolulu Weekly's Best of Honolulu Poll: "Best ISP" every year the category was offered since LavaNet was founded.

5/2003–8/2004 **Co-founder**, *Tiki Technologies Corp.*, Honolulu, HI.

I co-founded Tiki Technologies Corp., a software development spinoff from LavaNet. I worked as a technical liaison with the Tiki Technology development team and coordinated the beta test of Scora, Tiki's spam and virus filtering service. I also assisted with presentations to venture capitalists and angel investors in Hawai'i and Silicon Valley.

1988–1992 summer & winter breaks **Technical Specialist**, *Wolfram Research, Inc.*, Champaign, IL.

I began work at Wolfram Research (WRI) as employee #9 after graduating from high school in the summer of 1988. I worked at WRI each summer and winter break over the next four years. I was the first technical support representative for Mathematica 1.0. I wrote documentation on using Mathematica with a remote kernel, and later presented on this topic at the 1st Mathematica Conference. I represented WRI at trade shows, managed other student hires, and tested the Mathematica user interface on the Macintosh platform.

Ph.D. Dissertation

title ***The Kukui Cup: Fostering Sustained Energy Behavior Change and Increasing Energy Literacy In A Student Housing Energy Challenge***

committee Philip M. Johnson, Martha E. Crosby, Scott Robertson, Daniel D. Suthers, Anthony Kuh

description My dissertation research investigated how to use information technology to foster sustained, positive changes in energy use behavior and increase energy literacy. The research reflects my interest in how to combine incentives, real-time feedback, education, and game mechanics to produce engaging online and real-world experiences that can lead to long-term changes in how people perceive energy usage on both a personal and societal level. To investigate this approach, I helped design and implement the 2011 Kukui Cup, an energy challenge for over 1000 first-year students at the University of Hawai'i at Mānoa in Fall, 2011. The Kukui Cup combines a custom web-based game environment and real-time floor-level energy data with real world events, activities, and excursions. I assessed the impact of the competition using before and after questionnaires on energy literacy, before and after floor-level energy usage data, and fine-grained logs from the competition web application. Results from the questionnaire showed a small but significant increase in energy knowledge by those residents that participated in the Kukui Cup compared to those who did not participate. Energy use decreased on some floors during the competition compared to a baseline (by as much as 15%), but other floors increased and none of the changes were sustained after the competition ended. This mixed result led us to the surprising conclusion that evaluating these types of energy competitions using the metric of reduced energy use compared to a baseline is generally misleading, since baseline selection is arbitrary and there are many factors affecting energy use beyond the competition itself. My research has generated several contributions, including: a demonstration of increased energy literacy as a result of the challenge, the discovery of fundamental problems with the use of baselines for assessing energy competitions, the creation of two open source software systems, and the creation of an energy literacy assessment instrument. Our interactions with participants also brought to light possible longer-term impacts, such as future participation in sustainability groups on campus, and choice of major, which bear investigation in future research.

Masters Thesis

title ***Improving Mailing List Archives Through Condensation***

committee Philip M. Johnson, Wesley Peterson, Edoardo S. Biagioni

description My Masters research investigated how to improve the usability of question-and-answer-based archives for information seekers. I developed MCS, a system which improves mailing list archives through condensation. In MCS, a human uses an editing tool to distill frequently discussed topics into canonical question and answer pairs, and add metadata to messages to allow enhanced searching, such as searching by error message. To evaluate MCS, I condensed a 1428 message mailing list archive to only 177 messages.

Professional Organizations

ACM Association for Computing Machinery

UCS Union of Concerned Scientists

Publications

Journal Articles

Robert S. Brewer, Yongwen Xu, George E. Lee, Michelle Katchuck, Carleton A. Moore, and Philip M. Johnson. Three principles for the design of energy feedback visualizations. *International Journal On Advances in Intelligent Systems*, 3 & 4(6):188–198, 2013.

Philip M. Johnson, Carleton A. Moore, Joseph A. Dane, and Robert S. Brewer. Empirically guided software effort guesstimation. *IEEE Software*, 17(6), December 2000.

Conference Papers

Robert S. Brewer, Nervo Verdezoto, Thomas Holst, and Mia Kruse Rasmussen. Tough shift: Exploring the complexities of shifting residential electricity use through a casual mobile game. In *Proceedings of CHI PLAY 2015*, October 2015. [To Appear.].

Robert S. Brewer, Nervo Verdezoto, Mia Kruse Rasmussen, Johanne Mose Entwistle, Kaj Grønbæk, Henrik Blunck, and Thomas Holst. Challenge: Getting residential users to shift their electricity usage patterns. In *Proceedings of e-Energy 2015*, July 2015. [Acceptance rate: 25% (4/16)].

Johanne Mose Entwistle, Mia Kruse Rasmussen, Nervo Verdezoto, Robert S. Brewer, and Mads Andersen. Beyond the individual: The contextual wheel of practice as a research framework for sustainable HCI. In *Proceedings of CHI 2015*, April 2015. [Acceptance rate: 23%].

Yongwen Xu, Philip M. Johnson, George E. Lee, Carleton A. Moore, and Robert S. Brewer. Makahiki: An open source serious game framework for sustainability education and conservation. In *Proceedings of the 2014 International Conference on Sustainability, Technology, and Education*, December 2014. [Acceptance rate: 20% (22/112)].

Yongwen Xu, Philip M. Johnson, Carleton A. Moore, Robert S. Brewer, and Jordan Takayama. SGSEAM: Assessing serious game frameworks from a stakeholder experience perspective. In *Proceedings of the First International Conference on Gameful Design, Research, and Applications (Gamification 2013)*, October 2013. [Acceptance rate: 42% (17/40+)].

Robert S. Brewer, Yongwen Xu, George E. Lee, Michelle Katchuck, Carleton A. Moore, and Philip M. Johnson. Energy feedback for smart grid consumers: Lessons learned from the Kukui Cup. In *Proceedings of the Third International Conference on Smart Grids, Green Communications and IT Energy-aware Technologies (ENERGY 2013)*, March 2013. [Acceptance rate: 29%].

Philip M. Johnson, Yongwen Xu, Robert S. Brewer, Carleton A. Moore, George E. Lee, and Andrea Connell. Makahiki+WattDepot: An open source software stack for next generation energy research and education. In *Proceedings of the 2013 Conference on Information and Communication Technologies for Sustainability (ICT4S)*, February 2013. [Acceptance rate: 58% (44/75)].

Philip M. Johnson, Yongwen Xu, Robert S. Brewer, George E. Lee, Michelle Katchuck, and Carleton A. Moore. Beyond kWh: Myths and fixes for energy competition game design. In *Proceedings of Meaningful Play 2012*, October 2012. [Acceptance rate: approx. 50%].

Robert S. Brewer, George E. Lee, and Philip M. Johnson. The Kukui Cup: a dorm energy competition focused on sustainable behavior change and energy literacy. In *Proceedings of the 44th Hawaii International Conference on System Sciences*, January 2011. [Acceptance rate: "around 50%"].

Robert S. Brewer and Philip M. Johnson. WattDepot: An open source software ecosystem for enterprise-scale energy data collection, storage, analysis, and visualization. In *Proceedings of the First International Conference on Smart Grid Communications*, October 2010. [Acceptance rate: 40% (102/255)].

Robert S. Brewer. Improving problem-oriented mailing list archives with MCS. In *Proceedings of the 2000 International Conference on Software Engineering*, June 2000. [Acceptance rate: 14.5% (49/339)].

Philip M. Johnson, Danu Tjahjono, Dadong Wan, and Robert S. Brewer. Experiences with CSRS: An instrumented software review environment. In *Proceedings of the Pacific Northwest Software Quality Conference*, October 1993.

Workshop Papers

Robert S. Brewer. Beyond writing papers: Can SHCI move the needle? In *Proceedings of the CHI 2015 workshop "Expanding the Boundaries: A SIGCHI HCI & Sustainability Workshop"*, April 2015.

Robert S. Brewer. Three shifts for sustainable HCI: Scalable, sticky, and multidisciplinary. In *Proceedings of the CHI 2014 Workshop "What have we learned? A SIGCHI HCI & Sustainability community workshop"*, April 2014.

Johanne Mose Entwistle, Mia Kruse Rasmussen, and Robert Brewer. The contextual wheel of practice. In *Proceedings of the CHI 2014 Workshop on Personalizing Behavior Change Technologies*, April 2014.

Robert S. Brewer. The Kukui Cup: Shaping everyday energy use via a dorm energy competition. In *Proceedings of the CHI 2011 Workshop on Everyday Practice and Sustainable HCI*, May 2011.

Robert S. Brewer, George E. Lee, Yongwen Xu, Caterina Desiato, Michelle Katchuck, and Philip M. Johnson. Lights Off. Game On. The Kukui Cup: A dorm energy competition. In *Proceedings of the CHI 2011 Workshop on Gamification*, May 2011.

Robert S. Brewer. Carbon metric collection and analysis with the personal environmental tracker. In *Proceedings of the UbiComp 2008 Workshop on Ubiquitous Sustainability: Citizen Science and Activism*, September 2008.

Robert S. Brewer, Samuel R. H. Joseph, Guanghong Yang, Neil Scott, and Daniel Suthers. SocialSense: A system for social environment awareness. In *Proceedings of the UbiComp 2008 Workshop on Devices that Alter Perception*, September 2008.

Posters

Henrik Bærbak Christensen, Henrik Blunck, Niels Olof Bouvin, Robert S. Brewer, and Markus Wüstenberg. Karibu: A flexible, highly-available, and scalable architecture for

urban data collection. 1st International Conference on IoT in Urban Space, October 2014. [Acceptance rate: 28% (27/58), runner up for best poster].

Kaveh Abhari, Hana Bowers, Robert Brewer, Greg Burgess, Caterina Desiato, Philip Johnson, Michelle Katchuck, Risa Khamsi, George Lee, Yongwen Xu, Alex Young, and Chris Zorn. Lights Off. Game On. The 2011 Kukui Cup. Behavior, Energy, and Climate Change Conference, November 2011.

Robert S. Brewer and Philip M. Johnson. WattDepot: Open source software for energy data collection and analysis. Behavior, Energy, and Climate Change Conference, November 2010.

Theses

Robert S. Brewer. *Fostering Sustained Energy Behavior Change And Increasing Energy Literacy In A Student Housing Energy Challenge*. PhD thesis, University of Hawaii, Department of Information and Computer Sciences, March 2013.

Robert S. Brewer. Improving mailing list archives through condensation. M.S. thesis, University of Hawaii, March 2000.

Systems Developed

Makahiki 2010–present

Makahiki is an open source "serious game engine for sustainability" written in Python on the Django platform. It provides a framework for creating serious games for the purpose of education and behavioral change regarding energy, water, food, and waste generation and use. Makahiki has been used to run four Kukui Cup energy challenges to date at: the University of Hawai'i at Mānoa (2011 and 2012), Hawai'i Pacific University (2012), and the East-West Center (2012). I was part of the team that designed Makahiki, and I developed large portions of the educational content library that accompanies it. The system is available at `https://github.com/csdl/makahiki`

WattDepot 2009–present

WattDepot is an open source, RESTful web service written in Java that collects electricity data from meters and stores it in a database. The data can then be retrieved by other tools for visualization and analysis. It is designed to provide infrastructure for experimentation and development of "Smart Grid" applications. I designed and developed WattDepot 1.X, and oversaw the development of WattDepot 2.0. I participated in the design of WattDepot 3.0, which is available at `http://wattdepot.org/`

MCS 1998–2000

The Mailing List Condensation System (MCS) was a Java-based system intended to improve mailing list archives through a process called condensation performed by a human editor. Condensation involves several tasks: extracting only messages of longer-term relevance, adding metadata to those messages to improve searching, and potentially editing the content of the messages when appropriate to clarify. I was the sole designer and developer of MCS. MCS was a research system that was never publically released.

UHM LaTeX thesis style 1998–present

A LaTeXclass file to aid in the typesetting of theses and dissertations at the University of Hawai'i at Mānoa. The class was originally derived from the a University of California dissertation style file, but a new version has been rewritten from scratch. I am the primary maintainer of the system, which is available at `https://github.com/rbrewer/latex-uhm-thesis`

URN 1992–1994
: The URN system was a collaborative USENET reading and filtering system written in Emacs Lisp on the Egret platform. Readers could mark articles as interesting or uninteresting, and weights associated with those keywords would be stored with the article to be used by friends and colleagues to sort unread articles in order of interest. I was the sole designer and developer of URN. The system was a research prototype that was never publically released, but has been cited in multiple patents.

Notable Talks

2014
: Robert S. Brewer. Fostering Changes in Residential Resource Use: Sensors, Serious Games, and Sustainability. Participatory Information Technology Centre, Aarhus University, Denmark, March 10, 2014.

2013
: Robert S. Brewer. Pushing The Boundaries Of Student Sustainability Competitions With The Kukui Cup. Copenhagen Business School, Department of IT Management, Denmark, November 26, 2013.

2013
: Robert S. Brewer. Pushing The Boundaries Of Student Sustainability Competitions With The Kukui Cup. AASHE Conference and Expo, Nashville, TN, October 7, 2013.

2013
: Beth Karlin, Robert S. Brewer, Cindy Frantz, Stephanie Vezich. Panel: Technology to the Rescue? The Potential and Pitfalls of Feedback in Energy Conservation. American Psychological Association, Honolulu, HI, August 3, 2013.

2012
: Yuka Nagashima, Robert Brewer. Gamification and the Environment: Lessons from the Kukui Cup. ECO-TECH 4H with Leilehua Ecology Club and Kamaile Academy Ecology Club, University of Hawai'i at Mānoa, April 21, 2012.

2012
: Robert S. Brewer. The Kukui Cup: Smart Consumers for a Smart Grid. College of Engineering Special Seminar, University of Hawai'i at Mānoa, February 16, 2012.

2011
: Robert S. Brewer, George E. Lee, Philip M. Johnson. The Kukui Cup (Gamification of Energy Conservation). TechHui Conference, Honolulu, HI, December 10, 2011.

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