A Glimpse of Human-Computer Interaction

Jim Hollan
Co-Director Design Lab
Department of Cognitive Science
Department of Computer Science and Engineering

Email: hollan@ucsd.edu
Lab: Design Lab at UC San Diego
Web: hci.ucsd.edu/hollan & designlab.ucsd.edu
My research explores the cognitive consequences of computational media. It is motivated by a belief that we are at the beginning of a paradigm shift in thinking about representational media, one that is starting to appreciate the importance of representations that are not only dynamic and interactive but also adapt to the structure of tasks, the history and context of activities, and our relationships with others. My goal is to better understand the cognitive, computational, and social ecology of dynamic interactive adaptive systems.

My interests span across cognitive design, distributed and embodied cognition, human-computer interaction, multiscale information visualization, multimodal interaction, cognitive ethnography, and software tools for design and visualization. My work involves four intertwined activities: developing theory and methods, designing representations, implementing prototypes, and evaluating their effectiveness to better understand the broader design space in which they are situated.

Current research is funded by the National Science Foundation (NSF). Recently completed research has been funded by California's Digital Media Innovation Program, Chancellor's Interdisciplinary Collaboratories Program, Darpa, Intel, Microsoft, Nissan, NSF, Sony, Toyota, and the UC MICRO Program.

Honored to have received the ACM SIGCHI Lifetime Research Award in 2015.

**COURSES CURRENT ACADEMIC YEAR**

**FALL 2018**

**COGNITIVE SCIENCE 220: Information Visualization Seminar**
Wed 9-11:50 Cognitive Science Building 003

**DESIGN 119, COGNITIVE SCIENCE 229, and COMPUTER SCIENCE 219: Design@Large**
Wed 4-5 Computer Science 1202

**WINTER 2019**

**COGNITIVE SCIENCE 126: Human Computer Interaction**
Tues & Thurs 9:30 - 10:50 Cognitive Science 003

**SPRING 2019**

**COGNITIVE SCIENCE 10: Cognitive Consequences of Technology**

**RECENT RESEARCH PUBLICATIONS**

**Exploration and Explanation in Computational Notebook.**

**Stories We Tell Ourselves: Using Visual Histories to Make Sense of Interrupted Activities.**

**Sharing, Human Values, and Computer Activity Tracking.**

**Thinking in 4D.**

**RECENT GRADUATE STUDENTS AND OTHER COLLABORATORS**

**COGNITIVE SCIENCE**
Amaya Becvar Weddle (PhD, 2008; Now at Cisco), Gaston Cangiano (Ph.D. 2011), Monal Chokshi (M.S. 2005; Now at Lyft), Brynn Evans (M.S. 2009; Now at Google), Whitney Friedman, Adam Fouse (Ph.D. 2013), Amy Rae Fox, Daniel Friesinger, Tim Marks (Ph.D. 2006; Now at Meri), Anne Marie Piper (Ph.D. 2011; Now at Northwestern University), Erik Pukinskis, Nan Renner (Ph.D. 201; Now at UCSD), Adam Rule, Tim Sahn (Ph.D. 2008; Now at Google), So Yamaoka (Ph.D. 2011)

**COMPUTER SCIENCE**
Dan Amelang, Lisa Cowan (Ph.D. 2011), Jonathan Lee, Kevin Li (Ph.D. 2009; Now at AT&T Labs), Roshni Malani (Ph.D. 2009; Now at Google), Kevin Ponto (Ph.D. 2010; Now at University of Wisconsin), Macneil Sholle (Ph.D. 2009; Now at Google), Arvind Satyanarayan (Honors Undergrad; Ph.D. Stanford 2017; Now at Google; Starting MIT Fall 2018), Tim Sahn (Ph.D. 2008; Now at Google), So Yamaoka (Ph.D. 2011)

**SOCIOLOGY**
Tricia Wang (Ph.D. 2014)

**POSTDOCS**
Pierre Fastrez, David Fox, Jean-Baptiste Haue, Ron Hightower, Terry Jones, Derek Lomas, Melanie McComsey, Lars Mueller, Saeko Nomura, Malte Risto, Carsten Roeker, Nadir Weibel

**COLLABORATORS**
Maneesh Agrawala, Patrick Baudisch, Michel Beaudouin-Lafon, Jan Borchers, Barry Brown, Tom DeFanti, Jeff Elman, Bill Griswold, François Guimbretière, Ed Hutchins, Adriene Jenik, Scott Kiemmer, Falko Kuester, Saadi Lelahou, Wendy Mackay, Javier
But first, one slide of advice

Why do so few people make significant contributions? What is the difference between those who do and those who don’t?

One factor is expectations: If you think you can’t almost certainly you won’t

To do significant things you have to neglect other things

Take time to think important thoughts

Be thoughtful about who you spend time with

Refuse to let the urgent drive out the important
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HCI and Design at UC San Diego

UC San Diego is a special place with a long history in Cognitive Science and Human-Computer Interaction (HCI)

Early Days: Institute for Cognitive Science, PDP, User-Centered System Design

Today: New Design Lab
Focus: Complex Socio-Technical Systems

HCI/Design Faculty: Steven Dow, Philip Guo, Jim Hollan, David Kirsh, Scott Klemmer, Don Norman, Taylor Scott

Cognitive Science Majors (1652)
HCI & Design Specializations (614) ~37%
Design Minor (135)
HCI/Design Courses

Winter:
Cogsci 9 Introduction to Data Science
Cogsci 13 Field Methods
Cogsci 18 Introduction to Python
Cogsci 102B Cognitive Ethnography
Cogsci 120 Human Computer Interaction
Cogsci 126 HCI: Thinking with Computers
Cogsci 187B Practicum in Professional Web Design
Cogsci 189 Brain Computer Interfaces

DSGN 1 Design of Everyday Things
DSGN 100 Information Design
DSGN 119: Design@Large

Spring:
Cogsci 10 Cognitive Consequences of Technology
Cogsci 13 Field Methods
Cogsci 18 Introduction to Python
Cogsci 100 Cyborgs Now and in the Future
Cogsci 102C Cognitive Design Studio
Cogsci 121 HCI Programming Studio
Cogsci 181 Neural Networks and Deep Learning

DSGN 119: Design@Large
DSGN 1: Design of Everyday Things

DSGN 1 is a studio-based course about the principles and process of design. It focuses on developing skills. Design is as much about identifying problems as finding solutions. It is fundamental to making the world a productive, enjoyable, and wonderful place to live.

You will learn to observe, analyze, and understand the role design plays in our lives. Look around. Virtually everything you see was designed: the layout of keys on your laptop, even the font used for the letters, the shape and placement of your front door knob, the ways you control your car, how you swipe to interact with your smartphone. All were designed. But how well were they designed? Could they be designed better?

We examine not only the visible features of designed objects but also the less visible features of process and interaction (e.g., how we queue to obtain service at an ATM, why we decide to grasp an object in a certain way, or sit in that specific seat in the classroom), the implicit and explicit ways design influences our interaction with the world and with each other.
Cogsci 10: Cognitive Consequences of Technology

We address questions of crucial importance for our increasingly technological society:

How does technology shape our minds?

How should what we know about our minds shape technology?
Facebook, Twitter, and Google called before congress to testify about how their systems might have been “used to undermine our democracy and put our nation at risk.”

WASHINGTON, DC - OCTOBER 31: (L-R) Facebook General Counsel Colin Stretch, Twitter Acting General Counsel Sean Edgett, and Google Law Enforcement and Information Security Director Richard Salgado are sworn in before the Senate Judiciary Committee's Crime and Terrorism Subcommittee in the Hart Senate Office Building on Capitol Hill October 31, 2017 in Washington, DC. | Photo by Chip Somodevilla/Getty Images
Thinking with Computers

For far too long we have conceived of thinking as something that happens exclusively in the head.

Thinking happens in the world as well as in the head.

We think with things, with our bodies, with marks on paper, and with other people.

Thinking is a situated social activity that exploits the extraordinary facilities of language, representational media, and embodied interaction with the world and other people.

Today we increasingly think with computers.
Computers Are Special

Computers are special in that they provide a new kind of stuff, a new medium, out of which to fashion dynamic interactive systems to assist thought, communication, collaboration, and social interaction.

“The computer is the first meta-medium, and as such it has degrees of freedom for representation and expression never before encountered and as yet barely investigated.” — Alan Kay
Visual Rhythm and Beat

Based on:
“Visual Rhythm and Beat” SIGGRAPH 2018
by Abe Davis and Maneesh Agrawala
Stanford University

More info at:
abedavis.com/visualbeat
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Stanford AI Lab
Xerox Parc and the Alto: An Amazing Place and Machine

Xerox CEO decides Xerox should become “the architect of information.”

Xerox Parc (Palo Alto Research Center)

Parc becomes the place to be. Create the future by living in it. Alan Kay, “The best way to predict the future is to invent it.”

Parc Legacy: personal computer, ethernet, laser printing, object-oriented programming, icons and desktop metaphor, ethnography of technology, ...
Computers Are Special

Computation provides the most plastic medium for representation, interaction, and communication we have ever known

Mimic existing media (e.g., books, newspapers, magazines, photographs, audio recordings, and films)

Create new media and modify the form of existing media,

Create models that represent, with ever increasing fidelity, the physical world

Provide virtual worlds that range from the simple metaphorical desktop of the graphical user interface to the amazing digital effects and virtual characters of current games and films

Combine the real and the virtual, as with computer-augmented surgery in which images of internal structure are projected onto a patient's body to guide surgery and robotic-assisted controls remove the tremors from the surgeon's hands
Changing form of computers

Monolithic computer is coming apart and being reassembled in myriad new forms

New device ecologies and ways of interacting

Already today a billion google searches; each using the equivalent of all the computing of the Apollo Project that landed the first human on the moon

For good and for ill, our activities are increasingly mediated by computers
New types of computers: smartphones

Increasingly we have multiple and we don’t think of many of them as computers

iPhone introduced in 2007

Internet: Connected to computers, sensors, and people all over the world

Web: Changing our professional, personal, and social lives
Boundary between physical and digital worlds is becoming permeable
Boundary between physical and
digital worlds is becoming permeable
ObjecTop: Occlusion Awareness of Physical Objects on Interactive Tabletops

M. Khalilbeigi (Darmstadt), J. Steimle (MIT), and J. Hollan (UCSD)
ObjecTop
Occlusion Awareness of Physical Objects on Interactive Tabletops
Data Revolution

Inexpensive digital recording devices, sensors, and storage facilities are revolutionizing data collection in the behavioral sciences.

Extending data collection into situations that have not typically been accessible.

Enabling examination of the fine detail of action captured in meaningful settings.

This makes real world activity an object of scientific scrutiny in ways never before possible and at a scale that until recently was unimaginable.

Interesting work of Chuck Goodwin.

Three words: Yes, No, and And.

We don’t know nearly enough about what people really do.
Data Collection using Kinect
Creative Research
we study how people crash into technology

bolt | peters is a creative research firm.
Fun example: capturing behavior of people playing Spore (the outtakes)
Long Interested in Capturing Activity History

Story starts in an auto repair shop in Austin Texas
Activity Histories

Wear on menus, buffers, email, ...

Edit Wear and Read
Wear
Hill, Hollan, Wroblewski, and McCandless

History-Enriched Digital Objects
Hill and Hollan

Attribute-Mapped Scrollbars
Intelligent Driver Support System

Instrumenting activities with sensors
Video Streams
IT'S A 3-WAY STREET
Laboratory Studies
Field Studies
Exploratory Work
Summary

Computers are special: new media for representation, communication, and collaboration

Thinking with computers

Moving beyond the desktop: onto the desk, into the world, and mobile

Increasingly permeable boundary between physical and digital

Important data revolution: capture real-world activity for scientific scrutiny

We don’t know enough about what people really do

Activity Histories: read/wear edit/wear; real-world driving

ChronoViz: aid annotation, visualization, and analysis
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