Syllabus for HCC1, Fall 2016

Readings are subject to change. Please always check the online reading schedule.

CS 6451: INTRODUCTION TO HUMAN-CENTERED COMPUTING (**HCC1**)

Instructor: Mark Guzdial

Office: TSRB 329

Office Hours: Wednesday at 9 am in my office, or find me after class, or email for an appointment.

Location: College of Computing Building Room 53

Time: Tuesday and Thursday, 9:35-11 am. *EXCEPT for Aug 23*

Schedule: Class and reading schedule

Learning Objectives

This class provides an introduction to the field of Human-Centered Computing. It is designed for incoming, first semester HCC PhD students.

This class introduces students to theoretical readings that inform the School of Interactive Computing's approaches to Human-Centered Computing. The class is recommended for students with a theoretical bent. Master's students considering a PhD in the future may enjoy this class. If you are an interdisciplinary student mainly seeking a general introduction to how computing systems for humans are designed, then the class you are looking for is most likely CS 6750, Human-Computer Interaction.

Topics covered include an introduction to a wide range of theories, and their application to the design of interactive computing systems, including:

- Sociology of science and technology
- Epistemology
- Social construction of technology
- Category theory
- Activity theory

- Distributed cognition
- Culture
- Identity and presentation of self online
- Learning
- Ubiquitous computing

Where ever possible, we try to pair a theoretical reading with an application of that theory to human-centered computing. The applications papers are not necessarily foundational to the field, but are good examples of the use of theories and illustrate theory's relevance.

This class tries to cover as much as possible of the HCC Core qualifier exam reading list for PhD students in Human-Centered Computing. The rest of the list is covered in HCC 3. A copy of the list is here: **HCC Core Reading List** with **changes here**

Required Texts

We are going to be reading from all these books, but you don't necessarily have to buy all of them. For some of these, we're only going to read a chapter or two, and there are electronic versions "floating around" or I've made available via T-Square. Check with your peers first.

Books I recommend buying

- Wiebe Bijker, **Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change**
- Jean Lave and Etienne Wenger, **Situated Learning: Legitimate Peripheral Participation**
- Herbert Simon, **The Sciences of the Artificial - 3rd Edition**
- Russell & Norvig, **Artificial Intelligence: A Modern Approach**

Books I recommend borrowing/finding e-copies

- Clifford Geertz, **The Interpretation Of Cultures**
- Erving Goffman, **The Presentation of Self in Everyday Life**
- George Lakoff, **Women, Fire, and Dangerous Things**

Assignments and Grading

- Class Participation: 10%
- Reading Reflections: 30%
- **Mini-Projects**: 20%
- Elevator Pitches: 20%
- Research Proposal: 20%

Assignments

Assignments will be graded out of 100 and according to the criteria listed for each assignment that could include quality of writing, completeness, insight into technical issues, insight into social issues, etc.

Please hand all assignments in as PDF on T-Square, unless explicitly instructed otherwise.

Late Policy

Assignments are due at the start of class on the day they are due. Over the course of the term, you have three "late days" where work may be late with no explanation needed. Once you have used up your late days, late assignments will be penalized at a rate of 5 pts (e.g., 10 points from A to B) per day. Assignments more than one week late will not be accepted.

Reading reflections may not be late.

Class Participation

Research is a discursive practice. We write, we ask questions, we discuss. You cannot learn all that you will need to learn without engaging with others. Graduate School is the perfect place to work on this skill. Graduate School is an apprenticeship for what will come afterwards. Take advantage of the fact that you are learning with others in this safe space. Practice speaking in class. Come to class with questions. You think you are the only one with that question, unlikely.

- A Grade Participation: you come to class prepared, with thoughtful questions based on reading and reflecting on the materials. You participate by listening to others and encouraging them to speak. You have insights and questions to share.

- B Grade Participation: you have comments but they are not deeply connected to the readings. You may respond to others questions, but you don't share any deeper insights or raise questions of your own. You have opinions but not ideas.
- C and less Participation: you may or may not have done the readings. You spent no time with them of any substance.

Class attendance is required. This is a small class, so please email the instructor in advance if you can't attend for some reason. Legitimate reasons for missing class include illness (please keep your germs to yourself--we'll give you good notes--we promise!), a job interview, or attending a conference. Excuses that will not be accepted include for example picking someone up at the airport, having something due in another class, or having furniture delivered.

Course Reflections

Due: Start of class, the day the reading is assigned. *You owe one reading reflection each week, Weeks 2-14.*

Format: 12 pt font, double spaced

Length: Approx. 1-2 pages

Pick an assigned course reading and write a one to two page 'reflection' on that reading. What was interesting about it? Is it relevant for your work in some way? You may write about one reading, or compare and contrast more than one.

While it's OK to say some critical things about the paper, keep in mind that you can rip everything to shreds. The best paper has flaws. It's a better use of your time to focus on what is good about a paper than what is wrong with it.

Each reflection will be graded out of 100. You can earn up to 30% of your entire grade via reading reflections. Reading reflections will be associated with the readings in Weeks 3-13. Reflections are due at the start of class on the day the reading is assigned, and will not be accepted late.

"Elevator Pitch"

Due: see **class schedule**

Format: 12 pt font, double spaced

Length: < 3 pages

Grading criteria:

- Completeness
- Writing
- Insight into methods
- Insight into key questions

Write an "elevator pitch" proposal for a research project you would like to do. As succinctly as possible, describe the research questions and methods you will use. Why is this work interesting?

Be prepared to explain in class why this is interesting in one breath or two sentences (whichever comes first).

Research Proposal

Due: see **class schedule**

Format: 12 pt font, double spaced

Length: 10-12 pages

Grading criteria:

- Completeness: Intellectual merit, broad impact, **logic model** ("Guzdial chart"), methods, expected results
- Writing
- Literature review
- Insight into methods
- Insight into key questions

Write a proposal for a research project. Begin by stating the research question(s) and why they are important. Next, review the literature in this area. Next, describe the methods you will employ. Finally, describe risks of the project. What is hard about this work? What difficulties might you anticipate, and how will you address them?

This should be related to your 'elevator pitch' idea.

Other Important Issues

Use of Laptops in Class

Some people like to use **laptops in class** to take notes. I personally prefer to take notes on paper, because I find if my laptop is open I end up getting too distracted. Please think carefully about whether using a laptop in class is the right choice for you. Whatever you decide, please do not do anything that distracts your fellow students. In particular, please do not play video games during class.

Honor Code

This class abides by the **Georgia Tech Honor Code**. All assigned work is expected to be individual, except where explicitly written otherwise. You are encouraged to discuss the assignments with your classmates; however, what you hand in should be your own work.

Course Evaluation

Course evaluations are an important part of how we improve the educational experience at Georgia Tech. We take your feedback very seriously, and use it to improve classes for future years. In a small class like this one, the Dean expects 100% participation on the course evaluation. If you take this class, you agree to complete your course evaluation at the end of the term. Thanks in advance--your input is really helpful!

If you need help dealing with larger issues than this class:

If you are struggling to manage with your life at Georgia Tech, there are resources that you can draw upon. The **Georgia Tech Counseling Center** is staffed by psychologists and mental health counselors. They offer brief, confidential counseling and crisis intervention services to students, and after-hours on-call counselors to speak and consult with students in crisis. They also offer a series of workshops for managing stress.

The **Stamps Health Services** offers psychiatrist services to students and spouses. Call 404-894-2585 or visit the second floor of Student Health Services.

The **Office of the Dean of Students** welcomes referrals if you are concerned about a colleague.

Acknowledgments

Assignments and ideas on this syllabus build on those from everyone who has taught it before, especially Beki Grinter, Amy Bruckman, Eric Gilbert, and Colin Potts.

Schedule for HCC1, Fall 2016

Readings and assignments are subject to change. Please always check here.

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Week 1:

8/23: *No Class* (Mark is at ACM Education Council Meeting.)

8/25: **Introduction**

- Welcome & overview
- **Sociology of Science & Epistemology of Knowledge**
- Read: Thomas Kuhn, "Scientific Paradigms" (**on T-Square**) *Come to class with a "most interesting" quote from the chapters.* "Interesting" may mean "I so agreed with this!" or "I really hated this!" or "That was such a surprise!" or something else.

Week 2:

8/30:

- Herbert Simon, "Sciences of the Artificial", chapters 1 & 5.

9/1:

- *If you're not familiar with ethnography, read this as an introduction to Latour:* Horace Miner (1956). "**Body ritual among the Nacerima**." *American Anthropologist*, 58(3), 503-507.
- Bruno Latour and Steve Woolgar, **"An Anthropologist Visits the Laboratory"**, chapter 2 of "Laboratory Life"

Week 3:

9/6: **Social Shaping of Technology** (Guest teacher: Betsy DiSalvo)

- Bijker, **"Of Bicycles, Bakelites, Bulbs.",** chapters 1 & 2

9/8: (Guest teacher: Amy Bruckman)

- Claude S. Fischer (2014). "**All Tech Is Social**." In Boston Review.
- Colin Potts (2016). "**Listening Carefully**."

Week 4:

9/13: **Politics and Technology; Category Theory**

- Langdon Winner, **Do Artifacts Have Politics?**
- Blumenthal, Marjory S. and David D. Clark (2001) **Rethinking the Designing of the Internet: The End-to- End Arguments vs. the Brave New World**. ACM Transaction on Internet Technology 1,1 70-109. (ACM DL)

9/15:

- George Lakoff, **"From Wittgenstein to Rosch",** chapter 2 of "Women, Fire, and Dangerous Things"
- Amy Bruckman, **A new perspective on 'community' and its implications for computer-mediated communication systems.**

Week 5:

9/20: **Culture**

Assignment: First mini-project due

- Clifford Geertz, "The Interpretation of Cultures," Chapter 1 **"Thick Description: Toward an Interpretive Theory of Culture,"** and "Deep Play: Notes on the Balinese Cockfight."

9/22:

- Shore, B., Introduction to "Culture in Mind: Cognition, Culture, and the Problem of Meaning," Oxford University Press (1996) (**on T-Square**)

Week 6:

9/27: **Distributed Cognition**

- Hutchins, E. (1995). **"How a cockpit remembers its speeds,"** Cognitive Science, vol. 19, pp. 265-88.
- Hollan et al. (2000) **Distributed Cognition: Toward a New Foundation for Human-Computer Interaction**, ACM Transactions on Computer-Human Interaction (7)2.(ACM DL)

9/29:

- Zhicheng Liu, Nancy J. Nersessian, John T. Stasko, **Distributed Cognition as a Theoretical Framework for Information Visualization**, IEEE Transactions on Visualization and Computer Graphics, (InfoVis '08), Vol. 14, No. 6, November/December 2008, pp. 1173-1180.

Week 7:

10/4: **Activity Theory**

- Kuutti, Kari (2001). **"Activity Theory as a Potential Framework for Human-Computer Interaction Research".** Chapter 2 in *Context and Consciousness, Activity Theory and Human-Computer Interaction*, edited by Bonnie Nardi. MIT Press.

10/6:

- Bryant, S., A Forte and A. Bruckman (2005). "Becoming Wikipedian." Proceedings of ACM GROUP 2005. (**ACM DL**)

Week 8:

10/11: **Fall Break**

10/13: **Learning**

- Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). **How People Learn (Expanded edition)**. "How Experts Differ from Novices" and "Learning and Transfer." Make sure to read the expanded edition. Available free online, or you can also buy a paper copy.
- Barab, S. and Squire K. (2004). **"Design-Based Research: Putting a Stake in the Ground,"** Journal of the Learning Sciences.

Week 9:

10/18: **Artificial Intelligence**

- Russell & Norvig, Artificial Intelligence, Chapters 1 & 2
- Goel & Davies, **Artificial Intelligence**, Handbook of Intelligence

10/20:

- Boden **Computational Creativity**, AI Magazine
- **Assignment due**: first elevator pitch of research idea
  * Be prepared to do your elevator pitch in-class.

Week 10:

10/25: **The Social**

Assignment: Second Mini-Project Due

- Goffman, E. (1956). Introduction and Chapter 1 from The Presentation of Self in Everyday Life. New York: Doubleday. (**On T-Square**.)
- Granovetter,M (1973). **"The Strength of Weak Ties."** American Journal of Sociology.

10/27:

- Gilbert, E. and K. Karrahalios, **Predicting Tie Strength with Social Media**. Proceedings of CHI 2009, Boston MA. (ACM DL)
- Erickson, T. and Kellogg, W. **Social translucence: an approach to designing systems that support social processes**. ACM ToCHI 7, 1 (2000), 59-83. (ACM DL)

Week 11:

11/1: **Legitimate Peripheral Participation**

- Lave, J. and Wenger, E. (1991). Legitimate Peripheral Participation. (whole book)

11/3:

- We're going to continue discussing LPP, but if you want a different perspective:
  * *Optional:* Mark Guzdial and Allison Elliott Tew. 2006. Imagineering inauthentic legitimate peripheral participation: an instructional design approach for motivating computing education. In Proceedings of the second international workshop on Computing education research (ICER '06). ACM, New York, NY, USA, 51-58. DOI=**http://dx.doi.org/10.1145/1151588.1151597**

Week 12:

11/8: **Election Day!** (We still have class.)

What Makes Good Research?

- Dourish, Paul (2011). **What is Plagiarism?**

11/10: **What makes Good HCC Research?**

- Read FOUR papers from this list of (HCI-biased and missing most HCC alums and faculty) **Noteworthy Papers by Georgia Tech HCC Phd Students and Alumni**. Select one (that no one else has picked yet) and write your name next to it as the presenter for that paper.
- **Assignment**: Come to class prepared to discuss all four papers and lead the discussion of your one paper. Remember that not everyone in the class will have read the papers you picked, so you will need to summarize the paper. Focus on what is interesting about this paper and what makes the research noteworthy. What makes good HCC research?

Week 13:

11/15: **Ubiquitous Computing**

- Weiser, Mark (1991). **The computer for the 21st century.** Scientific American.
- Rogers, Yvonne (2006). "Moving on from Weiser's Vision of Calm Computing: Engaging UbiComp Experiences." Proceedings of Ubicomp 2006. (**ACM DL**)

11/17:

- Want, Roy (2009). "An Introduction to Ubiquitous Computing." In *Ubiquitous Computing Fundamentals*, edited by John Krumm. Chapman and Hall/CRC.

Week 14:

11/22: **Policy: Privacy and Education**

- Alessandro Acquisti, Laura Brandimarte, and George Loewenstein (2015). "**Privacy and human behavior in the age of information**." Science 347 (6221), 509-514.
- Mark Guzdial, Barbara Ericson, Tom Mcklin, and Shelly Engelman. 2014. Georgia Computes! An Intervention in a US State, with Formal and Informal Education in a Policy Con-

text. Trans. Comput. Educ. 14, 2, Article 13 (June 2014), 29 pages. DOI=10.1145/2602488 http://doi.acm.org/10.1145/2602488

11/24: **Thanksgiving!** (Come run a half marathon with Mark!)

Week 15:

11/29: **Discussion of Research Proposals**

Assignment: Third mini-project due

Assignment: Discussion of Research Proposals

12/1: **Further Discussion of Research Proposals**

Week 16 (How'd we get here?)

12/6: **Last Day of Class!**

Mini-Project

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Suggested Mini-Projects at Bottom of Page

Due: Weeks 5, 10, and 15 (before Tuesday class)

Summary, Purpose, and Parameters

The purpose of the mini-project is to allow you to explore the breadth of research that is being performed by faculty in the Human-Centered Computing program. You may want to make it a goal of your mini-project to explore a discipline that is outside of your immediate research interest or area. This exploratory process serves several important functions:

1. It gives you an excuse to introduce yourself to an HCC faculty member. You may find this relationship outside of your research area to be a useful independent source of advice throughout your graduate career.
2. It introduces you to research outside your immediate area. This breadth of exposure may prove useful in your own research. For example, you may ultimately apply techniques you learn from your mini-project area to your own research area at some later point. *Who knows: the mini-project may even become your dissertation topic!*
3. It allows faculty outside of your area to meet you. You can ultimately benefit from impressing a broader range of faculty (think career connections, etc.).
4. It's exploratory and fun! You will ultimately narrow down into a very specific research problem and area, and you won't get too many chances like this to explore research in other areas.

It is up to you to:

1. select a mini-project advisor, who can help you define the mini-project;
2. define the mini-project;
3. complete the mini-project to the satisfaction of the mini-project advisor (and me).

The specific milestones for the project, and specification of those milestones, is included below.

The scope of the project should be something that you can complete in 3-4 weeks as a "class project." Make sure that you and your mini-project advisor are clear on these expectations.

You are required to perform three mini-projects. In terms of grading criteria below, your two highest grades will count (dropping the lowest). You are still required to perform all three. Remember, the purpose of these projects is to give you a "rotation" with a faculty member, who will turn out to be anyone from a colleague to potentially your PhD advisor.

Milestones and Important Dates

You can start your mini-project anytime, as long as long as they are completed by the due dates on the **schedule**.

You must provide a title for your mini-project and the name of the faculty member with whom you are working by the due date below.

Grading for this project will be A, B, or F. In addition to the initial report of who you are working with and the topic you have chosen, your final mini-project grade will have two components:

1. We will ask the mini-project advisor for a grade (A or F) for the project and a brief evaluation/summary of your work. This component will form 75% of your mini-project grade. Your mini-project advisor will email this to the instructor.
2. Your final mini-project report is a one-page summary of the mini-project: (1) the problem/topic, (2) what you did, and (3) what you learned from the project. This component of the project will also have an A or F component. This component will form 25% of your mini-project grade.

Mini-Project Suggestions

Literature Review: HCC Perspectives on Rural Networking

Mini-project: co-supervised by Grinter and Zegura

Background: Beki & Ellen have started a project (in collaboration with PSU and UCSB colleagues) focused on implementing a whitespaces network on a tribal reservation. Whitespaces uses frequencies allocated, but not used, for broadcasting services, allowing them to be used for other purposes. We plan to create a network using those frequencies that can be used in places where traditional Internet technologies are difficult to deploy—starting with a Native American Reservation.

The Mini-Project: We would like a student to review related HCC literature. What do we know about rural networking? Rural computing? What do people want? We recommend starting with these two papers below, both of which focus on the reservation we will be working with. You should read them, and follow the citation trails (what papers do they cite, who cites their papers —you can use Google Scholar and the ACM DL to get this information).

Sandvig, C. (2012). Connection at Ewiiaapaayp Mountain: Indigenous Internet Infrastructure. In: L. Nakamura & P. Chow-White (eds.) Race After the Internet. New York: Routledge.

http://www-personal.umich.edu/~csandvig/research/Sandvig__Connection_at_Ewiiaapaayp_-Mountain.pdf

M. Vigil, E. Belding and M. Rantanen, "Repurposing FM: Radio Nowhere to OSNs Everywhere", ACM CSCW, San Francisco, CA, February 2016

http://people.cs.ucsb.edu/ebelding/sites/people/ebelding/files/publications/cscw_radio.pdf

Deliverable: An annotated bibliography of papers that are relevant to understanding rural computing/networking. Literature reviews are a critical skill to develop as an HCC PhD student, so this project will provide you with an opportunity to develop this skill.

Helping Patients Manage Chronic Illness

Rosa I. Arriaga, Ph.D.

Both HCI researchers and Behavioral Scientist develop technology to help patients manage their chronic illness. In our lab we have conducted a systematic analyses of the literature on mobile apps for diabetes and have found some interesting parallels and disconnects between these two research communities. In this mini project you will be asked to update the literature review to include studies conducted over the past 3 years. You will also be asked to update our paper with the new data and prepare it for submission for a journal article. A high caliber mini project will lead to an authorship opportunity.

Feedback on Online Behavior and SRS

Amy Bruckman

Does receiving feedback on online behavior actually change an individual's future behavior? In this mini project, you will complete your human subjects training, and then interview three to five people whose postings have been featured on the site Shit Reddit Says (SRS), **https://www.reddit.com/r/ShitRedditSays/** Do people even know their posting is linked on SRS? How do they feel about it? What can we learn from this more broadly about how to make the Internet a more civil place?

AI and Cognitive Science Projects with Ashok Goel

A. Research Area: Artificial Intelligence and Machine Learning

A.1. **Project name: Extracting Conceptual Knowledge for Engineering Design**

Project description: Engineering design requires conceptual, causal and functional knowledge. This project seeks to automatically acquire this knowledge from natural language documents. It combines knowledge representation, analogical reasoning, natural language processing, and machine learning for the knowledge acquisition.

Contact names: Ashok Goel and Spencer Rugaber

Contact email: **goel@cc.gatech.edu**

Possible funding: No

Possible course credit: Yes

A.2. **Project name: Exploiting Big Data for Scientific Discovery**

Project description: The process of scientific discovery engages qualitative modeling as well as quantitative simulation, both of which require access to big data. This project seeks to use big data about biological species for qualitative modeling and quantitative simulation of ecological systems.

Contact names: Ashok Goel

Contact email: **goel@cc.gatech.edu**

Possible funding: No

Possible course credit: Yes

A.3. **Project name: Explaining Intelligent Agents**

Project description: Humans can explain their goals, knowledge, reasoning, decisions, actions – but computers cannot. But explanation is central to communication, trust, diagnosis, etc. So how can we build intelligent agents that can explain themselves?

Contact names: Ashok Goel

Contact email: **goel@cc.gatech.edu**

Possible funding: No

Possible course credit: Yes

A.4. **Project name: Using Watson for Question Answering**

Project description: This project builds on IBM's Watson tool to build conversational systems that can use information of different types to answer questions.

Contact names: Ashok Goel

Contact email: **goel@cc.gatech.edu**

Possible funding: No

Possible course credit: Yes

B. Human-Centered Computing (Cognitive Science and Learning Science)

B.1. **Project name: Learning about Scientific Discovery**

Project description: How do scientists make discoveries? How can we help college-level biology students learn about the processes of scientific discovery? This project combines AI with cognitive science and learning science.

Contact names: Ashok Goel

Contact email: **goel@cc.gatech.edu**

Possible funding: No

Possible course credit: Yes

B.2. **Project name: Perceptions of AI's among Humans**

Project description: How do students learn and interact with one another in online classes? How might we design virtual teaching assistants that can enhance these interactions? How might the presence of AI agents impact human learning?

Contact names: Ashok Goel

Contact email: **goel@cc.gatech.edu**

Possible funding: No

Possible course credit: Yes