Advanced Human-Computer Interaction

EECS 255, 4 Units

Catalog Description

This course explores the theory, design procedure, programming practices, and evaluation methods in Human-Computer Interaction (HCI), with a particular focus on input and interaction techniques. It introduces students to recent developments in the area and provides them with the methods to design, develop, and evaluate existing or novel interactive systems.

Course Webpage

Visit https://www.asarif.com/courses/EECS255_S18.html for additional information.

Textbooks and Other Required Materials

This course does not use textbooks. However, students are expected to study scientific publications and relevant books form a suggested reading list, for example:

- Stuart K. Card, Allen Newell, and Thomas P. Moran. 1983. *The Psychology of Human-Computer Interaction*. Lawrence Erlbaum Associates Inc.
- Don Norman. 2013. *The Design of Everyday Things: Revised and Expanded Edition*. Basic Books.
- Bill Buxton. 2007. *Sketching User Experiences: Getting the Design Right and the Right Design (Interactive Technologies)*. Morgan Kaufmann.
- I. Scott MacKenzie. 2013. *Human-Computer Interaction: An Empirical Research Perspective*. Morgan Kaufmann.
- I. Scott MacKenzie and Kumiko Tanaka-Ishii. 2007. *Text Entry Systems: Mobility, Accessibility, Universality*. Morgan Kaufmann.

A complete list of suggested reading in Human-Computer Interaction (HCI) is available here: https://www.asarif.com/notes/SuggestedReading.html.

Course Objectives

Primarily, the course covers the following topics.

1) A brief overview of the historical development of major advances in the area.
2) Recent developments and challenges in the area, focusing on input and interaction techniques, tangible and embodied user interactions, mobile interactions, augmented and virtual reality, game user interfaces, and/or interaction techniques for special user groups.
3) Quantitative research methods, including experimental design, quantifying and modeling human and system factors, digital and physical prototyping, and statistical analysis.
4) Research ethics and working with human subjects.
5) Reporting research findings in scientific articles.

Program Learning Outcomes

Graduate Studies in Electrical Engineering and Computer Science (EECS) has established the following program learning outcomes. Graduates of the PhD in Electrical Engineering and Computer Science:

1) Are able to identify novel and significant open research questions in electrical engineering and computer science and are able to situate such questions in the contexts of current research literature.
2) Are able to apply their knowledge of computing, mathematics, science, and engineering to the analysis of technological problems, as well as to the design and implementation of viable solutions to those problems.
3) Are able to design and conduct experiments and computational simulations for the purpose of evaluating and comparing proposed solutions on the basis of empirical evidence

4) Possess the characteristics of lifelong learners; they are able to acquire and use new techniques, skills, and engineering and scientific tools for research and development in electrical engineering and computer science, as well as to develop new methods and make new discoveries.
5) Practice a high standard of professional ethics, including integrity in the conducting and writing of research.
6) Communicate effectively through oral, visual, and written means, effectively addressing a broad range of technical audiences.

Course Learning Outcomes

Students participating in this course are expected to achieve the following learning outcomes through lectures, guest lectures, readings, and research projects. The ability to:

1) Apply theory to design and develop useful, efficient, and enjoyable interactive systems (consistent with program learning outcome 1 and 2).
2) Evaluate interactive systems using empirical research methods (consistent with program learning outcome 3).
3) Practice a high standard of professional ethics (consistent with program learning outcome 5).
4) Report research findings in scientific articles (consistent with program learning outcome 5 and 6).

Further, course learning outcomes 1 and 2 will require the students to adapt techniques, skills, and research tools to make discoveries, all of which are characteristics of lifelong learners (consistent with program learning outcome 4).

Prerequisites by Topic

Strong skills in computer and/or Web programming strongly preferred.

Course Policies

Class participation is required. Late submission is not permitted.

Lecture. Typically, a lecture consists of the following.

- **Weekly Inspiration.** Each week a student(s) picks a recent, relevant research project or publication that has inspired him/her and briefly discusses it in the class.
- **Lecture.** The instructor delivers a lecture on a topic(s) listed in the Topics section.
- **Discussion.** The class engages in a discussion on the corresponding topic(s). Students must prepare for each lecture ahead of time by studying the corresponding reading material.

Research Project. All students are required to work on a research project, approved by the instructor, individually. Group projects are acceptable only in special cases. This is to enable students to apply the new techniques and skills they have acquired in class. Each research project involves the design and development of a novel/existing input and interaction technique(s), which are then compared with other techniques in empirical studies. The data collected in the studies are analyzed using statistical tools. Students then report the complete research process and the findings of the studies in scientific articles.

Lab. Labs are dedicated to research projects. The instructor meets with students to discuss their research progress, and provides them with feedback and guidance. Students may also seek assistance and resolutions to problems they are facing with their projects, including a design or development issue. Some lab sessions are dedicated to specific learning objectives, such as how to use common statistical analysis tools, how to create demonstration videos using popular video editing tools, and feedback on the first draft of students' research papers.

Academic Dishonesty Statement

a) Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.
b) Students are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. They may give "consulting" help to or receive "consulting" help from such

students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an email, an email attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

c) During examinations, students must do their own work. Talking or discussion is not permitted in the examinations, nor comparing papers, coping from others, or collaboration in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Disability Statement

The University of California, Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity (see http://disability.ucmerced.edu). The course coordinator is available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

Topics

The course covers either all or most of the following topics.

Part 1: History and Recent Developments in HCI

- A brief history of HCI
- Input and interaction techniques
- Tangible and embodied user interactions
- Mobile interactions
- Augmented and virtual reality
- User interface for games
- Child-computer interaction
- Accessibility research

Part 2: HCI Research Methods

- Empirical research methods
- Quantifying human and system factors
- Modeling interaction: descriptive and predictive techniques
- Digital and physical prototyping: development toolkits and fabrication
- Hypothesis testing
- Working with human subjects
- Research ethics
- Reporting research findings: writing a research paper

Tempted Timeline for Research Projects

- Week 1-2: Finalize a research project
- Week 2-3: Finalize a timeline for all deliverables and submit ethics protocol for user studies
- Week 3-10: Design and develop of research prototypes
- Week 11: Finalize user study design
- Week 11-12: Conduct user studies
- Week 12-13: Perform statistical analysis on the study data
- Week 13-14: Prepare demonstration video
- Week 14-15: Write the research paper

Class and Laboratory

Lecture, Monday & Wednesday, 4:30pm—5:45pm, **COB2 263**
Lab, Friday, 7:30pm—10:30pm, **Kolligian Library 202**

Assessment and Grading Policy

Participation (20%)

Research Project (80%)

- Active participation 5%
- Weekly inspiration 5%
- Reading 5%
- Lab participation 5%
- Design 20%
- Development 20%
- Evaluation 20%
- Final report 20%

Office Hours

Friday, 5:00pm—7:00pm, **SE 212**

Contact Information

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