Using Affect-Aware Computing as a Theme for a User-Centered Design Course

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SYNOPSIS

This user-centered design project invites students to conduct hands-on human-computer interaction research and design by exploring affect-aware technology. These technologies seek to account for users' emotions, moods, and other affective phenomena in the user experience. Examples include emojis used while texting, social robots that model emotional responses, and emotionally-aware chatbots. This project is for a user-centered design and usability testing course offered to undergraduate computer science students. The course learning objectives are to use research and design methods to (1) build an empirical understanding of technology stakeholders and (2) apply that knowledge to design and evaluate an interactive prototype. By immersing themselves in the complex domain of affect-aware computing, students learn to apply user-centered design to emerging technologies. Students create and refine common user-centered design artifacts, including personas, interaction designs, and prototypes. The reader of this paper will obtain recommendations for structuring the user-centered design project and a high-level understanding of affect-aware computing.

KEYWORDS

Assignment Design, Human-Computer Interaction, User Research, Usability

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1 ENGAGEMENT HIGHLIGHTS

This project engages students with the user-centered design (UCD) process focusing on understanding users' emotions and affect. The domain of emotions is not unfamiliar to UCD. User experience (UX) experts—researchers and designers—are called to develop empathy of users by attuning to research participants' lived experience, which naturally includes emotions. By centering real users, rather than designers' self-perception or stereotypes of users, UX experts can create technology that is meaningful to diverse, disabled, and global communities. UX experts embed a deep understanding of users' emotions into the design process as they define personas, user journey maps, and other artifacts.

With this project, users' emotions are considered through a different but related lens of affect-aware computing, which is technology designed to illuminate, support, or intervene in users' emotional experiences in some manner [**?**]. This technology goes beyond technology's incidental impact on emotions, such as the phenomenon of social contagion on social media [**?**]. Instead, affect-aware computing is explicitly affect-aware, affect-mimicking, or affect-altering in its goals. Examples include users selecting emojis in chat, and, in a more sophisticated form, artificial intelligence detecting emotions during a video call. The technology can have various goals, including informing users of their emotional states, supporting reflection of emotions at play during an interpersonal conflict, or role-modeling emotions. In this project, students have hands-on experiences applying UCD principles and processes within the context of affect-aware computing. This project allows students to make meaningful choices that make the project culturally relevant. Key decisions include selecting affect-aware computing user scenarios, formative research methods (e.g., diary study, survey, interview), prototype design, and scope of usability testing.

This project requires students and instructors to attune to a crucial component of user-centered design—building empathy for users by developing a nuanced understanding

of people and the context in which they use technology. Although students' lived experiences with emotions will influence their choices and interpretation of data from their research, students must learn to design for others, not themselves. The class should explore how a researcher's positionality, lived experiences, and empirical observations gained through research are incorporated into user-centered design.

By conducting UCD of affect-aware computing, students will make interdisciplinary connections to CS with psychology and sociology as they consider individuals' emotional experiences and social norms. This project requires students to work in teams, establish clear roles and responsibilities, and synthesize their learning into design artifacts. Instructors should scaffold team formation and performance to build effective student teams diverse in life experiences and skills. In summary, this project's engagement practices are:

- Use Meaningful and Relevant Content
- Make Interdisciplinary Connections to CS
- Incorporate Student Choice
- Encourage Student Interaction
- Culturally Relevant Pedagogy

2 RECOMMENDATIONS

This project introduces students to both UCD and the domain of affect-aware computing. The topic of emotions in technology may be unfamiliar to many students. The instructor should give ample time to introduce affect-aware computing scenarios and technologies. The students should be encouraged to immerse themselves in the domain by conducting secondary research and gathering examples of current affect-aware computing. When choosing an affect-aware computing scenario, students can select a technology that already incorporates emotions (e.g., a Mood Tracker app or social robots) or a technology that currently does not incorporate emotions but could (e.g., streaming music service).

Ethical HCI requires UX experts to understand and be responsive to the societal impacts of technology. This project will present the class with socio-technical scenarios related to privacy, disclosure, bias, and other ethical considerations related to technology supporting and intervening in people's emotion-based experiences. Class discussions and assignments should address ethical considerations and critical perspectives about affect-aware computing. Normative views are often embedded in affect-aware computing making non-normative and marginalized communities vulnerable to emotional manipulation by technology [**?**]. For example, a hiring algorithm based on normative expectations of verbal and nonverbal communication behavior is likely to mischaracterize a neurodivergent applicant and limit job opportunities.

To address these complexities, instructors need to guide students through conceptual analysis and practical steps for conducting ethical UCD. At a fundamental level, students need to recognize and challenge their biases and deepen their appreciation for the diversity of potential users. Instructors can scaffold discussion and design activities using toolkits, such as Value-Sensitive Design Envisioning Cards [**?**], Tarot Cards of Tech [**?**], and Black Mirror activities [**?**]. To support UCD processes that directly engage with research participants, the instructors and students should ensure access, cooperation, and mutual goals established with target communities. Students and research participants should be aware and prepared for the research topics, especially potentially sensitive topics and recalling emotionally-laden episodes. The instructor and potentially their institution's ethics review board should review and approve research protocols, including screening criteria and participant consent forms.

3 SCOPE OF PROJECT MATERIALS

The project materials describe the multi-step UCD project and the affect-aware computing domain. The project entails the following activities: (1) using online resources to gain an understanding of the domain of affect-aware computing, (2) building personas, (3) conducting formative user research (e.g., diary study, survey, interview) about users and context of use, (4) iterating on personas, (5) creating an interactive prototype, (6) conducting a usability test of the prototype, and (7) synthesizing their learning into a user experience portfolio. The project materials do not cover teaching and producing the deliverables for each activity. Instead, the materials focus on tailoring those activities for an affect-aware computing theme.

4 CREATING INTERACTIVE PROTOTYPE

Students create an interactive prototype for their usability study. There are three main requirements for the prototype:

1. it is interactive (meaning, the user can select elements, type into edit boxes, and the prototype reacts accordingly. 2. The prototype supports the primary tasks that the team has identified as necessary for the user experience. 3. The prototype is stable and does not generate unintended error messages so research participants have a baseline, usable experience.

The purpose of creating a prototype is for students to design and evaluate the user interface and user interactions, not back-end functionality. Therefore, the prototype should be low- or medium-fidelity. It can include "Wizard of Oz" functionality behind the scenes. The teams select their prototyping tools, such as paper prototyping, Figma, or coding a strawman application.

5 RELATED RESOURCES

Readers can find information about affect-aware computing at:

- MIT Affective Computing: https://news.mit.edu/topic/affective-computing
- Nature. April 6, 2021. "Time to regulate AI that interprets human emotion" Retrieved from https://www.nature.com/articles/d41586-021-00868-5

6 MATERIALS

For this project, students benefit from a clear overview of the UCD group project and an introduction to Citizen Science. Instructors can provide overview content during a lecture, supplemented by a written summary. The instructor can present a list of major milestones in the project and, as the course progresses, show current project status by checking off the recently completed milestones and highlighting the next milestone.

- Lecture Slides UCD Course Project with Affect-Aware Computing Theme
- Overview of UCD Course Project
- Overview of Affect-Aware Computing Domain

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