

SYDE543 Winter 2023

Assignment #2 (Final Project) – 30% of Final Mark

Due to LEARN Dropbox by April 5th 2023 11:00 am

This assignment must be completed in the assigned teams. Only one person needs to upload the final submission to the LEARN Dropbox.

Description

Artificial Intelligence (AI) and cognitive ergonomics are two fields of study that are increasingly intersecting in many exciting ways. AI aims to study intelligent systems and it has been transforming aspects of our daily living in the last decade (e.g., chatbots, wearables, content-recommendation). Cognitive ergonomics is the study of how the human mind works and it deals with the complexity of human cognitive processes. By combining the two fields, it is possible to develop intelligent systems that are tailored to the needs of people and provide them with the best possible experience. This assignment aims to explore the ways in which AI and cognitive ergonomics are connected, and how these connections can be used to create more efficient, adaptive and user-friendly systems. As discussed during the lectures, these are some of the most challenging areas of the intersection between AI and cognitive ergonomics: i) developing systems that are aware of cognitive processes and their limitations to determine the best user interface for a targeted audience and application, ii) data collection and analysis remain as some of the main barriers since AI applications need data such as user preferences, user behavior, user experience and user feedback to accurately generate solutions to provide the best user experience, iii) designing adaptive user interfaces that can change their functionality or behavior (e.g., user preferences, elements, feedback) based on recognized human states.

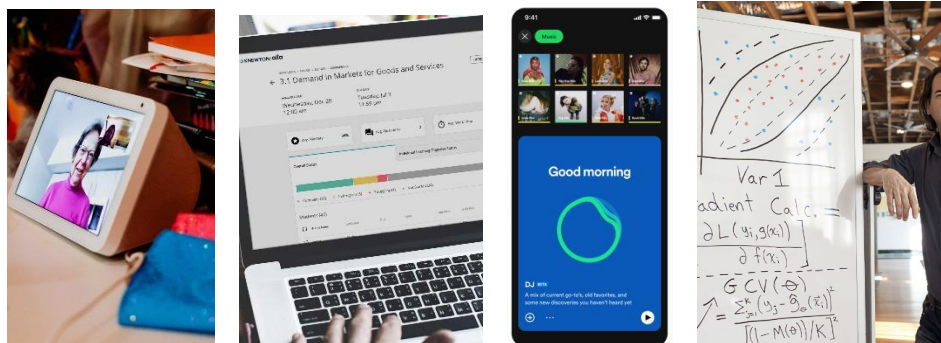


Figure 1. Project niche examples of using cognitive ergonomics principles to create user-centered AI applications (e.g., AI-powered virtual assistants, AI-based system for personalized learning, AI system that provides personalized recommendations for entertainment)

Scope

This assignment challenges you to design an AI-based system that uses principles of cognitive ergonomics such as simplicity (interfaces simple and easy to use), adaptivity (systems that can adapt to the changing needs of the user), inclusive design (applications that can be used for people that are often excluded) and solve real detected and measurable problems in society. You need to create prototypes (e.g., Wireframes, Mockups, Data Science Platforms) that demonstrate the potential of a future implementation of an intelligent system that have been designed using a user-centered approach. The prototypes must be: i) designed involving potential end-users of your system, ii) iterated, considering feedback from real potential end-users, iii) refined using key and fundamental elements of cognitive ergonomics. Do not get involved in the development of new AI-powered algorithms but rather use already existing solutions that, based on research and evidence, could potentially help you to solve your defined problem. The expected outcome is a prototype of your App/platform/artifact that clearly demonstrates the potential of using it to solve the defined problem and contains evidence of how it was iterated considering end-user's feedback.

Part 1: Empathise with Potential Users and Define the Problem

AI is rapidly evolving, and we are constantly being exposed to great examples of how to (and also how not to) use AI to create powerful virtual assistants, recommendation systems and searching platforms for personalized applications. However, often the user-centred approach is often neglected when creating those applications, leaving the world with lots of bad examples of systems that are more artificial than intelligent. Part of this problem is a lack of early involvement of end-users and a clear definition of real (more than artificially created) problems. This first part, involve the definition of your design space, the clear articulation of a problem you are trying to solve and the clarification of why it is important in the context of this assignment. You and your team are challenged to brainstorm multiple times and came out with different ideas of potential applications that will benefit from fresh, user-centred, creative and out-of-the-box solutions to allow AI to be more cognizant of the cognitive capabilities of its potential end-users. Start by: i) listing between 3 and 5 potential problems that can be (or are already) being tackled with AI-powered solutions, ii) clearly define and state what is the problem you are trying to solve and conduct research to narrow it down iii) observe and define who are the targeted users and conduct user modeling activities (e.g., user persona, empathy map, scenarios/storyboards). Suggestion: you can use the [LucidChart board](#) we have used for the Library Challenge to help you processing the brainstorming process. The suggested team deadline for this is Wednesday April 22nd.

Part 2: Ideate, Prototype and Iterate

After knowing your users and narrowing down your problem scope, you are ready to bombard your design space with potential solutions. Be careful, you only have 3 weeks to ideate, prototype and iterate on your envisioned solutions before wrapping up the final assignment. Thus, choose wisely the potential solution and the prototyping techniques you would be using to

validate your hypothesis. Think of solutions you can rapidly prototype using paper prototypes, cardboard Mockups or low-fidelity digital wireframes. Create prototypes and get them ready for testing with real end-users of your envisioned solution, so you can receive timely feedback and iterate upon findings and insights. Start by: i) organizing your design ideas in clusters or maps that will help you visualize the diversity of backgrounds and mindsets of your team, ii) select the ones that seem to be more feasible to be prototyped and iterated in the short-term, iii) meet with your team and work on different ways of doing parallel prototyping and testing, iv) prototype and test with end-users (at least 3 iterations total, the more the better), v) improve your prototype (e.g., add/remove functionalities, improve features, make it more accessible) and carefully document every design-decision you make. Use your diverse team skill wisely, divide and conquer and conduct multiple user testing and usability testing in parallel (e.g., one prototype, multiple features, test different hypothesis). Everyone on your team needs to work and collaborate to ensure you can timely deliver the best and most iterated version of your envisioned solution.

Suggestion: two tutorials will be provided in this course focusing on two different prototyping tools: [Figma](#) and [Streamlit](#). Although it is not mandatory, these two tools are highly flexible and widely used among designers and data scientist to prototype (and even deploy) interactive applications. The suggested team deadline for this is Monday April 3rd.

Part 3: Wrap Up, Document, Present

- **Wrap-up**: collect your findings and improve the prototype by considering the user-testing sessions and feedback. Maybe you will have time for one or two more user testing, but this stage is really for polishing your prototype and make it more “usable” by your end-users. Move from low-fidelity prototypes to high-fidelity and interactive prototypes, change your materials, tools and features to make your prototype look and act more similar to how you and your team have envisioned it will be in a “final” implementation. For instance, you can move from cardboard to wood (e.g., laser cut) or from individual dashboards to multipage navigable solutions.
- **Document**: throughout your design process, you need to carefully document the process, ideas, methodologies and tools, decisions made and testing sessions with users. You can designate one of your team members to be in charge of collecting the information and organizing it in a way that is accessible to everyone. From notes to meeting minutes, pictures of your prototypes and design modifications, videos of participants during the testing sessions and anecdotes. This material will be used to create a final report of the project and its design process. Without a proper documentation, even the best user-centred design process can be seen as an improvised work, which will severely impact your final grade for this assignment. Design decisions and iterations that are not clearly supported by evidence of user testing will negatively impact your final grade.
- **Present**: We will conduct a final public presentation of your projects on Wednesday April 5th from 11:00 am - 2:00 pm (space: EC5, sixth floor, beside the piano). All the team members must attend and be ready to talk to the attendees and present their project. We will use posters (and any other artifact, device to show your final implementation) to present the final project, similar to what was done for assignment #1.

Deliverables

Table 1. Final assignment deliverables: Friday, April 5th 2023, 11:00 am

Deliverable	Description	Grading
A3 Printed Poster (LEARN Dropbox: PDF of the poster)	A3 printed poster summarizing and visually describing your final design project. You will need to present it in-person during the public event on April 5th.	1. Content (60%) 2. Aesthetics (20%) 3. Final presentation (20%)
Report (LEARN Dropbox: PDF of the report)	Document summarizing your process and final insights. Include diagrams, tables and text that better represent your design process (1-7 pages max, 12pt type in a standard font) as well as hyperlinks to the collected media and other information (only: videos, audios, pictures, diagrams, additional sketches, surveys and results).	1. Problem definition (20%) 2. User research (40%) 3. Originality of the proposed solution and application of cognitive ergonomics principles, the human-centered design methodologies and design thinking (e.g., prototyping, testing, iterations) (40%)