Universitat de les Illes Balears | Centre d'Estudis de Postgrau

11755 – Human-Computer Interaction
Summer Semester 2025

Weely Assignment 5
"Prototyping and Iteration Phase"

Overview:

In this phase of your dashboard design project, you will transform your conceptual designs into functional prototypes for explainable AI visualization. Building directly on the insights gained from your user research phase, you will create interactive prototypes based on your selected dataset, implement key XAI techniques, and conduct iterative testing to refine your solution.

Objectives:

By completing this assignment, you will:

- Develop a functional prototype of the explainable AI dashboard informed by user research findings.
- Apply appropriate visualization techniques for machine learning interpretability based on identified user needs.
- Integrate Python-based XAI tools with interactive visualization frameworks.
- Connect design decisions directly to user research insights.

Assignment Details:

1. Prototype Development (40%)

   Create a (at least) medium-fidelity interactive prototype of your explainable AI dashboard that:
   - Visualizes different XAI methods appropriate for your chosen model and dataset.
   - Includes both global and local explanations.
   - Provides appropriate interactive elements for users to explore model behavior.
   - **Explicitly addresses user needs identified in your research phase.**

2. Implementation Requirements (30%)

   Your prototype implementation must include:
   - A functional web-based interface (using Streamlit, Gradio, Dash, or similar).
   - Integration with at least one Python XAI library.
   - Interactive visualizations that respond to user input.
   - **Design rationale connecting implementation decisions to user research findings.**

3. User Testing and Iteration (30%)

   Conduct at least two rounds of user testing:

- First round: Identify major usability issues and conceptual gaps.
- Second round: Evaluate refinements and gather feedback on explanation effectiveness.

For each testing round, document:

- Your testing protocol.
- Key findings and insights.
- Specific changes implemented based on feedback.
- Rationale for design decisions.
- **Comparison of new findings with previous user research insights.**

Deliverables:

- **The (at least) medium-fidelity interactive prototype or the final dashboard. Format: GitHub repository with README and deployment instructions.**
- **User Testing Plan and Results, analysis of findings with quantitative and qualitative insights. Format: PDF, maximal pages.**

Leveraging Your User Research Phase:

Your prototype should demonstrate clear connections to your user research findings. Consider the following approaches:

1. **Persona-Driven Development:**
   - Reference the user personas developed during your research phase.
   - Identify which aspects of your prototype address the needs of each persona.
   - Prioritize features based on the importance to your primary personas.
2. **Task Alignment:**
   - Map each dashboard component to specific tasks identified in your research.
   - Ensure your prototype supports the complete task flows documented in earlier phases.
   - Address pain points and inefficiencies identified during contextual inquiry.
3. **Mental Model Integration:**
   - Design explanations that align with the mental models uncovered in user interviews.
   - Use terminology and visual metaphors that match user expectations.
   - Bridge gaps between user understanding and technical XAI concepts.

4. Information Hierarchy:

- Structure your dashboard to prioritize information based on user research findings.
- Consider the sequence in which users typically approach explanations.
- Distinguish between primary (always visible) and secondary (on-demand) information.

5. **Addressing Domain-Specific Needs:**
   - Incorporate domain-specific visualization requirements identified during research.
   - Contextualize explanations within the workflow patterns observed in your user studies.
   - Adapt standard XAI visualizations to match domain conventions.

Recommended Bibliography:

1. **Explainable AI Fundamentals:**
   - Molnar, C. (2022). *Interpretable Machine Learning: A Guide for Making Black Box Models Explainable*. https://christophm.github.io/interpretable-ml-book/
   - S. Ali et al., *Explainable Artificial Intelligence (XAI): What we know and what is left to attain Trustworthy Artificial Intelligence*, Information Fusion, vol. 99, p. 101805, 2023. https://www.sciencedirect.com/science/article/pii/S1566253523001148
   - L. Longo et al., *Explainable Artificial Intelligence (XAI) 2.0: A manifesto of open challenges and interdisciplinary research directions*, Information Fusion, vol. 106, p. 102301, 2024. https://www.sciencedirect.com/science/article/pii/S1566253524000794

2. **Dashboard Design:**
   - Y. Chen, et al. *Designing a dashboard for transparency and control of conversational AI*. arXiv preprint arXiv:2406.07882, 2024. https://arxiv.org/pdf/2406.07882
   - Brath, Richard, and Michael Peters. *Dashboard design: Why design is important*. DM Direct 85 (2004): 1011285-1. https://cs.furman.edu/~pbatchelor/csc105/articles/TUN_DM_ONLINE.pdf
   - B. Bach et al., *Dashboard design patterns*. IEEE transactions on visualization and computer graphics 29, no. 1 (2022): 342-352. https://arxiv.org/pdf/2205.00757
   - J. J. Dudley and P. O. Kristensson, *A Review of User Interface Design for Interactive Machine Learning*, ACM Trans. Interact. Intell. Syst., vol. 8, no. 2, pp. 1–37, Jun. 2018, doi: 10.1145/3185517.

3. **Usability (User) Testing:**
   - Lewis, James R. *Usability testing. Handbook of human factors and ergonomics* (2012): 1267-1312. https://www.researchgate.net/profile/Cahyono-St/publication/361885118_Handbook_of_human_factors_and_ergonomics_fourth_edition/links/62ca4ecc00d0b4511046af45/Handbook-of-human-factors-and-ergonomics-fourth-edition.pdf#page=1274
   - C. M. Barnum, *Usability testing essentials: ready, set...test!*, 2nd edition. Amsterdam: Morgan Kaufmann, 2021.
   - Dieber, Jürgen, and Sabrina Kirrane. *A novel model usability evaluation framework (MUsE) for explainable artificial intelligence*. Information Fusion 81 (2022): 143-153. https://www.sciencedirect.com/science/article/pii/S1566253521002402?casa_token=P

SlPs6sCG0wAAAAA:vKvJqbrXrfmO-uU09vR2HJlRxCKSpBRR8-xd_75ev37BTWmNOHOwWswdEqh7ZyStcwh-QaC48w

- Kibria, Mohammad Golam, et al., *Usability Testing of an Explainable AI-enhanced Tool for Clinical Decision Support: Insights from the Reflexive Thematic Analysis*. arXiv preprint arXiv:2504.04703 (2025). https://arxiv.org/pdf/2504.04703