

# Research Design 2

Daylen Mejlak, Mario Mallia-Milanes  
Institute of Information & Communication Technology  
Malta College of Arts, Science & Technology  
Corradino Hill  
Paola PLA 9032

{daylen.mejlak.e21464, mario.mallia.milanes}@mcast.edu.mt

## I. INTRODUCTION, POSITIONING, RESEARCH UNION

User Experience design (UX), focuses mainly on the overall user perception during navigation. It strives to create positive user experiences through intuitive UI design which enhances readability and navigation. Yet, the quality of such UX/UI designs influences user engagement either in a positive or a negative manner. In this study, the main research topic is about UX/UI design, and analyzing the user's behaviour between a professional and unprofessional UX/UI design.

### A. Description of Theme and Topic Rationale

1) *Description of theme:* The theme of the study focuses on how the UX/UI design of digital interfaces affects how users feel and behave while interacting with such designs. By comparing professional and unprofessional design examples, the study aims to understand what makes interfaces engaging or frustrating for users. Using technologies like head tracking and computer vision, the research gathers data on user interactions to help designers create better experiences. Ultimately, the goal is to improve usability and satisfaction for people using digital interfaces.

2) *Topic Rationale:* Considering professional UX/UI design is crucial as it plays a vital role in delivering the optimal user experience. Differentiating between a professional and an unprofessional UX/UI design is acknowledged as a significant aspect. With the incorporation of the head tracking program using computer vision, examining user engagement with these designs becomes feasible. The rationale behind this study lies in the potential to utilize computer vision technologies for investigating and improving user experiences during navigation, regardless of whether the designs are professional or unprofessional. Due this type of utilization, valuable insights can be obtained as users interact with these designs through tracking their head movements and tilts. This study aims to close the gap between computer vision and UX/UI design user interaction, by investigating the viability of using the head tracker tool developed to assess and optimize user involvement in both the professional and unprofessional UX/UI designs. The aim of this study is to bridge the gap between computer vision and user interaction in UX/UI design. It seeks to explore the effectiveness of utilizing the developed head tracking tool to evaluate and improve user engagement in both professional and unprofessional UX/UI designs.

### B. Positioning

1) *Positioning:* The position of this research lies at the intersection of user experience (UX) design and computer vision technologies. This study addresses the increasing demand for seamless and intuitive digital experiences by investigating the role of computer vision, particularly head tracking, in evaluating user interactions across various design contexts. The aim of this research is to create a tool via computer vision which helps UX/UI designers in identifying flaws and frustration. A head tracker tool would be utilized during user interaction which this help in identifying that users are frustrated and UX designers have the chance to arrange and make the designs more professional. By examining both professional and unprofessional design interfaces, the study aims to uncover patterns in user behavior and preferences, providing knowledge on the effectiveness of various design approaches. Moreover, this study aims to help improve UX/UI design practices by offering practical insights that can guide the enhancement of interfaces to meet user needs and expectations more effectively. By exploring innovative technologies and their integration into user-centered design, this research positions itself as a valuable addition to the ongoing conversation about improving digital experiences for users.

### C. Research Union

1) *Research Philosophy:* The study adopts a positive philosophical stance, aiming to advance knowledge through empirical observation and quantitative analysis. Its objective is to explore the correlation between user interaction with professional and unprofessional UX/UI designs and head movements, by systematically collecting and assessing empirical data during navigation. Furthermore, the study employs an objective approach, recognizing the existence of observable realities linked to user behavior and head tracking data. It acknowledges that user navigation with both professional and unprofessional designs, along with the corresponding head movements, can be empirically observed and studied.

2) *Research Approach and Research Strategy:* The research approach and chosen strategy aim to employ an experimental design methodology. Through controlled experiments, the study seeks to systematically manipulate variables, such as the effects of professional versus unprofessional designs on user navigation and interaction. This approach facilitates thorough testing of hypotheses and the identification of causal

relationships between various types of UX designs and user navigation.

3) *Choice of Methodology*: The methodology chosen for this study integrates both quantitative and qualitative approaches, enabling a comprehensive investigation of both the research problem and questions. The quantitative approach is employed to analyze and collect data from the head tracking program tool, as its output is numerical. These numerical values represent the frequency of head tilts during navigation of both professional and unprofessional designs, along with the real-time duration of user navigation with each design separately. Conversely, the qualitative approach is utilized for the data gathered from interviews.

4) *Time Horizon*: Regarding time frames in this study, data collection occurs whenever the user tilts their head during navigation. As users interact with both professional and unprofessional designs, immediate user responses are recorded by the head tracking tool, with variations observed based on the design being navigated. The study explores the dynamics of interaction between professional and unprofessional designs and user behavior, examining how user actions vary during navigation with different designs.

5) *Techniques and Procedures*: In terms of techniques and procedures, a combination of hardware and software technologies was employed. For hardware, the laptop's webcam tracked user head movements during interactions with designs. On the software side, Python was utilized to develop the head tracking tool, with PyCharm serving as the programming software. To ensure the success of the head detection program, several libraries were integrated, including CSV, CV2, mediapipe, numpy, and datetime. The CSV library facilitated data display in an Excel file for clearer evaluation, while CV2 enabled head movement and face recognition tracking. Mediapipe implemented AI and machine learning techniques to optimize prototype performance, and datetime allowed the program to calculate user time spent on the UI. Additionally, numpy handled small mathematical calculations and functionalities. Adobe XD was utilized for creating UX/UI designs. Statistical procedures were then applied to analyze head tracking data, aiming to detect significant differences in head tilts during navigation of both designs. This comprehensive methodology framework guides the systematic exploration of the relationship between UX design and user behavior and navigation.

#### D. Background to this Research Theme

1) *Overview of UX and what makes UX Professional or Unprofessional*: User Experience (UX) design involves designing products that offer good experiences to users, especially concerning websites and web applications. It encompasses the entire user journey, aiming for a seamless and pleasant experience [1]. Key aspects include the look and feel, ease of use, accuracy, reliability of data, and interface responsiveness. UX designers strive for consistency throughout the project to maintain a positive user experience [2]. According to Nielsen's article [3], Professional and unprofessional UX designs are identified using heuristics such as system visibility, real-world

match, user control, consistency, error prevention, recognition over recall, flexibility, and efficiency, aesthetic design, error recovery, and help documentation. These heuristics acts as guidelines that helps UX/UI designers design professional design. Visibility of system status ensures users are always informed of their location within the system, preventing confusion and frustration. Designs should mirror real-world concepts and language to enhance user understanding and intuition, aligning with the match between system and real-world heuristic. User control and freedom empower users to navigate the system easily and recover from errors effortlessly. Consistency and standards maintain predictability and familiarity for users by ensuring uniformity in design elements and adherence to established norms. Error prevention involves proactively incorporating clear instructions and safeguards to mitigate user errors. Recognition over recall prioritizes presenting information and actions in a manner that reduces users' reliance on memory. Flexibility and efficiency of use cater to both novice and expert users by providing shortcuts and efficient interactions. Aesthetic and minimalist design principles prioritize simplicity and visual appeal, enhancing user comprehension and engagement. Lastly, helping users recognize, diagnose, and recover from errors, along with providing comprehensive help and documentation resources, further aids users in understanding and effectively utilizing the product [3]. These heuristics collectively contribute to crafting seamless, intuitive, and satisfying user experiences during navigation.

2) *Overview of computer vision and it's use in UX Design*: Computer vision is a component of artificial intelligence (AI), significantly influences user experiences (UX) by facilitating innovative and personalized interactions. It leverages advanced technology to understand how individuals engage with digital platforms such as websites and applications, enabling designers to tailor experiences to each user's preferences [4]. A key application of computer vision in UX design is through tracking techniques like head and eye tracking. Head tracking monitors users' head movements to gauge their understanding and engagement [5], while eye tracking observes where users look on the screen to identify points of interest and potential usability issues [6]. By analyzing this data, designers gain insights into user behavior and preferences, allowing them to refine interface designs for optimal usability and effectiveness [7]. For instance, in a study examining student interaction with an online learning system, eye tracking provided researchers with valuable information about students' visual focus and interaction patterns [8]. By combining this data with interviews and feedback, designers were able to make informed adjustments to enhance the system's usability and learning experience [8]. In summary, computer vision enhances UX design by providing designers with valuable insights into user behavior and preferences, enabling them to create more intuitive and engaging digital experiences.

### E. Hypothesis

The objective of this study is to explore how computer vision can assist in assessing user interaction with both professional and unprofessional UX/UI designs. The primary focus is on measuring the accuracy of user interaction with the provided User Interface, with the independent variable being the precision of head position tracking from the trained dataset. Hence the hypothesis of this study is that by using computer vision especially head tracking, it is possible to identify the user's head posture and head tracking while the user is navigating with a specific user interface.

### F. Research Aim and Purpose Statement

This study seeks to explore the application of computer vision, particularly head tracking, in evaluating user interactions with both professional and unprofessional design interfaces. The primary objective is to gain understanding of user behavior and interactions across various designs. The research aims to evaluate the feasibility of employing head tracking as a means to comprehend user navigation and improve overall user experience. Ultimately, the study aims to provide valuable insights that can guide the enhancement of UX/UI designs, thereby increasing user engagement and satisfaction.

## II. REVIEW OF RESEARCH METHODOLOGIES AND MAP

### III. REFLECTION OF THE CHOSEN METHODOLOGY

### IV. RESULTS, ANALYSIS AND DISCUSSION

### V. CONCLUSION

### REFERENCES

- [1] I. D. Foundation, "What is user experience (ux) design?" Aug 2022. [Online]. Available: <https://www.interaction-design.org/literature/topics/ux-design>
- [2] A. Ijaz, "The difference between a good and bad ux design," Aug 2022. [Online]. Available: <https://medium.com/geekculture/the-difference-between-a-good-bad-ux-design-91ac979323c7>
- [3] J. Nielson, "10 usability heuristics for user interface design," Nov 2020. [Online]. Available: [https://www.nngroup.com/articles/ten-usability-heuristics/?fbclid=IwAR3eSnX5B0CurVFUihLv-KBcOI6Ulo6vNWQU69Jz5jFbUPG3PX\\_Isf6jb6M](https://www.nngroup.com/articles/ten-usability-heuristics/?fbclid=IwAR3eSnX5B0CurVFUihLv-KBcOI6Ulo6vNWQU69Jz5jFbUPG3PX_Isf6jb6M)
- [4] IBM, "What is computer vision?" [Online]. Available: [https://www.ibm.com/topics/computer-vision?fbclid=IwAR1N4w-l-BVNsnBg\\_aiApkSUhkqUQvmfCHV0k-ZQuHKd0rPyCytYz9R\\_KyE](https://www.ibm.com/topics/computer-vision?fbclid=IwAR1N4w-l-BVNsnBg_aiApkSUhkqUQvmfCHV0k-ZQuHKd0rPyCytYz9R_KyE)
- [5] T. Contributor, "What is head tracking?: Definition from techtarget," May 2017. [Online]. Available: [https://www.techtarget.com/whatis/definition/head-tracking?fbclid=IwAR1B-nBHwhsGcPrIsNGTG1GTSRBd6faxoKoejbrZUukYd\\_IyAJsoRSaGtjs](https://www.techtarget.com/whatis/definition/head-tracking?fbclid=IwAR1B-nBHwhsGcPrIsNGTG1GTSRBd6faxoKoejbrZUukYd_IyAJsoRSaGtjs)
- [6] B. T. Carter and S. G. Luke, "Best practices in eye tracking research," *International Journal of Psychophysiology*, vol. 155, pp. 49–62, 2020.
- [7] M. Macedo, "Eye-tracking in mobile ux research," Oct 2021. [Online]. Available: [https://www.smashingmagazine.com/2021/10/eye-tracking-mobile-ux-research/?fbclid=IwAR180deky7b0XNUad1-iK2ZcsHIt9z3MIuueIO8j-6HI7PaIyBWO\\_n9rdq0](https://www.smashingmagazine.com/2021/10/eye-tracking-mobile-ux-research/?fbclid=IwAR180deky7b0XNUad1-iK2ZcsHIt9z3MIuueIO8j-6HI7PaIyBWO_n9rdq0)
- [8] P. Ramakrisnan, A. Jaafar, F. H. A. Razak, and D. A. Ramba, "Evaluation of user interface design for learning management system (lms): Investigating student's eye tracking pattern and experiences," *Procedia-Social and Behavioral Sciences*, vol. 67, pp. 527–537, 2012.