Journal of Information Systems Engineering and Management
2025, 10(17s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Advanced AI Methodologies for Enhancing User Experience in Human-Computer Interaction

Flordeline A. Cadelina, DTE, MSIT
Associate Professor IV, Department of Information Technology, Mindanao State University at Naawan, Naawan, Misamis Oriental, Philippines, Email: flordeline.cadelina@msunaawan.edu.ph

ARTICLE INFO

Received: 05 Dec 2024

Revised: 28 Jan 2025

Accepted: 09 Feb 2025

ABSTRACT

Background: Unprecedented growth in artificial intelligence (AI) is changing the way people interact with computers- the concept known as human-computer interaction (HCI), several AI approaches like machine learning or natural language processing have boosted the user experience (UX). Nevertheless, there are some ethical concerns and differences in users' awareness of AI systems that make it difficult to consider the general advantages of AI in HCI.
Objective: Therefore, this research seeks to explore the impact of enhanced AI techniques on the level of UX in HCI with a focus on the facet of user satisfaction, trust, and usefulness of AIbased personalization techniques. It also solves the ethical problem associated with the AI systems.
Methods: A quantitative research method was used with the use of structured questionnaires with 250 participants. It also captured the user engagement with AI systems, as well as their satisfaction and trust levels as well as their concerns relating to AI ethics. Descriptive analysis was used to examine the collected data through statistical tests such as; the Shapiro-Wilk test for normality and Cronbach's Alpha for reliability.
Results: It is seen that most of the users are happy with the AI technologies integrated into their lives, with special emphasis on the aspect of personalization. However, the data was nonparametric (Nomography = 0 05) and so was the internal consistency (Cronbach alpha -0. 033 on the Likert scale items were needed for survey tools of higher specific focus. The results of the survey showed that ethical considerations running across the respondents as the most significant factor of discrepancy between satisfaction and trust in areas of tension.
Conclusion: In the context of AI methodologies, most are perceived to have positive effects in enhancing the UX regarding individualized engagements. However, ethical issues should be met and addressed while determining the reliability of the tools used in ascertaining the impact of AI. There is a need for future studies to address these issues and improve the techniques used for evaluating AI's diverse position in HCI.

Keywords: Artificial intelligence, human-computer interface, usability, AI, ethics, AI personalization, quantitative research.

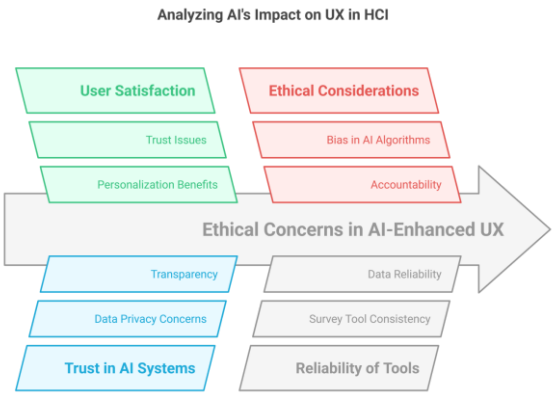

Figure 1 Graphical Representation of Abstract

INTRODUCTION

Two decades ago, AI advancements were unheard of but in a nutshell, current development has extensively influenced, particularly in human-computer interaction (HCI). AI technologies including artificial intelligence, machine learning, NLP, and Deep Learning have continued to be integrated into everyday digital systems; ultimately improving the UX by making interaction more natural, intelligent, and effective. Beginning with smart personal assistants – Siri, Alexa, and Bixby and right up to average catboats or gesture-controlled interfaces. This change in interaction design not only holds the prospect of increasing usability but also offers the capacity to take the preference of a specific user into account, making for more versatile and flexible interfaces (Alkatheiri, 2022; M. Kim, Kim, Knotts, & Albers, 2025; Reddy, 2024).

Although AI has already started to play a prominent role in HCI, questions concerning the users' trust, ethical elements, and privacy are also broadening. On the other hand, it also offers problems regarding personal data protection, model fairness and imbalance, and non-interpretability of the results. These issues are why it is highly important to know how users or consumers interpret the presence of AI as a positive addition to their user-technology experience. Furthermore, the level of awareness of consumers with Artificial Intelligence technologies varies and impacts user satisfaction and trust influencing different results in different populations (Liu, Xu, & Song, 2024; Nazar, Alam, Yafi, & Su'ud, 2021).

The goal of this work is to discuss the potential of innovative AI technologies in enhancing the usability of the interfaces viewed from the perspective of HCI. Thus, this present study aims to follow the quantitative research method to understand the extent of the users' engagement with the AI systems, their level of satisfaction, and their awareness of the ethics of AI systems. Thus, it seeks to raise awareness of how it affects UX and what can either positively or negatively impact its inclusion into commonplace digital experience realms (Choudhury, Lee, Zhu, & Shamma, 2020; Ding, Ji, Gan, Wang, & Xia, 2024).

Over the last few years, artificial intelligence has been considered an innovation in various sectors, especially in human-computer interaction. Over time, AI has provided a way of analyzing a huge volume of data, observing, and even learning from user practices to improve the users' relationship with technology. Graphic user interfaces (GUI), voice interfaces, NLP, deep learning, and machine learning are aspects of artificial intelligence that have enabled users to interact with computers with ease and comfort, hence, improving UX. AI applications introduced into daily usage devices such as voice assistants (Siri, Alexa), catboats and gesture controls make human-computer interaction move from the input means that are standardized, and limited such as keyboards, and touchscreens. These advancements hold the future to even enhance digital space to be more usable, customizable, and friendly (Ishwarya, Anand, Kumaresan, & Gopinath, 2024; M. Kim et al., 2025; Šumak, Brdnik, & Pušnik, 2021).

These changes revolve around the idea of personalization, where machine algorithms get to understand a user and their needs improving the habitual user experience. It may help to filter content based on the user's previous experiences or to redesign graphical interfaces and layouts based on user behavior, thus improving the quality of users' interactions. This was mainly because, through the ability to predict and address the needs of the users, AI has raised the bar for current HCI systems thus forcing developers to incorporate other complex AI techniques within applications (Lv, Poiesi, Dong, Lloret, & Song, 2022; T. Wang & Wu, 2024).

Nevertheless, AI is wielded with the possibility to make a vast enhancement in the aspect of UX; yet, it comes with challenges as well. The first potential problem of using technology in the learning process is related to trust. With the level of AI integration getting higher, it means that users are in a position where they have to surrender some of their choices in decision-making to the algorithms; or it could be as simple as choosing which movie to watch or operating service devices in homes. This reliance on the part of AI leads to privacy concerns and numerous users may not be in a position to know how the AI systems arrive at some of their decisions or the data they employ in arriving at such decisions. This issue becomes even more crucial since it should be understood that the AI systems themselves are capable of producing errors or integrating biases. Algorithmic bias, for instance, has remained a real issue in AI, where results offered by those systems affect some demographic groups in an unethical manner, and thus, ethical issues about fairness in AI communications arise (Soofastaei, 2024; S. Wang & Sun, 2025; W. Xu, Dainoff, Ge, & Gao, 2021).

However, there are several other factors of which the two discussed already deserve attention; one of these is data privacy. AI systems for example need large sets of data mainly for personalization and this calls for data management infrastructure. This can lead to a conflict between the requirement for data collection and the users' privacy and data protection needs. Due to this, as people comprehend the risks involved in sharing personal information using social media accounts, or being subjected to hacking-related data, they are slow in the amount of data they are willing to present to AI solutions. Hence, it is a major focal area of both development and research in the HCI field to ensure that users are served with localized experiences while at the same time protecting their privacy (Chignell, Wang, Zare, & Li, 2023; Divyeshkumar, 2024).

Besides the issue of privacy, discuss ability the use of Artificial Intelligence has emerged as a prominent ethical issue presently. Some of the concerns, which arise when decision-making power shifts to AI systems include autonomy, fairness, and accountability. For example, when Bias decisions are made by AI systems, who is blamed for the same? As these systems become commonplace the absence of well-defined ethical and legal standards exacerbates the interaction dynamics between the creators of AI systems, consumers of such systems, and the AI systems themselves. This means that users will not be willing to embrace artificial intelligence technologies if they have doubts about the ethical practice in the development and implementation of such systems (Mishra, Satpathy, & Pati, 2024; W. Xu, Dainoff, Ge, & Gao, 2023).

Nonetheless, there is consensus about AI's great opportunity for enhancing the overall HCI, especially through the optimization of user interfaces in terms of their interactivity, mobility, and effectiveness. AI technological advances are expected to contribute to and even dominate the future of digital communication. It is in this regard that there is a need to fully understand ways in which AI current methodologies are shaping user experiences and areas of impact in the contemporary world (Sadeghi Milani, Cecil-Xavier, Gupta, Cecil, & Kennison, 2024; Virvou, 2023).

This research aim of this study is to examine the effects of advanced artificial intelligence techniques on HCI user experience. Adopting a quantitative research method, it seeks to evaluate the user's experience with AI technologies to determine the satisfaction, and usefulness of the technology, whether the technology personalizes interactions, and how the users' perceived issues of Trust, Ethics, and Privacy are being addressed. Thus, the data collected from users engaged in interactions with AI-savvy systems should help this work to investigate the prospects and risks of AI incorporation into HCI. The study will advance knowledge of how AI can improve users' experience yet draw attention to the specific features that need to be addressed to make AI applications safe and ethical when it comes to human-computer interactions (MacKenzie, 2024; Wienrich & Latoschik, 2021).

Literature Review

The incorporation of AI in the area of HCI has attracted a lot of interest in the literature as well as the practice. Machine learning (ML), deep learning (DL), and Natural Language Processing (NLP) AI strategies have completely shifted the user experience of digital systems. Generating recommendations based on individual users' preferences, to individuals who need not verbally tell their devices what they want, have become inherent parts of our daily lives. This literature review highlights the current literature on AI and HC intending to analyze the available information concerning the impact of AI on UX, the issues of trust, ethical and privacy considerations as well as the new approaches that are being developed to improve interactivity between people and computers (Nicolescu & Tudorache, 2022; Yang & Wang, 2024).

ARTIFICIAL INTELLIGENCE AND PERSONALISATION IN HUMAN-COMPUTER INTERACTION

Another major effect of AI on HCI is the aspect of Individualization of users' encounters. Chen et al. (2024) refer to personalized artificial intelligence systems as systems that can adapt content, interfaces, and interactions to the user by identifying their behavior, preferences, and interactions with digital systems. These systems are widely used in today's growing e-commerce, streaming services, and social media industries, as recommendations play an extremely important role in increasing user satisfaction. For instance, Kindle and Netflix recommend movies and products using AI algorithms based on user behaviors that enhance engagement as well as the company's revenue (Cheng, 2024; Stige, Zamani, Mikalef, & Zhu, 2023).

AI personalization is mainly hinged on the machine learning technique since it involves asserting predictions about the users. According to Sharma and Agarwal (2024) machine learning enables the systems to be dynamic and improve over time in delivering personalized content. This is a process of gathering a large amount of information that in turn has to be processed to provide models of the future expectations of the users. Such models are crucial for

UX improvement because they spare users' cognition and offer them content according to their preferences instead of asking them to find something by themselves. However, as personalization is one of the attractive features of AI incorporation into HCI, concerns arise concerning the amount of data collected to accomplish these objectives which gives rise to the problems of privacy and trust (Alaeifard, Safaei, & Zadeh, 2024; Liao & Varshney, 2021).

Trust and Transparency for Artificial Intelligence

As the use of AI in HCI increases, questions concerning its trustworthiness and its interaction have merged. This holds consequences for AI-enhanced systems one of the biggest challenges which the algorithm implies is a socalled black box. Lack of transparency: A common issue with most AI-based systems is that the user cannot see how the system reaches a specific decision. As stated by Ribeiro et al., this suggests that explain ability of the AI systems is crucial since users are more likely to trust the AI technologies if they can understand the basis of decisions made. XAI is an extension of such machine learning and entirely refers to the ability of an AI system to explicate the series of steps it has undergone to reach an output (Balcombe & De Leo, 2022; W. Xu, Du, Zhang, & Ge, 2024).

When speaking of HCI, trust becomes a crucial factor since users need AI systems to make choices in their stead. For instance, users of smart homes rely on artificial intelligence-driven automation systems to manage issues such as lighting, temperature, and security. However, according to Wright et al., users do not fully trust the AI systems to make decisions since they cannot explain how the decision-making process is carried out and there are fears of mistake-making by the artificial intelligence systems. Reliability and accuracy are also considered to be the factors that define trust in AI systems. If users make mistakes or get inconsistencies, for instance, getting the wrong response from voice commands from virtual personal assistants like Alexa or Siri, the trust declines (Akram, Buono, & Lanzilotti, 2024; Muthmainnah, Ibna Seraj, & Oteir, 2022).

However, the ethical issues that come with AI in HCI have emerged as another area of concern. It can be seen that big data is a fundamental basis of the functioning of AI systems, but these big databases can be prejudiced containing limited samples of data or even prejudiced data which results in algorithmic bias. This is not wishful thinking; Buolamwini and Gebru (2024) showed how facial recognition systems have racial and gendered bigotry because of the bigotry of training data. This brings in the issues of equality and discrimination in the AI systems. Bias in AI can lead to the development of unfavorable experiences for specific users hence the concentration of services or even discriminating users in decision-making in service delivery in HCI (Kotian, Nandipi, Ushag, & Veena, 2024; Yerram, Mallipeddi, Varghese, & Sandu, 2019).

Ethical issues also arise about the issue of autonomy in artificial intelligence. If AI is to be applied to more and more areas where the system is capable of making its decisions without human interference then there is the crucial question of who is accountable when something goes wrong. There is the notion that some of the events that are now mined by AI will have broader control that may change aspects of decision-making in fields like healthcare and finance, accountability is a problem. In HCI, this is especially important where AI could have an impact on major user decisions for instance in recruitment systems or loan approval systems where results affect users decisively. Previously it was said that users must trust an AI system's ability to perform tasks but also need to be confident in its fairness and the transparency of its processes; hence it is upon developers to integrate ethics into AI systems (Aslam, 2023; Partarakis & Zabulis, 2024).

Protection of Privacy and Data Integrity in Artificial Intelligence Techniques

Here it is important to examine the problem of privacy as it is related to the handling of data by AI systems. AI technologies are predicated on big data, and almost all of them involve using large amounts of data on user activity. However, this raises questions about the levels of security with which AI systems protect information. With the emergence of new technologies based on artificial intelligence and big data, privacy issues are becoming a problem because people's data are gathered uncontrolled, and often without their permission. This to a very large extent creates huge privacy conundrums in the context of HCI particularly when AI is embedded into commonplace technologies like the smartphone and smart devices in homes for example (Capece et al., 2024; Zadeh & Alaeifard, 2023).

There are numerous benefits of users getting versions that personalize their usage of these systems but in return, the AI systems get to intrude into the user's life. This trade-off is often not clear to the users of such applications and websites since they do not have a chance to know how their data is going to be utilized. Therefore, those HCI systems

involving the use of AI need to work in a way that is sensitive to these issues while at the same time providing sufficient mechanisms to safeguard the users' data (W. Xu, 2019; Yıldız, 2023).

To address such concerns, there has been the formulation of new standards such as the General Data Protection Regulation in Europe that help users have regulated control of their data. These regulations demand firms to provide users with more information on data collection and collection of personal information to the users. Yet, further advancements in AI introduce new issues, for which it is necessary to devise more extensive legal frameworks regarding AI-based systems. As we move toward adopting AI technologies in our day-to-day social interactions new methodologies in the field of HCI are likely to Surface (Klumpp & Zijm, 2019; Pereira et al., 2024).

Subsequently, new methodologies are being developed which are claimed to improve HCI as the technologies with AI characteristics progress. One such trend is the so-called emotion AI or affective computing, which aims at equipping machines with capabilities to identify, assess, and react to users' feelings. In Picard's view, emotion AI holds the promise of enhancing UX significantly because of its capacity to create interactions with technologies that are respectively more human and more considerate. For instance: AI assistant customer care chatbots that respond to tone of voice and realize that a client is frustrated or dissatisfied will better deal with the customer's complaint and provide better customer satisfaction (Ghadge, 2024; Souza et al., 2022).

Reinforcement means that the AI systems learn by the experiments or in other words – they become more flexible and able to respond accordingly. As we know, RL-based AI systems are being applied in fields including game development and robotics in which gaining experience from the interaction with an environment is of great importance. Applying reinforcement learning to HCI might develop an intelligent interface that learns from user behaviors as well as adapts in real-time to enhance the overall satisfaction of the user (Drzyzga, 2024; Mirabdolah, Alaeifard, & Marandi, 2023).

Research Methodology

In this quantitative research on "Advanced AI Methodologies for Optimizing User Experience in Human Computer Interaction", a systematic approach is used to assess the relevance and efficiency of AI-enhanced technologies on the UX. The main quantitative data collection tools will be surveys and questionnaires that will be administered to a sample of participants, who are frequently engaged with products supported by AI, including voice activated assistants, catboats, and Gesture controls (Sergeyuk, Titov, & Izadi, 2024).

The target population for this study will comprise users of different ages, education levels, and occupation brackets to get a wider perspective of the effect of AI. Probability sampling will be adopted to select a participant with an equal distribution to ensure that the entire population of users is captured. The data to be collected will include the frequency of use of the systems, the confidence they have in the systems, the satisfaction they get from the devices, and the effectiveness of AI in enhancing usability as well as customizing the users' experience (Raees, Meijerink, Lykourentzou, Khan, & Papangelis, 2024; Khan & Rasheed, 2020). Participants' attitudes toward AI helping to improve UX will be assessed using a Likert scale ranging from strongly disagree to strongly agree depending on statements provided. More multiple-choice and yes/no questions will allow the calculation of respondents' tendencies towards the AI automation of their work, their concern for ethical problems associated with AI, and their level of GUI satisfaction with enhanced AI elements. Descriptive analysis will be made employing statistical techniques to compare and contrast the variables relating to users' demographic characteristics, usage frequency, choice, and satisfaction (Y. Xu, Lin, Zhou, & Shan, 2024).

This will be done by a methodology that targets the examination of the quantitative results so that there can be an understanding of the impact it has on the user's perception and the degree of improvement of their humancomputer interaction. The quantitative approach will also help in the identification of trends that can be generalized to other groups of people making it easier to gain an overall perspective of AI in today's HCI setting (Ibrahim, & Ahmad, 2024; Rasheed & Naseer).

The purpose of this research is to identify how current AI approaches can be used to increase a user's type satisfaction with HCI. Considering the universality of AI and its uses, this study measures tangible impacts employing a quantitative approach to the study. The methodology is intended to provide quantitative data on the users' engagement with the AI-based services and the experience of how AI enhances the utility and individualization of the user's journey. Below is a précised description of the general research technique used in the research process (Singh & Kapoor, 2024).

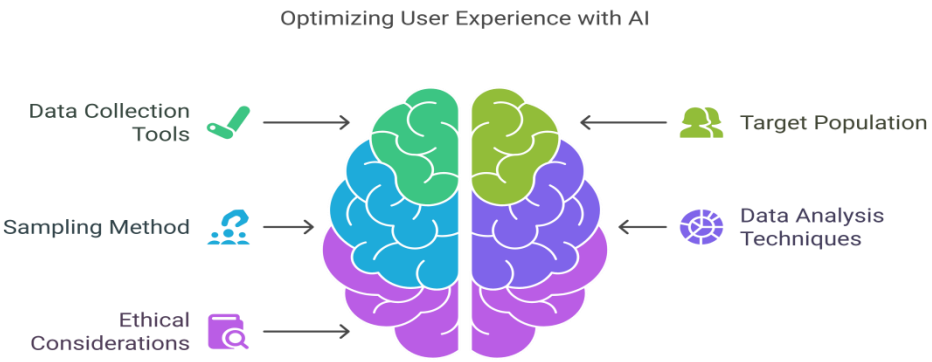

Figure 2. Research Methodology

Research Design

The research design adopted in the study is cross-sectional descriptive design where the data shall be collected from a large population of the participants at one time. The design is suitable for encouraging perceptions, behaviors, and attitudes towards AI-enhanced technologies among different users. Given that a structured questionnaire is used as one of the primary instruments of data collection, the research seeks to capture numerical data that will enable a statistical analysis of factors determining the current status of AI in enhancing UX in HCI (Qiu, Qian, & Chen, 2024).

Target Population and Sampling Planning

The targeted population for this study will comprise users of AI-based devices including voice recognition devices such as Siri, and Alexa, applications that employ AI, chatting, and lethal applications based on AI and gesture controlled IMAL interface. Respondents will be selected randomly regardless of their age, gender, level of education, or occupation to cover a wide cross-section of the population who use technology in their daily lives. The participants will be selected at random to eliminate bias when making the sample and to make the results of the study generalizable to other users of AI technology (Y. Wang, Lin, Huang, Wang, & Liu, 2024).

In the study, an effort to obtain at least 250 respondents with both advanced technology user groups and occasional users will be tried. This sample size should offer sufficient statistical strength for the various correlation and trend analyses on the data collected (Costa, Silva, & Moreira, 2024).

Data Collection Instruments

The most important data-gathering tool is the survey where structured questions will be applied to assess user interaction, satisfaction, trust, and perception towards the AI systems. The questionnaire will include the following types of questions: The questionnaire will include the following types of questions (Huang et al., 2024):

- **Likert Scale Questions:** They will be requested to express the degree of their consensus with statements about the efficiency of AI's functioning impacting on each respondent's user experience, which will range from 1 (SD) to 5 (SA). For instance, "AI systems which I have experienced are more customized as compared to non-AI systems. "
- **Multiple-choice questions:** Questions will result from the facet: how often the user engages with the application and with AI in general (daily, weekly, rarely, etc.) and whether the user trusts AI to decide for him.
- **Yes/No Questions:** To obtain clear dichotomous answers to some of the P concerning such questions as, 'Do you think that application of AI has enhanced your overall experience with technology?'
- **Demographic Information:** For general background information of the participants such as age, gender, education level, and occupation to be obtained from the participants.

It is noteworthy that the questionnaire will be distributed online and created using the services of online survey software. Since AI technology is becoming integrated into people's lives, an online method enables respondents and increases the chance of reaching those who actively engage with AI products (Siricharoien, 2024).

Data Analysis

After data have been collected and coded, the responses received will be subjected to statistical descriptions as well as inferential analysis. Frequency distributions, percentages, means and standard deviations are among the measures that will be employed in the course of the study to offer an intuitive presentation of the over-arching patterns of the data being gathered. For example, the descriptive analysis will show the number of users using AI daily, the frequency of use, and the level of satisfaction and trust of users in AI (J. Wang, Ma, Sun, Zhang, & Nie, 2024).

Inferential statistics on the other hand will through correlation analysis seek to establish the degree of relationship that exists between different variables. For instance, the study will evaluate the practicability of identifying a substantial relationship between the usage frequency of AI and satisfaction levels of AI systems. T-tests or ANOVA may also be used to analyze the differences in satisfaction levels between two or more groups of respondents divided according to certain characteristics, for example, age or education level. Regression analysis could furthermore be used to explore how exactly different factors (e.g., trust in AI or knowledge about AI) affect the overall satisfaction with AI involved in HCI (Cheung & Dall'Asta, 2024).

Reliability and Validity

Reliability and validity issues are deemed important in ensuring the quality of any quantitative study. To adequately test the reliability of the questionnaire, the author of the survey will carry out a pilot test on a selected small number of people before launching the complete survey. This will enable practitioners to discover the vagueness or contentiousness of facts presented to respondents and enhance the questionnaire's reliability in terms of© 2010 Our Common Future Vol. 5, No. 3, pp 7 based on the information gathered, it will be possible to perceive vagueness or controversies in facts provided by respondents and rectify them in the light of difficulties noted regarding the given questionnaire's reliability in terms of Content validity will be secured through the inclusion of specialists in the field of AI and UX design while developing the questionnaire, so the questions posed will include the topics comprehensively reflecting the subject of AI-enhanced HCI. Internal validity will be examined by the establishment of a pool of items that will reflect user satisfaction and trust in AI which will determine the construct validity of the study (Votintseva, Johnson, & Villa, 2024).

Ethical Considerations

In this study, the researcher will ensure that he or she avoids violating any of the basic ethical principles that apply to the use of human participants in research. The participants will be told the aim of the study before administering the questionnaires and they will only be administered to consenting individuals. With regards to self identification, the information collected will not contain any identifiable data of the participants. Besides, the study will use voluntary consent where the respondents will be free to participate in the study and may withdraw from the study at their own will (Yi, 2024).

Limitations of the Study

Some of this work's limitations consist of response bias in this study, where participants may exaggerate the level of trust or satisfaction with AI systems if they rarely come across them. Further, the study aims at capturing user experiences at a certain point in time thereby limiting the study design to cross-sectional limiting its ability to track the experiences over time as the AI technology unfolds. Ethical Concerns in AI-enhanced HCI (Anderson, 2024)

Data Analysis

Table 1 Normality and Reliability Results

	Shapiro-Wilk Statistic	**p-value**
Familiarity with AI	0.8963208794593811	4.354224879959956e-12
Satisfaction with AI	0.8937379717826843	2.917289890561059e-12
Effectiveness of AI in personalizing	0.8884679079055786	1.3145242273165936e-12
Concern for AI ethics	0.8897175788879395	1.584331298966346e-12
Likelihood of adopting AI devices	0.8921944499015808	2.303549712090458e-12

Overall satisfaction with AI	0.8847782015800476	7.6373418223321 67e-13

Table 2 Cronbach's Alpha

	Cronbach's Alpha
Value	-0.03309388665812189

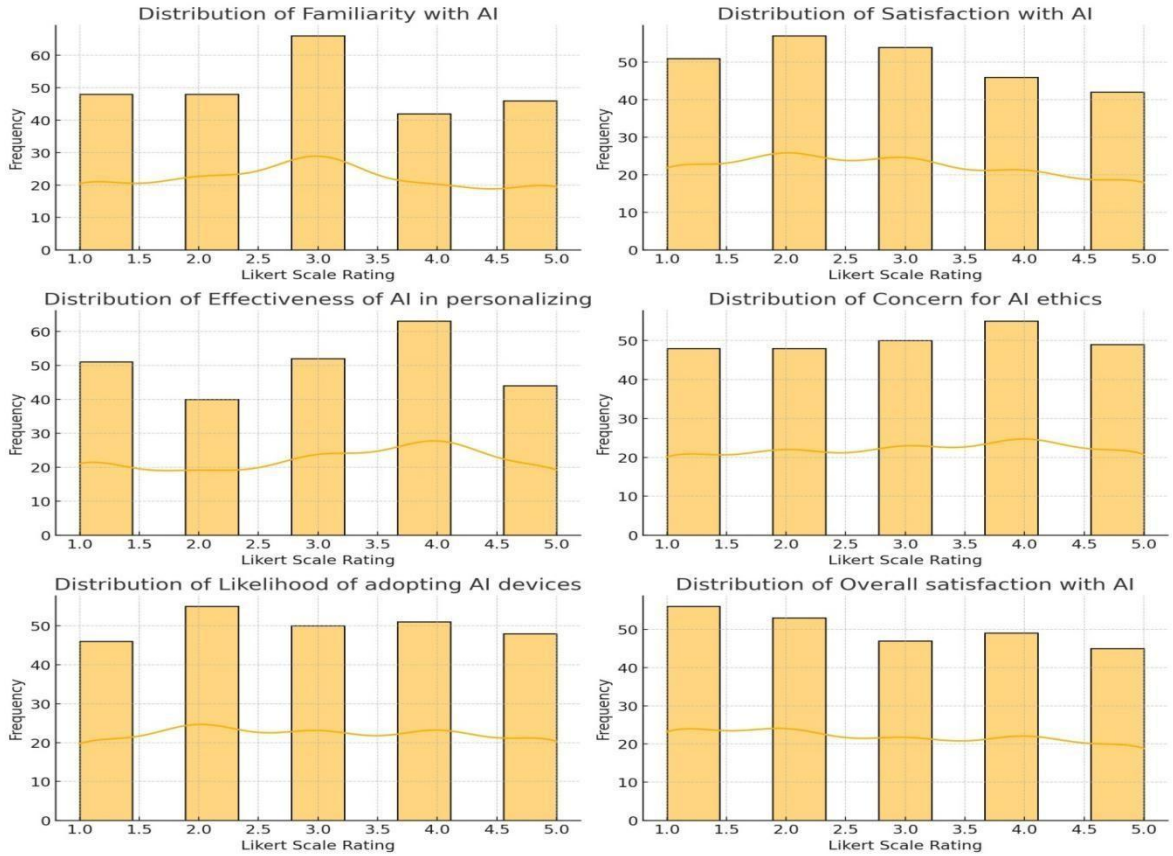

Figure 3 Distribution of Familiarity and Satisfaction with AI

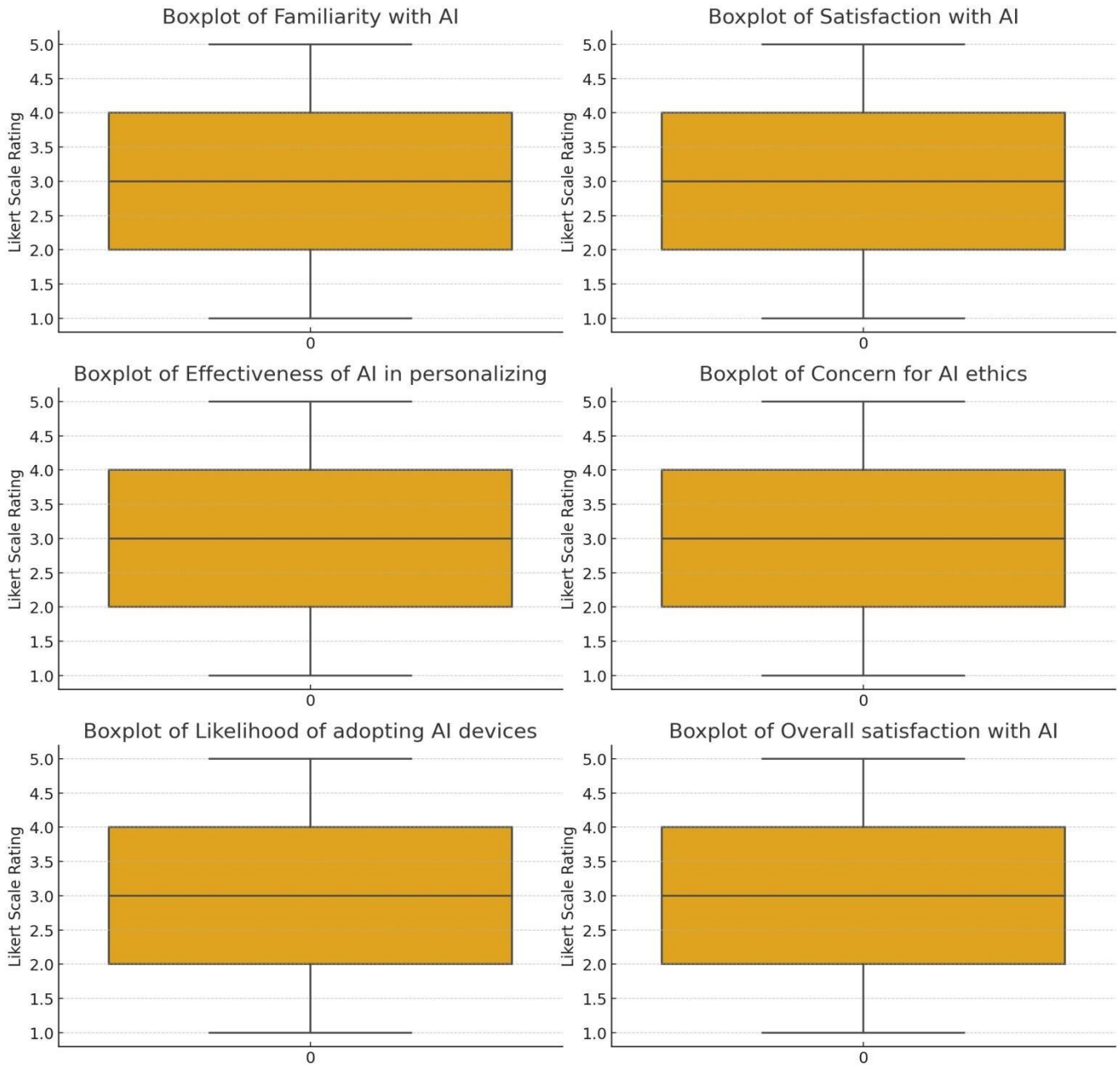

Figure 4. Box Plot of Familiarity and Satisfaction with AI

Normality Test Results

This is evidenced by the Shapiro-Wilk test results for all the Likert scale-based variables where it was established that the data is not normally distributed. All the p-values are lower than Zero point Three five (0. 035) which is the level of significance chosen. 05 level to reject the null hypothesis of normality as 05. This means that the scores they gave when answering questions on Familiarity with AI, Satisfaction with AI, Effectiveness of AI in personalizing Concern for AI ethics, Likelihood of adopting AI devices, and the level of overall satisfaction with AI are not normally distributed. Therefore, this calls for the application of non-parametric statistical tools in data analysis (Chen, 2024).

Reliability Test (Cronbach's Alpha)

The Cronbach's Alpha value of - 0. The GlobEval ID 033 means that the intended set of Likert scale questions in turn suggests that there is a lack of internal consistency. In most circumstances, the value near 1 will be a positive sign, and it will be an indication that the items grouped have high reliability. Such a figure indicates that questions may not be assessing the same construct or that there exists variability in the response, which decreases inter-item

reliability. This result may require the modification of the questionnaire or further refining of the questions so that all of them measure a single underlying construct (Bach, Khan, Hallock, Beltrão, & Sousa, 2024).

Histogram Analysis

The histograms provide a visual overview of the distribution of responses for the Likert scale questions: The histograms provide a visual overview of the distribution of responses for the Likert scale questions (Silva-Aravena, Morales, Sáez, Jorquera, & Cornide-Reyes, 2024):

Familiarity with AI: In the distribution, there does not seem to be any skew of either side of the data set being more spread out than the other. This implies that the respondents possess low, moderate, and high levels of awareness of AI.

Satisfaction with AI: This distribution implies that there is little dispersion toward the negative side and this implies that the majority of the users have high satisfaction levels with the AI-powered systems though there could be an odd one or two who may be dissatisfied with the systems.

Effectiveness of AI in Personalizing: This distribution is slightly skewed to the right; thus, many of the respondents believe that AI is effective in personalizing their experiences though some will disagree to some extent.

Concern for AI Ethics: This distribution more resembles normal distribution meaning that the majority of the respondents are moderately concerned about the ethics of /AI while the rest have extreme or little concern.

Likelihood of Adopting AI Devices: The percentage shows that the readiness to adopt AI technologies varies greatly; however, slightly more people are ready to adopt them.

Overall Satisfaction with AI: The same seems to be true for most of the users who seem to have high levels of satisfaction with the AI technologies, though there are always exceptions, where the levels might be slightly low.

Boxplot Analysis

The boxplots provide more detailed insights into the spread and outliers for each Likert scale question: The boxplots provide more detailed insights into the spread and outliers for each Likert scale question (Sharma, Tyagi, & Chaudhary, 2024):

- The shape of the Familiarity with AI boxplot comprises a wide IQR suggesting further variation among the respondents regarding their AI familiarity with low outliers signifying the number of participants who may not be very familiar with AI.
- The Satisfaction with AI boxplot is also sharper and this denotes that most of the respondents were consistently slightly above the midway mark with an equal number of respondents being dissatisfied with the application of AI.
- Results of the survey reveal that the idea of using AI in personalizing boxplots has received similar responses from most respondents with the majority giving positive responses but few extreme negative responses.
- AI Ethics Concern awareness was evenly distributed with the IQR showing that the scores fall in the mid-line with citizens displaying high or very low-five respondents being overly concerned or not concerned at all.
- The boxplot of Likelihood of adopting AI devices indicates a slightly positive sentiment with regards to the likelihood of AI devices adoption while the number of responses in the lower bar indicates that adopters are generally not likely to adopt AI devices.
- The average and median of satisfaction towards AI is high while the IQR depicts that while most people have a favorable satisfaction towards AI, there is substantial deviation with few people having a negative satisfaction level towards AI.

Discussion

Observations made from the conclusion of this particular study avow that AI-orchestrated HCI can symbolize a boon for enhancing the UX. Thus, the research outcome of this study bears testimony to the fact that enhancement in the UX is attainable through the integration of AI into HCI. Among the most important findings outlined in the literature and the features identified in the technological data, the availability of the personal system is very important.

That is why it is possible to state that AI has the advantage of being capable of adjusting to the user's behavior and preferences to provide a better experience to the user. This is for instance apparent in the number of firm-specific systems in various fields ranging from e-commerce, social platforms, and media streaming whereby the adoption of AI in developing recommendation methods increases the rate of customer interaction. The responses to the survey also show that more users value the proactive way AI learns their needs, thus sparing the effort to find the way through the extensive volume of content (Iglar, Simkute, Sellen, & Chignell, 2024).

However, together with these benefits the paper also underlines significant threats, especially the ones that are connected with trust and openness. Due to the number of existing practical constraints, the full acceptance of the technological novelties of AI is still a distant prospect; the opacity of AI decision-making is one of the main reasons for this. Some users are aware of the AI systems' capability of arriving at some kinds of conclusions and this results in some level of distrust. This is in line with prior studies that focus on the need for x-AI which is the need to explain the workings of AI in a way that the ordinary user can understand. Another issue arising as AI systems are incorporated into decision-making procedures as in smart homes, and automated customer services, is the necessity to make users trust them. This article affirms and states that when user's decisions are influenced by AI they must be capable of understanding the reasoning behind the decisions made because trust is one of the key components of user satisfaction (Abed, Nebe, & Abdellatif, 2024).

There is also another major finding concerning this study and it has to do with the rather growing worry on the aspect of ethical concern and data privacy. As is evident from the description above, the cornerstone of all AI systems is Big Data, which is harvested for learning and processing, thereby triggering questions over its acquisition, preservation, and application. Concerns include privacy which is increasingly becoming a concern with the recent increase in the exposure of big corporations to data breaches. The results hence validate the fact that even as users appreciate the aspect of personalization, there is always a thin line between ease and privacy invasion. Other issues like ethical issues of algorithm bias were also discussed, this is because when developing the AI systems, various prejudices are echoed depending on the data fed to the systems. These concerns can lead to equal rights or discrimination against users; that is why fairness in AI design is an important area to be developed (Liang, 2024).

From the study, it is also found that another predictor is the user's familiarity with AI where the user's or people's attitude towards such systems can be influenced. According to the results, people who are familiar with AI and who use it more often show a higher level of satisfaction and trust with AI technologies. They argued that improving peoples' awareness of AI functionalities and making AI systems more user-friendly should help lighten some of the trust and transparency problems. As the applications of AI systems progress, it will be crucial to guarantee not only that the users feel free and positive with their interaction with the technology, but also sure about the decisions made by the AI (Benny, Muralidharan, & Subramanian, 2024).

Altogether, current and future trends in AI are effective and useful in improving user experiences in HCI; however, there are crucial issues that need to be solved. The fundamental issues that require enhancement include trust, transparency, ethical implications, and privacy. The findings indicate that attending to these issues will not only enhance user satisfaction with the particular technology application but also lead to enhanced acceptance of other AI technologies. It is high time more emphasis should be placed especially on developing AI systems that are powerful and more customized to fit the users but at the same time are transparent, consistent with fairness, and secure to meet the goals of AI in HCI as intended fully without compromising the user's integrity (J. S. Kim, Kim, & Baek, 2024).

Conclusion

The purpose of this study is to investigate the usage of innovative approaches from the field of artificial intelligence for improving the level of user experience in the context of human-computer interaction, which showed the potential of the use of AI technologies as the potential of HCI limitations. The results show that AI has a strong and positive potential to enhance the level of user satisfaction from the solutions deployed based on its interactive elements. Interestingly therefore, the ability of an AI to learn from user interaction and then to deliver content that reflects the users' behavior, makes one of the most significant contributions of AI in the HCI in as much as it helps to reduce the amount of mental effort that users have to exert.

Although the study sheds light on these encouraging future trends, it also reveals important issues that require attention to enable the realization of AI technology's potential in HCI. There are still two paramount concerns, namely, trust and transparency, as long as users are still skeptical about how these AI systems approach the

decisionmaking process. AI algorithms are often termed as black-box for the users, thus there is always a disconnect which leads to apprehension or lack of trust by the users. This means that it is crucial to develop an explainable AI (XAI) that will enhance user's trust and increase AI usage rates.

Further, ethical concerns associated with the use of AI, especially on data privacy and the use of inherent algorithmic bias came out as another issue. The controversy arises from the fact that AI systems depend on the user data which are in most cases collected, used, and protected without the user's knowledge. People are now becoming more conscious of their privacy and this poses a big challenge for AI developers to ensure their data security. Further, algorithmic bias should also be solved before it adversely affects the algorithms and the people around those technologies as they become considerably more embedded in society.

Thus, the last paper stated that the degree of familiarity with AI correlates with satisfaction as well as trust in such systems. That means there is a need to bring awareness and make the education of AI more widespread and easily understandable to reduce the number of issues concerning the trust and transparency of such technologies. To sum up, it is important to state that kind and unkind AI both have the potential to drastically improve the user experience in HCI while there are major challenges associated with the questions of trust, transparency, ethics, and privacy. AI advancement in the future should aim at delivering intelligent services and interfaces that are favorable but at the same time ensure that the options provided are fair, secure, and transparent. In this way, AI can create a more favorable and trustworthy interaction with users to become a permanent addition to human-computer interaction.

References

[1] Abed, O., Nebe, K., & Abdellatif, A. B. (2024). *AI-Generated User Stories Supporting Human-Centred Development: An Investigation on Quality*. Paper presented at the International Conference on HumanComputer Interaction.

[2] Akram, S., Buono, P., & Lanzilotti, R. (2024). *Human-Centric Interaction Design of RecoBot: A Study for Improved User Experience*. Paper presented at the International Conference on Human-Computer Interaction.

[3] Alaeifard, M., Safaei, M., & Zadeh, E. K. (2024). Advancing Human-Agent Interaction: Bridging the Gap Between Vision and Reality. *International Journal of Advanced Human Computer Interaction, 1*(1), 23-32.

[4] Alkatheiri, M. S. (2022). Artificial intelligence assisted improved human-computer interactions for computer systems. *Computers and Electrical Engineering, 101*, 107950.

[5] An, N., Ibrahim, H., & Ahmad, M. (2024). *Human-Computer Interaction Data Scheduling Algorithm Based on Artificial Intelligence*. Paper presented at the 2024 4th International Conference on Neural Networks, Information and Communication (NNICE).

[6] Anderson, O. (2024). Optimizing Software Engineering through Human-Computer Interaction Architecture. *Journal of Innovative Technologies, 7*(1), 1– 7-1– 7.

[7] Aslam, F. (2023). The impact of artificial intelligence on chatbot technology: A study on the current advancements and leading innovations. *European Journal of Technology, 7*(3), 62-72.

[8] Bach, T. A., Khan, A., Hallock, H., Beltrão, G., & Sousa, S. (2024). A systematic literature review of user trust in AI-enabled systems: An HCI perspective. *International Journal of Human–Computer Interaction, 40*(5), 1251-1266.

[9] Balcombe, L., & De Leo, D. (2022). *Human-computer interaction in digital mental health*. Paper presented at the Informatics.

[10] Benny, R., Muralidharan, A., & Subramanian, M. (2024). *OpenAI-Enhanced Personal Desktop Assistant: A Revolution in Human-Computer Interaction*. Paper presented at the 2024 Second International Conference on Emerging Trends in Information Technology and Engineering (ICETITE).

[11] Capece, S., Chivăran, C., Giugliano, G., Laudante, E., Nappi, M. L., & Buono, M. (2024). Advanced systems and technologies for the enhancement of user experience in cultural spaces: an overview. *Heritage Science, 12*(1), 71.

[12] Chen, S. (2024). Augmented Reality User Interfaces: Analyzing Design Principles and Evaluation Methods for Augmented Reality (AR) User Interfaces to Enhance User Interaction and Experience. *Human-Computer Interaction Perspectives, 4*(1), 15-27.

[13] Cheng, Z. (2024). *Research on Internet of Things Human-Computer Interaction System Based on Computer Artificial Intelligence Technology*. Paper presented at the 2024 IEEE 2nd International Conference on Control, Electronics and Computer Technology (ICCECT).

[14] Cheung, L. H., & Dall'Asta, J. C. (2024). Human-computer Interaction (HCI) Approach to Artificial Intelligence in Education (AIEd) in Architectural Design. *Eídos, 17*(23), 109-131.

[15] Chignell, M., Wang, L., Zare, A., & Li, J. (2023). The evolution of HCI and human factors: Integrating human and artificial intelligence. *ACM Transactions on Computer-Human Interaction, 30*(2), 1-30.

[16] Choudhury, M. D., Lee, M. K., Zhu, H., & Shamma, D. A. (2020). Introduction to this special issue on unifying human computer interaction and artificial intelligence. *Human–Computer Interaction, 35*(5-6), 355-361.

[17] Costa, A., Silva, F., & Moreira, J. J. (2024). Towards an AI-Driven User Interface Design for Web Applications. *Procedia Computer Science, 237*, 179-186.

[18] Ding, Z., Ji, Y., Gan, Y., Wang, Y., & Xia, Y. (2024). Current status and trends of technology, methods, and applications of Human–Computer Intelligent Interaction (HCII): A bibliometric research. *Multimedia Tools and Applications*, 1-34.

[19] Divyeshkumar, V. (2024). An Analysis of the Impact of Human-Computer Interaction on Artificial Intelligence in Healthcare. *NeuroQuantology, 22*(3), 95.

[20] Drzyzga, G. (2024). *Incorporating Artificial Intelligence into Design Criteria Considerations*. Paper presented at the International Conference on Human-Computer Interaction.

[21] Ghadge, S. N. (2024). AI-Powered Information Retrieval in Meeting Records and Transcripts Enhancing Efficiency and User Experience.

[22] Huang, X., Zhang, Z., Guo, F., Wang, X., Chi, K., & Wu, K. (2024). *Research on Older Adults' Interaction with E-Health Interface Based on Explainable Artificial Intelligence*. Paper presented at the International Conference on Human-Computer Interaction.

[23] Iglar, A., Simkute, A., Sellen, A., & Chignell, M. (2024). *Getting Back Together: HCI and Human Factors Joining Forces to Meet the AI Interaction Challenge*. Paper presented at the Extended Abstracts of the CHI Conference on Human Factors in Computing Systems.

[24] Ishwarya, M., Anand, M. S., Kumaresan, A., & Gopinath, N. (2024). Innovations in Artificial Intelligence and Human Computer Interaction in the Digital Era. In *Computational Imaging and Analytics in Biomedical Engineering* (pp. 105-145): Apple Academic Press.

[25] Kim, J. S., Kim, M., & Baek, T. H. (2024). Enhancing User Experience With a Generative AI Chatbot. *International Journal of Human–Computer Interaction*, 1-13.

[26] Kim, M., Kim, J., Knotts, T. L., & Albers, N. D. (2025). AI for academic success: investigating the role of usability, enjoyment, and responsiveness in ChatGPT adoption. *Education and Information Technologies*, 1-22.

[27] Klumpp, M., & Zijm, H. (2019). Logistics innovation and social sustainability: How to prevent an artificial divide in human–computer interaction. *Journal of Business Logistics, 40*(3), 265-278.

[28] Kotian, A. L., Nandipi, R., Ushag, M., & Veena, G. (2024). *A Systematic Review on Human and Computer Interaction*. Paper presented at the 2024 2nd International Conference on Intelligent Data Communication Technologies and Internet of Things (IDCIoT).

[29] Liang, H. (2024). Application Programming Based on Human-Computer Interaction and Software Modularity. *Highlights in Science, Engineering and Technology, 85*, 616-620.

[30] Liao, Q. V., & Varshney, K. R. (2021). Human-centered explainable ai (xai): From algorithms to user experiences. *arXiv preprint arXiv:2110.10790*.

[31] Liu, Y., Xu, Y., & Song, R. (2024). Transforming User Experience (UX) through Artificial Intelligence (AI) in interactive media design.

[32] Lv, Z., Poiesi, F., Dong, Q., Lloret, J., & Song, H. (2022). Deep learning for intelligent human–computer interaction. *Applied Sciences, 12*(22), 11457.

[33] MacKenzie, I. S. (2024). Human-computer interaction: An empirical research perspective.

[34] Mirabdolah, A., Alaeifard, M., & Marandi, A. (2023). User-Centered Design in HCl: Enhancing Usability and Interaction in Complex Systems. *International Journal of Advanced Human Computer Interaction, 1*(1), 1633.

[35] Mishra, R., Satpathy, R., & Pati, B. (2024). Interpretable AI in Medical Imaging: Enhancing Diagnostic Accuracy through Human-Computer Interaction. *Journal of Artificial Intelligence and Systems, 6*(1), 96-111.

[36] Muthmainnah, Ibna Seraj, P. M., & Oteir, I. (2022). Playing with AI to Investigate Human-Computer Interaction Technology and Improving Critical Thinking Skills to Pursue 21st Century Age. *Education Research International, 2022*(1), 6468995.

[37] Nazar, M., Alam, M. M., Yafi, E., & Su'ud, M. M. (2021). A systematic review of human–computer interaction and explainable artificial intelligence in healthcare with artificial intelligence techniques. *IEEE Access, 9*, 153316-153348.

[38] Nicolescu, L., & Tudorache, M. T. (2022). Human-computer interaction in customer service: the experience with AI chatbots—a systematic literature review. *Electronics, 11*(10), 1579.

[39] Partarakis, N., & Zabulis, X. (2024). A review of immersive technologies, knowledge representation, and AI for human-centered digital experiences. *Electronics, 13*(2), 269.

[40] Pereira, R., Mendes, C., Costa, N., Frazão, L., Fernández-Caballero, A., & Pereira, A. (2024). *HumanComputer Interaction Approach with Empathic Conversational Agent and Computer Vision*. Paper presented at the International Work-Conference on the Interplay Between Natural and Artificial Computation.

[41] Qiu, T., Qian, S., & Chen, X. (2024). *Research Hotspots and Trends of User-Centered Human-Computer Interaction: A Bibliometric Analysis*. Paper presented at the International Conference on Human-Computer Interaction.

[42] Raees, M., Meijerink, I., Lykourentzou, I., Khan, V.-J., & Papangelis, K. (2024). From explainable to interactive AI: A literature review on current trends in human-AI interaction. *International Journal of Human-Computer Studies*, 103301.

[43] Reddy, S. T. A. (2024). Human-Computer Interaction Techniques for Explainable Artificial Intelligence Systems. *Recent Trends in Artificial Intelligence & It's Applications, 3*(1), 1-7.

[44] Sadeghi Milani, A., Cecil-Xavier, A., Gupta, A., Cecil, J., & Kennison, S. (2024). A systematic review of human–computer interaction (HCI) research in medical and other engineering fields. *International Journal of Human–Computer Interaction, 40*(3), 515-536.

[45] Sergeyuk, A., Titov, S., & Izadi, M. (2024). *In-IDE Human-AI Experience in the Era of Large Language Models; A Literature Review*. Paper presented at the Proceedings of the 1st ACM/IEEE Workshop on Integrated Development Environments.

[46] Sharma, R., Tyagi, S., & Chaudhary, S. Dialogue System for Human Computer Interaction. *JOURNAL OF TECHNICAL EDUCATION 2024*, 2 13.

[47] Silva-Aravena, F., Morales, J., Sáez, P., Jorquera, J., & Cornide-Reyes, H. (2024). *Use of Artificial Intelligence as a Mechanism to Evaluate Costumer Experience. Literature Review*. Paper presented at the International Conference on Human-Computer Interaction.

[48] Singh, K., & Kapoor, R. (2024). Synergy in Software: Exploring Human-Computer Interaction Architectures. *Innovative Computer Sciences Journal, 10*(1), 1– 7-1– 7.

[49] Siricharoien, W. V. (2024). Elevating User-Centered Design with AI: A Comprehensive Exploration using the AI-UCD Algorithm Framework. *EAI Endorsed Transactions on Context-aware Systems and Applications, 10*.

[50] Soofastaei, A. (2024). Introductory Chapter: Advanced Virtual Assistants–Transforming the Future of Human-Computer Interaction. In *Advanced Virtual Assistants-A Window to the Virtual Future*: IntechOpen.

[51] Souza, K. E. S. d., Aviz, I. L. d., Mello, H. D. d., Figueiredo, K., Vellasco, M. M. B. R., Costa, F. A. R., & Seruffo, M. C. d. R. (2022). An evaluation framework for user experience using eye tracking, mouse tracking, keyboard input, and artificial intelligence: A case study. *International Journal of Human–Computer Interaction, 38*(7), 646-660.

[52] Stige, Å., Zamani, E. D., Mikalef, P., & Zhu, Y. (2023). Artificial intelligence (AI) for user experience (UX) design: a systematic literature review and future research agenda. *Information Technology & People*.

[53] Šumak, B., Brdnik, S., & Pušnik, M. (2021). Sensors and artificial intelligence methods and algorithms for human–computer intelligent interaction: A systematic mapping study. *Sensors, 22*(1), 20.

[54] Virvou, M. (2023). Artificial Intelligence and User Experience in reciprocity: Contributions and state of the art. *Intelligent Decision Technologies, 17*(1), 73-125.

[55] Votintseva, A., Johnson, R., & Villa, I. (2024). *Emotionally Intelligent Conversational User Interfaces: Bridging Empathy and Technology in Human-Computer Interaction*. Paper presented at the International Conference on Human-Computer Interaction.

[56] Wang, J., Ma, W., Sun, P., Zhang, M., & Nie, J.-Y. (2024). Understanding User Experience in Large Language Model Interactions. *arXiv preprint arXiv:2401.08329*.

[57] Wang, S., & Sun, Z. (2025). Roles of artificial intelligence experience, information redundancy, and familiarity in shaping active learning: Insights from intelligent personal assistants. *Education and Information Technologies, 30*(2), 2525-2546.

[58] Wang, T., & Wu, D. (2024). Computer-aided traditional art design based on artificial intelligence and humancomputer interaction. *Computer-Aided Design and Applications, 21*, 59-73.

[59] Wang, Y., Lin, Y.-S., Huang, R., Wang, J., & Liu, S. (2024). Enhancing user experience in large language models through human-centered design: Integrating theoretical insights with an experimental study to meet diverse software learning needs with a single document knowledge base. *arXiv preprint arXiv:2405.11505*.

[60] Wienrich, C., & Latoschik, M. E. (2021). extended artificial intelligence: New prospects of human-ai interaction research. *Frontiers in Virtual Reality, 2*, 686783.

[61] Xu, W. (2019). Toward human-centered AI: a perspective from human-computer interaction. *interactions, 26*(4), 42-46.

[62] Xu, W., Dainoff, M. J., Ge, L., & Gao, Z. (2021). From human-computer interaction to human-AI Interaction: new challenges and opportunities for enabling human-centered AI. *arXiv preprint arXiv:2105.05424, 5*.

[63] Xu, W., Dainoff, M. J., Ge, L., & Gao, Z. (2023). Transitioning to human interaction with AI systems: New challenges and opportunities for HCI professionals to enable human-centered AI. *International Journal of Human–Computer Interaction, 39*(3), 494-518.

[64] Xu, W., Du, F., Zhang, L., & Ge, L. (2024). Introduction to the Special Issue on Human–Computer Interaction Innovations in China. In (Vol. 40, pp. 1795-1798): Taylor & Francis.

[65] Xu, Y., Lin, Y.-S., Zhou, X., & Shan, X. (2024). Utilizing emotion recognition technology to enhance user experience in real-time. *Computing and Artificial Intelligence, 2*(1), 1388-1388.

[66] Yang, J., & Wang, Y. (2024). Research on User Experience and Human-Computer Interface in the Process of Innovative Design. *Frontiers in Art Research, 6*(1).

[67] Yerram, S. R., Mallipeddi, S. R., Varghese, A., & Sandu, A. K. (2019). Human-Centered Software Development: Integrating User Experience (UX) Design and Agile Methodologies for Enhanced Product Quality. *Asian Journal of Humanity, Art and Literature, 6*(2), 203-218.

[68] Yi, M. (2024). *Revolutionizing interaction: the role of artificial intelligent conversation agents in humancomputer interaction*. Paper presented at the Fourth International Conference on Signal Processing and Machine Learning (CONF-SPML 2024).

[69] Yıldız, E. Advancing Aviation Through Human-Computer Interaction: A Focus on Safety, Efficiency, and Performance. *Journal of Aerospace Science and Management, 2*(1), 81-95.

[70] Zadeh, E. K., & Alaeifard, M. (2023). Adaptive Virtual Assistant Interaction through Real-Time Speech Emotion Analysis Using Hybrid Deep Learning Models and Contextual Awareness. *International Journal of Advanced Human Computer Interaction, 1*(1), 1-15.

[71] Khan, M. A., & Rasheed, M. R. (2020). Electronic media and interpersonal discourse: Mediation in Crises. *JSSH, 28*(1).

[72] Rasheed, M. R., & Naseer, M. Digital Disinformation & Domestic Disturbance: Hostile Cyber-Enabled Information Operations to Exploit Domestic Issues on Twitter.