



Enhancing User Experience through Artificial Intelligence: An Algorithmic Exploration

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Abstract – This systematic literature review investigated the role of Artificial Intelligence (AI) algorithms in enhancing user experiences across various domains. The study identified, evaluated, and interpreted relevant research articles exploring the application of AI to improve user experiences. The research questions addressed were: (1) What AI algorithms are used to enhance user experience in various domains? and (2) How effectively are these AI algorithms improving user experience? The review revealed various AI algorithms, including Machine Learning, Natural Language Processing, Support Vector Machines, Artificial Neural Networks, and more, employed in healthcare, education, transportation, smart cities, and other domains to enhance user experiences. The findings highlighted the positive impact of AI algorithms on user satisfaction and efficiency, emphasizing the need for ethical considerations and ongoing collaborations between academia and industry to further optimize AI for user experience.

Keywords – Artificial Intelligence (AI), User experience (UX), Systematic Review, Algorithms.

INTRODUCTION

The role of Artificial Intelligence (AI) in transforming various aspects of our lives has been increasingly prominent in recent years. (Silva, Artificial Intelligence and the Future of User Experience, 2023) One area where AI holds immense potential is enhancing user experiences across applications and services in various domains. (Yang, 2020) The ability of AI algorithms to analyze vast amounts of data, learn from patterns, and make intelligent decisions has opened up new possibilities for creating personalized, efficient, and engaging user interactions. (Silva, The Impact of Artificial Intelligence on User Experience, 2019)

User experience, often called UX, refers to the overall satisfaction and usability of a product, service, or system as perceived by its users. (Yang, 2020) In the digital era, where users interact with many applications and services daily, optimizing UX has become a crucial goal for businesses and developers. (Haleem, Javaid, Qadri, Singh, & Suman, 2022) AI technologies have emerged as powerful tools in this pursuit, offering novel ways to understand user preferences, predict user behavior, and tailor interactions to individual needs. (Yang, 2020)

This study presented a systematic literature review examining AI algorithms' impact on enhancing user experiences. The main goal was to identify, evaluate, and interpret relevant studies exploring the application of AI in improving user experiences across diverse domains.

The research was motivated by the increasing importance of AI in shaping modern digital experiences. As digital reliance grows, user expectations rise for seamless, personalized, and context-aware interactions. Understanding AI algorithms driving these experiences is crucial to achieving enhanced UX. With AI constantly evolving and new techniques emerging, this study aimed to capture the latest developments and provide insights into the current state of AI-driven user experiences.

OBJECTIVES OF THE STUDY

The primary objective of this study is to systematically review and analyze the role of Artificial Intelligence (AI) algorithms in enhancing user experience across various domains.



Specifically, this study aims to:

- Identify the different Artificial Intelligence (AI) algorithms utilized to enhance user experience in various applications and services; and
- Analyze the effectiveness of AI algorithms in enhancing user satisfaction, usability, efficiency, personalization, and interaction quality.

MATERIALS AND METHODS

This study has been undertaken as a systematic literature review based on the original guidelines introduced by Kitchenham (Kitchenham, et al., 2007), which propose identifying, evaluating, and interpreting all primary studies related to the topic of interest. The steps in the systematic literature review method are documented below.

Research Questions

The research questions addressed by this study are:

Table 1. The research questions addressed in the study.

RQ1	What are the Artificial Intelligence (AI) algorithms used to enhance user experience in various domains?
RQ2	How effective are these AI algorithms in improving user experience?

In this systematic review, the Kitchenham methodology (Kitchenham, et al., 2007) identified relevant concepts through the PICOC criteria (Population, Intervention, Comparison, Outcomes, and Context). However, the comparison criterion was excluded since the aim is to focus on studies using artificial intelligence algorithms to enhance user experience. Table 2 presents the PICOC criterion applied to the study.

Table 2. The definition of PICOC criteria.

Criterion	Description
Population	Applications or Services with AI features

Intervention	Different AI algorithms used to enhance user experiences
Outcomes	Metrics of Artificial Intelligence (AI) algorithms used to enhance user experience
Context	Academic and Industrial

Table 2 shows the PICOC criteria of the study, which aims to investigate the impact of AI algorithms on enhancing user experiences in various domains. By analysing the outcomes and metrics associated with these AI algorithms, valuable insights could be gained to create more user-friendly and efficient digital environments. The research covered both academic and industrial contexts, providing a broader understanding of the role of AI in enhancing user experiences.

Search Process

The search for literature related to the study was conducted on Google Scholar (scholar.google.com). This choice was made due to Google Scholar's ability to aggregate papers from various research databases, including but not limited to Web of Science, Scopus, PubMed, PsycINFO, ERIC, IEEE Xplore, ACM Digital Library, SpringerLink, Elsevier, making it a valuable resource for accessing relevant research dispersed across multiple databases.

Inclusion and Exclusion Criteria

To ensure the relevance and quality of the studies selected for this review, certain inclusion and exclusion criteria were established:

Inclusion Criteria

- Studies published in peer-reviewed journals and reputable conference proceedings were included.
- Articles that specifically explore using AI algorithms to enhance user experience were considered.
- Only papers published within the last 5 years were considered.



Exclusion Criteria

- Non-English articles were excluded from the review due to potential language barriers and to ensure a consistent analysis.
- Studies lacking sufficient information on the AI algorithms that enhance user experience were excluded.

Data Extraction

The data extracted from each study included the following information:

Table 3. The data extraction form format.

Field	Description	Type of Information
ID	Unique code to identify the scientific article	General
Year	Year of publication	General
Title	Title of the scientific article	General
Author	Author(s), their institution, and the country where it is located	General
Source	Source (journal or conference) and full reference	General
Summary	Summary of the study, including the primary research questions and their corresponding answers	General
AI Algorithms Employed	Specific AI algorithms used in each study to enhance user experience	Related to question 1
Qualitative Findings	Qualitative insights provided in the studies regarding the impact of AI	Related to question 2

algorithms on user experience

Data Analysis

The data was organized in a tabulated format to showcase the following information:

- The number of relevant articles obtained per year.
- The details of obtained relevant articles.
- The list of AI algorithms used to enhance user experience (UX).
- The domains where AI algorithms have been utilized.

The results of the data analysis were presented in the "Results" section. A comprehensive summary of the extracted data and the synthesis of findings was provided. The data were presented using tables to facilitate understanding and comparison across studies.

RESULTS AND DISCUSSION

RESULTS

Search Results

A total of 20 relevant articles were obtained using the search chain and the defined inclusion and exclusion criteria. Table 4 shows the number of search results obtained.

Table 4. The number of obtained relevant articles per year.

Year	Relevant Articles Obtained
2019	5
2020	3
2021	8
2022	4
Total	20

After obtaining relevant articles, a comprehensive analysis was conducted to address the research questions outlined in the "Methods" section. The main objective was to identify a range of Artificial



Intelligence (AI) algorithms used to enhance user experience across diverse domains. The details of these papers are summarized in Table 5.

Table 5. The details of obtained relevant articles.

ID	Title
RR01 (Eli-Chukwu & Ogwugwam, 2019)	Applications of Artificial Intelligence in Agriculture: A Review
RR02 (Meseguer, 2019)	Application of Artificial Intelligence to Gastroenterology and Hepatology
RR03 (Liyange, 2019)	Applications of Artificial Intelligence in Transport: An Overview
RR04 (Can, 2021)	Application of Artificial Intelligence-Based Technologies in the Healthcare Industry: Opportunities and Challenges
RR05 (Abdelraheem, 2022)	Applications of Artificial Intelligence and Machine Learning in Smart Cities
RR06 (Kumar, 2022)	Transforming Business Using Digital Innovations: The Application of AI, Blockchain, Cloud, and Data Analytics
RR07 (Karimi, 2022)	Applications of Artificial Intelligence-based Modeling for Bioenergy Systems: A Review
RR08 (Hernández-Ortega, 2020)	Artificial Intelligence in Medicine: Today and Tomorrow
RR09 (Fuchs, 2021)	Current Applications of Artificial Intelligence in Tourism and Hospitality
RR10 (Wang X.-F. W.-F.-M., 2021)	An Overview of Artificial Intelligence Applications for Power Electronics

RR11 (Wang J. W., 2020)	Artificial Intelligence in Online Higher Education: A Systematic Review of Empirical Research from 2011 to 2020
RR12 (Zhang, 2021)	A Review of Artificial Intelligence (AI) in Education from 2010 to 2020
RR13 (Chen, 2020)	Artificial Intelligence in Education: A Review
RR14 (Zheng, 2020)	UX Research on Conversational Human-AI Interaction: A Literature Review of the ACM Digital Library
RR15 (Brereton, 2020)	Adapting User Experience Research Methods for AI-driven Experiences
RR16 (Bronzin, 2021)	Artificial Intelligence (AI) Brings Enhanced Personalized User Experience
RR17 (Khan, 2019)	A Review of Artificial Intelligence Applications in Healthcare: Current Status and Future Prospects
RR18 (Zuiderwijk, 2021)	Implications of the Use of Artificial Intelligence in Public Governance: A Systematic Literature Review and a Research Agenda
RR19 (Sadiku, 2021)	Artificial Intelligence in Social Media
RR20 (Dai, 2019)	Artificial Intelligence Empowered Edge Computing and Caching for Internet of Vehicles

RQ1: What Artificial Intelligence (AI) algorithms are used to enhance user experience in various domains?

In addressing this question, a thorough review of each relevant article was conducted to identify the artificial intelligence algorithms utilized to enhance UX.

The study also involved extracting and analysing the application of these AI algorithms in their respective contexts. Table 6 presents the list of the AI algorithms used to enhance UX.

Table 6. The list of AI algorithms used to enhance UX.

AI Algorithms	Papers	Quantity
Machine learning	RR04, RR06, RR08, RR09, RR10, RR11, RR12, RR13, RR14, RR15, RR17, RR18, RR19, RR20	14
Natural language processing	RR04, RR06, RR08, RR09, RR11, RR12, RR13, RR17, RR15, RR17, RR18	11
Support vector machines	RR01, RR02, RR03, RR05, RR07	5
Artificial neural networks	RR01, RR03, RR05, RR13	4
Deep learning	RR06, RR08, RR18, RR18	4
Recommender systems	RR09, RR11, RR12, RR13	4
Fuzzy logic	RR01, RR03, RR10	3
Reinforcement learning	RR11, RR14, RR20	3
Computer vision	RR04, RR17	2
Convolutional neural networks	RR02, RR07	2
Rule-based expert system	RR01, RR10	2
3-D object recognition	RR16	1

Adaptive educational systems	RR12	1
Automatic recognition of 2D images	RR16	1
Bayesian networks	RR03	1
Decision Trees	RR05	1
Digital maps	RR16	1
Genetic algorithm	RR01	1
GPS services	RR16	1
IoT (Internet of Things)	RR16	1
K-Nearest Neighbors	RR05	1
Metaheuristic methods	RR10	1
Recurrent neural network	RR03	1
User modeling	RR15	1
Virtual assistants	RR09	1

Table 6 shows the AI algorithms used in different research papers and their quantities. The most common algorithm is machine learning, used in 14 papers for disease prediction and personalized content. Natural language processing appears in 11 papers, mainly for healthcare and education tasks. Support vector machines are in five papers, while artificial neural networks and deep learning are used in four papers each. Other algorithms like recommender systems, fuzzy logic, and reinforcement learning are also present in a few papers. These algorithms play essential roles in diverse fields, and their use is likely to continue growing as AI advances.



RQ2: How effective are these AI algorithms in improving user experience?

Each pertinent article was carefully examined in this inquiry to assess the effectiveness or potential benefits of the AI algorithms. Additionally, the articles were categorized according to their respective domains. Table 7 presents the list of domains where AI algorithms have been utilized.

Table 7. The list of domains where AI algorithms have been utilized.

Domain	Papers	Quantity
Healthcare	RR02, RR04, RR08, RR17	4
Education	RR11, RR13, RR12	3
Designs	RR15, RR16, RR14	3
Transportation	RR03, RR20	2
Agriculture	RR01	1
Bioenergy	RR07	1
Business	RR06	1
Electronics	RR10	1
Government	RR18	1
Smart Cities	RR05	1
Social Media:	RR19	1
Tourism, Hospitality	RR09	1

Table 7 shows different domains and papers discussing the effectiveness of AI algorithms in improving user experience. In healthcare, AI has been effective in improving diagnosis and treatment options. In education, AI personalizes learning and provides feedback. In user experience, AI customizes content and makes processes more efficient. Transportation benefits from AI in resource management and content prediction. Agriculture uses AI for disease identification and treatment recommendations. AI in bioenergy predicts the effectiveness of new inhibitors.

DISCUSSION

Artificial Intelligence (AI) Algorithms Used to Enhance User Experience in Various Domains

The systematic review presented in this study aimed to identify and analyse the Artificial Intelligence (AI) algorithms used to enhance user experience in various domains. The findings shed light on the diverse range of AI algorithms employed in different domains to improve user experiences.

The analysis revealed various AI algorithms utilized in various domains to enhance user experience. Some commonly used AI algorithms include Genetic Algorithms, Artificial Neural Networks, Rule-based Expert Systems, Fuzzy Logic, Support Vector Machines, Convolutional Neural Networks, Machine Learning, Natural Language Processing, Recommender Systems, and Reinforcement Learning. These algorithms demonstrated specific capabilities harnessed to address user experience challenges in their respective domains.

The effectiveness of AI algorithms was demonstrated in diverse fields, such as healthcare, agriculture, transportation, smart cities, education, social media, and more. In the healthcare domain, Support Vector Machines and Convolutional Neural Networks proved effective in improving the accuracy and efficiency of disease diagnosis, leading to better patient outcomes. Similarly, in agriculture, Genetic Algorithms and Artificial Neural Networks significantly improved the identification of physiological diseases in tomatoes. They prevented pest diseases in rice and wheat crops. Using AI algorithms in smart cities led to enhanced traffic prediction and road safety through algorithms like K-Nearest Neighbors and Decision Trees.

Effectiveness of AI Algorithms in Improving User Experience

The second research question aimed to assess the effectiveness of AI algorithms in enhancing user experience across different domains. The systematic review yielded valuable insights into the impact of AI algorithms on user experiences.



The findings demonstrate that AI algorithms positively affect user experience in various applications. For instance, the application of AI algorithms in personalized learning (education domain) showcased a significant improvement in student performance prediction and accurate content recommendations based on individual preferences. Using Recommender Systems and Natural Language Processing in social media platforms resulted in a more engaging and efficient user experience through personalized content recommendations and efficient search results.

Implementing AI algorithms, such as Machine Learning and Natural Language Processing, has shown the potential to streamline diagnostic processes, reduce errors, and enhance patient care. Furthermore, AI algorithms like Reinforcement Learning have been successfully applied in transportation and edge computing domains to optimize resource management and content caching, leading to faster and more responsive user experiences.

However, it is essential to acknowledge that the effectiveness of AI algorithms can be influenced by various factors, including the quality and quantity of data, algorithm design, and domain-specific challenges. Challenges like interpretability, bias, and ethical considerations must be carefully addressed to ensure responsible and ethical deployment of AI systems, which can further enhance user experience.

CONCLUSION AND RECOMMENDATION

This systematic literature review explored how Artificial Intelligence (AI) algorithms improve user experiences in various domains. By analysing relevant studies and extracting data on AI algorithms and their effectiveness in improving user experience, valuable insights were gained to understand the role of AI in creating more user-friendly and efficient digital environments.

Key Findings

AI Algorithms Used for Enhancing User Experience. The review identified various AI algorithms

employed in different domains to enhance user satisfaction. These algorithms included Machine Learning, Natural Language Processing, Support Vector Machines, Artificial Neural Networks, Deep Learning, Recommender Systems, and more. Each algorithm demonstrated specific capabilities tailored to address user experience challenges in various contexts.

Effectiveness of AI Algorithms. The review demonstrated the effectiveness of AI algorithms in improving user experience across different domains. In healthcare, AI algorithms led to better diagnosis accuracy and treatment options. In education, AI personalization improved learning outcomes. In user experience, AI algorithms customized content and made processes more efficient. Transportation benefited from AI in resource management and content prediction, among other domains.

Implications

Advancing AI for User Experience. The findings underscore the importance of continued research and development of AI algorithms to further enhance user experience in diverse applications. As technology evolves, optimizing AI algorithms can lead to more personalized, efficient, and engaging user interactions.

Ethical Considerations. Responsible and ethical deployment of AI is critical to ensuring positive user experiences. Addressing algorithmic bias and transparency challenges is essential to building trust and user confidence in AI-driven systems.

Collaboration between Academia and Industry. The review covered academic and industrial contexts, emphasizing the significance of collaboration between researchers and industry professionals. Such collaborations can facilitate the application of cutting-edge research in real-world scenarios, fostering innovation and meaningful improvements in user experiences.



Limitations and Future Research

Limited Data Availability. The review was constrained by data availability from the selected studies. Further research could benefit from an expanded data pool and a longer time to track ongoing advancements in AI algorithms and their impact on user experiences.

Emerging AI Technologies. As AI rapidly evolves, new algorithms and applications not covered in this review may emerge. Future research should continue to explore novel AI technologies and their potential contributions to user experience enhancement.

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