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(Research/ Review) Article

Classification and Prediction of User Satisfaction Using Machine Learning: A Systematic Literature Review

Muhammad Nafal Ramadhan[1*], Martanto[2], Yudhistira Arie Wijaya[3]

[1-3] Information Systems, STMIK IKMI Cirebon, Indonesia
* Corresponding Author: muhammadnafalramadhan@gmail.com

Abstract: User satisfaction is a key indicator in assessing the success of smart digital systems as it influences engagement, trust, and the sustainability of system usage. However, research on the application of machine learning for classifying and predicting user satisfaction remains scattered across various domains, making it difficult to obtain a comprehensive overview. This study aims to identify trends, methods, and challenges in the application of machine learning for user satisfaction classification and prediction through a Systematic Literature Review (SLR) approach. The research method involved searching for, selecting, and synthesizing scientific articles published between 2021 and 2026 based on predefined inclusion and exclusion criteria. The results of the study indicate a shift in the use of methods from conventional machine learning algorithms toward deep learning, transformer-based natural language processing, explainable artificial intelligence (XAI), and adaptive personalization systems. Furthermore, transparency, fairness, trust, and personalization have been proven to be critical factors influencing user satisfaction, in addition to prediction accuracy. This study provides a comprehensive overview of current research developments and future research directions in the development of adaptive, transparent, and user-centered intelligent systems.

Keywords: Explainable Artificial Intelligence; Machine Learning; Sentiment Analysis; Systematic Literature Review; User Satisfaction.

1. Introduction

Journal of Future Artificial Intelligence and Technologies accepts research paper submissions that contain at least 4000 to 8000 words or around 8 to 20 pages for research articles and a maximum of 30 pages for review articles. The introduction must be written briefly, concisely, and clearly. The introduction must contain an explanation of (1) the Research object, (2) Methods that have been used previously, (3) the Weaknesses and strengths of each method or may briefly allude to related work and/or hypotheses, (4) Research problems (5) Proposed solutions and/or approaches (6) List of Contributions (6) Rest of paper. The introduction section must be scientific and rich in citations. Use "maintext_FAITH" style for this paragraph.

The development of artificial intelligence (AI) and machine learning technologies in recent years has driven changes in various digital services. A wide range of platforms, such as e-commerce, recommendation systems, mobile applications, social media, and even conversation-based services, utilize these technologies to understand user behavior and improve the quality of services provided. In this context, user satisfaction is a key indicator as it relates to technology adoption rates, user loyalty, and the system's success in meeting user needs.

The application of machine learning enables organizations to process large amounts of user data to obtain more accurate information regarding user satisfaction levels. This data can include user reviews, interaction history, system usage patterns, and other contextual data. Several studies indicate that machine learning methods can be effectively used to classify and predict user satisfaction through the analysis of user behavior and sentiment[1] . Additionally,

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advancements in Natural Language Processing (NLP) technology further enhance the system's ability to understand user opinions presented in text form.

The emergence of Transformer-based models, such as BERT, has made a significant contribution to sentiment analysis and user satisfaction prediction because they are better able to understand contextual relationships between words compared to previous approaches[2] ,[3] . On the other hand, modern recommendation systems have also begun to integrate machine learning to dynamically predict user satisfaction levels so that the services provided can be tailored to each user's preferences[4].

Although research on machine learning for user satisfaction has seen significant progress, existing studies remain scattered across various topics and research domains. Some studies focus on sentiment analysis, while others emphasize recommendation systems, service personalization, or user experience evaluation. This situation makes it difficult to obtain a comprehensive overview of the most widely used methods, current research trends, and the challenges still faced in the development of user satisfaction prediction models[5] ,[6].

In addition to differences in research approaches and subjects, attention to aspects of model transparency, trust, and interpretability is also increasing. Users not only need accurate prediction results but also require an understanding of the reasoning behind the decisions generated by the system. Therefore, the concepts of Explainable Artificial Intelligence (XAI) and Human-Centered AI are increasingly being applied to enhance system transparency while building user trust in AI-based technology[7].

Given these conditions, a study is needed that can summarize and integrate the research findings conducted in this field. This study employs a Systematic Literature Review (SLR) method to identify developments, methodologies used, research trends, and various challenges in the application of machine learning for user satisfaction classification and prediction. Through this review, it is hoped that a more comprehensive understanding of the direction of research development and opportunities for creating smarter systems that are more adaptive, transparent, and user-centric can be obtained.

2. Literature Review

Machine Learning

Machine learning is an approach in artificial intelligence that enables systems to acquire knowledge from data and use it to make predictions or decisions. As digital services evolve, this technology is increasingly utilized to process user data, identify behavioral patterns, and evaluate and predict user satisfaction levels. Machine learning's ability to continuously learn changes in user characteristics makes it a crucial technology in developing adaptive and user-oriented systems[8] ,[9].

User Satisfaction

User satisfaction describes the degree to which a system or service succeeds in meeting the needs and expectations of its users. The higher the perceived level of satisfaction, the greater the likelihood that users will continue to use the service, place their trust in it, and demonstrate loyalty to the system. Therefore, user satisfaction is often used as a benchmark for evaluating the success of technology implementation across various digital platforms[10] ,[11].

Sentiment Analysis

Sentiment analysis is a widely used approach to understanding user opinions and perceptions through textual data such as reviews, comments, and user feedback. Advances in Natural Language Processing (NLP) enable systems to process textual information more effectively, allowing them to identify positive, negative, or neutral sentiments with greater accuracy. This technology is a crucial component in research related to predicting and classifying user satisfaction because it can represent user experiences in the form of data that can be automatically analyzed[12][13].

3. Research Method

Literature Search Strategy

This study employs a systematic literature review (SLR) method to identify, evaluate, and synthesize research related to the application of machine learning in the classification and prediction of user satisfaction. The SLR method was chosen because it provides a systematic and comprehensive overview of research developments in a specific field. The research process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which are widely used in systematic literature review studies[14].

The literature search was conducted using the Scopus database because it provides reputable scientific publications from various disciplines. The search process focused on articles published between 2021 and 2026 with topics related to machine learning and user satisfaction. To obtain relevant articles, the following search keywords were used:

"user satisfaction" AND "machine learning"

The search results were then compiled and used as the basis for selecting articles to be analyzed further.

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were established to ensure that the selected articles align with the research objectives. The inclusion criteria used include:

a. Peer-reviewed journal articles
b. Discussing the application of machine learning in the classification or prediction of user satisfaction
c. Published in english
d. Available in full text
e. Presenting the results of the evaluation or implementation of machine learning methods.

Meanwhile, articles are excluded from the selection process if:

a. It is a duplication of data
b. Are editorials, opinion pieces, or conference abstracts
c. Do not use a machine learning approach
d. Are unrelated to user satisfaction
e. It does not adequately explain the research methods.

Article Selection Process

The article selection process is conducted based on the PRISMA stages, which consist of identification, screening, eligibility assessment, and inclusion. During the identification stage, articles are obtained from a search of the Scopus database using predetermined keywords. Duplicate articles are then removed before proceeding to the screening stage based on titles and abstracts. Articles deemed relevant then entered the eligibility assessment stage through a full-text review to ensure compliance with the inclusion and exclusion criteria. After the entire selection process was completed, articles meeting the requirements for analysis in this study were identified. The flowchart of the article selection process is shown in figure 1.

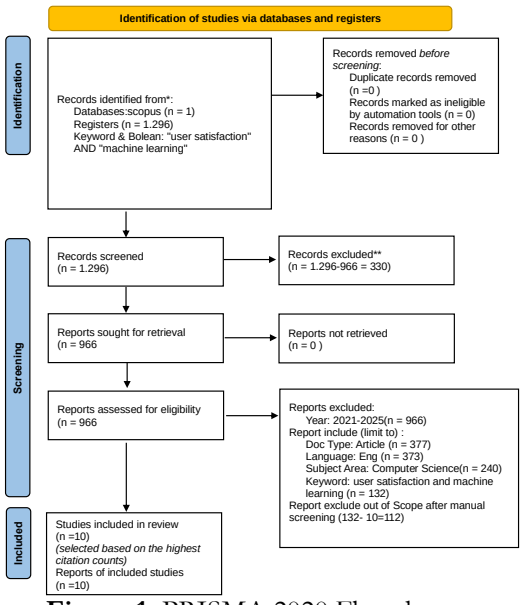


Figure 1. PRISMA 2020 Flowchart.

The initial search process yielded a number of articles obtained from the Scopus database using predetermined keywords. After removing duplicate articles and screening based on titles and abstracts, the number of articles meeting the study criteria decreased further. The eligibility assessment stage was conducted by reading the full text to ensure the articles aligned with the study's objectives. In the final stage, articles meeting the inclusion criteria were ranked by citation count, and the 10 articles with the highest citations were selected for further analysis.

4. Results and Discussion

In this section, the author needs to explain the hardware and software used, dataset sources, initial data analysis, results, and results analysis/discussion. Presenting the results with pictures, graphs and tables is highly recommended. Formulas or evaluation measuring tools also need to be included here. There must be discussion/analysis, and you can't just rewrite the results in sentence form, but you need to provide an explanation of their relationship to the initial hypothesis. In addition, this section needs to discuss and elaborate on important findings.

The literature selection process yielded 10 articles that met the research criteria and had the highest number of citations on the topic of machine learning for user satisfaction classification and prediction. A summary of the characteristics of the analyzed studies is presented in table 1.

Table 1. Summary of Selected Articles.

Rank	Author(s)	Citations	Domain / Application	Machine Learning Algorithm(s)	Key Findings
1	Zhao et al. [3]	202	E-commerce sentiment analysis	LSIBA ENN	Optimized ML improved sentiment polarity classification.
2	De Prisco et al. [15]	74	Ambient Intelligence / Smart Gym	Random Forest, Genetic Algorithms	Intelligent music personalization increased satisfaction from 3.05 to 4.91.
3	Al-Hawari et al. [16]	55	IT Service Management	ML Model for Ticket Classification	Text classification improved service efficiency and user satisfaction.
4	Nguyen et al. [17]	41	Cellular network optimization	Reinforcement Learning	ML-based mobility optimization significantly improved satisfaction rates.
5	Yahya et al. [18]	40	Mobile app reviews	RNN, LSTM, BiLSTM	Hybrid deep learning outperformed traditional ML models in classifi ng NFR issues linked to user satisfaction.
6	Darko et al. [19]	25	Mental health applications	BERT, LightGBM, SHAP	Explainable ML effectively predicted determinants of user satisfaction.
7	Koonsanit et al. [20]	21	UX and service/product evaluation	SVM, Multiple ML Models	Momentary UX data significantly improved the prediction of final satisfaction.
8	Yuan et al. [21]	20	Smart Product Service Systems	Neural Networks	Context-aware systems improve personalized services and user satisfaction.
9	Lee et al. [22]	19	Book recommendation systems	CNN, ResNet, LSTM, BiLSTM, GRU, BiGRU	Multimodal deep learning improved the prediction of perceived satisfaction.
10	Khan et al. [23]	10	Google Play Store reviews	AdaBoost, XGBoost, ANN	Advanced ML models improved sentiment classification and understanding of user satisfaction.

Based on table 1, research on user satisfaction classification and prediction has been applied to various domains, such as e-commerce, IT service management, mental health applications, recommendation systems, cellular networks, and smart product service systems. This indicates that user satisfaction is a critical aspect that must be considered in the development of various digital services.

In terms of methodology, the reviewed studies demonstrate a shift in the use of machine learning algorithms from conventional approaches toward more complex models.[3] uses LSIBA ENN to improve sentiment classification on e-commerce platforms, while[15] employs Random Forests and Genetic Algorithms to generate music recommendations capable of enhancing user satisfaction. Additionally,[16] shows that machine learning-based ticket classification models can improve service efficiency and user satisfaction in an IT Service Management environment.

Advances in deep learning are also evident in several studies utilizing RNNs, LSTMs, BiLSTMs, CNNs, and GRUs.[18] found that a combination of deep learning models outperforms traditional machine learning methods in analyzing mobile app reviews. Similar findings were reported in[22] , which demonstrated that a multimodal approach based on

CNNs, ResNets, LSTMs, BiLSTMs, GRUs, and BiGRUs can improve user satisfaction predictions in book recommendation systems.

In addition to focusing on prediction accuracy, some studies have begun to address model interpretability.[19] uses a combination of BERT, LightGBM, and SHAP to identify factors influencing user satisfaction in mental health apps. The study's results indicate that explainable machine learning can help understand the reasoning behind model predictions, thereby enhancing system transparency.

Other research indicates that contextual data and user behavior also play a crucial role in improving prediction quality.[20] found that user experience (UX) data collected directly can enhance the accuracy of satisfaction predictions. Meanwhile,[21] leverages contextual information in smart product service systems to generate services that are more personalized and tailored to user needs.

Personalization is also a prominent trend observed in the reviewed studies.[15] ,[21] , and[22] demonstrate that systems capable of tailoring services based on user characteristics tend to yield higher satisfaction levels. Additionally,[17] proves that applying reinforcement learning to mobile network optimization can significantly enhance user experience and satisfaction.

Overall, the study's findings indicate that machine learning is an effective approach for classifying and predicting user satisfaction. Research trends point toward the use of deep learning, reinforcement learning, explainable AI, and personalization systems capable of understanding user needs more accurately. These findings suggest that the success of modern systems is determined not only by high predictive capabilities but also by the system's ability to provide adaptive, transparent, and user-oriented services

5. Conclusions

Based on the results of a Systematic Literature Review (SLR) of the 10 most-cited articles discussing the application of machine learning for user satisfaction classification and prediction, it can be concluded that machine learning has been utilized across various fields, such as e-commerce, recommendation systems, information technology services, healthcare applications, and communication networks. The study's findings indicate a shift in methods from conventional machine learning algorithms toward more advanced approaches, such as deep learning, reinforcement learning, and explainable artificial intelligence (XAI). Additionally, service personalization and the use of contextual data have proven effective in enhancing prediction quality and user satisfaction. Nevertheless, several challenges remain, including limitations in model generalization, data imbalance, model interpretability, and user privacy issues. Therefore, further research is recommended to develop models that are more transparent, adaptive, and capable of being applied across various domains by leveraging multimodal data and XAI approaches to improve prediction accuracy and user trust in the developed systems.

References

[1] M. Zaghloul, A. Elragal, and M. Hassan, "Predicting *e-commerce* customer satisfaction: Traditional *machine learning* versus *deep learning* approaches," *J. Retail. Consum. Serv.*, vol. 79, p. 103821, 2024, doi: 10.1016/j.jretconser.2024.103821.

[2] N. J. Prottasha, A. A. Sami, and T. K. Roy, "Transfer Learning for Sentiment Analysis Using BERT *Based* Supervised Fine-Tuning," *Sensors*, vol. 22, no. 11, p. 4157, 2022, doi: 10.3390/s22114157.

[3] A. Zhao and Y. Yu, "Knowledge-enabled BERT for Aspect-*Based* Sentiment Analysis," *Knowledge-Based Syst.*, vol. 227, p. 107220, 2021, doi: 10.1016/j.knosys.2021.107220.

[4] G. Zhou, Y. Wang, and L. Chen, "Understanding and Predicting *User satisfaction* with Conversational Recommender Systems," *ACM Trans. Interact. Intell. Syst.*, 2024, doi: 10.1145/3624989.

[5] A. Ligthart, C. Catal, and B. Tekinerdogan, "Systematic Reviews in Sentiment Analysis: A Tertiary Study," *Artif. Intell. Rev.*, vol. 54, no. 7, pp. 4997–5053, 2021, doi: 10.1007/s10462-021-09973-3.

[6] D. Roy and M. Dutta, "A Systematic Review and Research Perspective on Recommender Systems," *J. Big Data*, vol. 9, p. 59, 2022, doi: 10.1186/s40537-022-00592-5.

[7] A. K. M. B. Haque, A. K. M. N. Islam, and P. Mikalef, "*Explainable Artificial intelligence* (*XAI*) from a User Perspective: A Synthesis of Prior Literature and Future Research Directions," *Inf. Syst. Front.*, vol. 25, no. 6, pp. 2435–2459, 2023, doi: 10.1007/s10796-023-10417-9.

[8] O. Gheibi, D. Weyns, and F. Quin, "Applying *Machine learning* in Self-Adaptive Systems: A *Systematic literature review*," *ACM Trans. Auton. Adapt. Syst.*, vol. 16, no. 1, pp. 1–37, 2021, doi: https://doi.org/10.1145/3469440.

[9] N. Malik, A. Alzahrani, and A. Alghamdi, "*Natural Language Processing* for Analyzing Online Customer Reviews: A Survey, Taxonomy, and Open Research Challenges," *PeerJ Comput. Sci.*, vol. 10, p. e2203, 2024, doi: 10.7717/peerj-cs.2203.

[10] T. Bach, A. Khan, H. Hallock, G. Beltrão, and S. Sousa, "A *Systematic literature review* of User Trust in AI-Enabled Systems: An HCI Perspective," *Int. J. Hum. Comput. Interact.*, vol. 40, pp. 1–16, Nov. 2022, doi: 10.1080/10447318.2022.2138826.

[11] X. He, S. Kim, and K. Lee, "The Impact of Recommendation Systems on *User satisfaction*: The Moderating Role of Shopping Goals," *J. Theor. Appl. Electron. Commer. Res.*, vol. 19, no. 1, p. 24, 2024, doi: https://doi.org/10.3390/jtaer19010024.

[12] M. M. Agüero-Torales, J. I. Abreu Salas, and A. G. López-Herrera, "*Deep learning* and multilingual sentiment analysis on social media data: An overview," *Appl. Soft Comput.*, vol. 107, p. 107373, 2021, doi: https://doi.org/10.1016/j.asoc.2021.107373.

[13] T. Shaik, X. Tao, and C. Dann, "Sentiment Analysis and Opinion Mining on Educational Data: A Survey," *Nat. Lang. Process. J.*, vol. 2, p. 100003, 2023, doi: https://doi.org/10.1016/j.*nlp*.2022.100003.

[14] M. J. Page *et al.*, "The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews," *BMJ*, vol. 372, p. n71, 2021, doi: 10.1136/bmj.n71.

[15] R. De Prisco, A. Guarino, N. Lettieri, D. Malandrino, and R. Zaccagnino, "Providing music service in Ambient Intelligence: experiments with gym users," 2021, doi: 10.1016/j.eswa.2020.114433.

[16] F. Al-Hawari and H. Barham, "A *machine learning based* help desk system for IT service management," 2021, doi: 10.1016/j.jksuci.2019.04.001.

[17] M.-T. Nguyen and S. Kwon, "*Machine learning-Based* Mobility Robustness Optimization under Dynamic Cellular Networks," 2021, doi: 10.1109/LCOMM.2021.3067013.

[18] A. E. Yahya, A. Gharbi, W. M. S. Yafooz, and A. Al-Dhaqm, "A Novel Hybrid *Deep learning* Model for Detecting and Classifying Non-Functional Requirements of Mobile Apps Issues," 2023, doi: 10.3390/app13063683.

[19] A. P. Darko, C. O. Antwi, K. Adjei, B. Zhang, and J. Ren, "Predicting determinants influencing *user satisfaction* with mental health app: An *explainable machine learning* approach *based* on unstructured data," 2024, doi: 10.1016/j.eswa.2024.123647.

[20] K. Koonsanit and N. Nishiuchi, "Predicting final *user satisfaction* using momentary UX data and *machine learning* techniques," 2021, doi: 10.3390/jtaer16070171.

[21] W. Yuan, D. Chang, and T. Han, "A context-aware smart *product service* system development approach and application case," 2023.

[22] S. Lee, J. Kim, and E. Park, "Can book covers help predict bestsellers using *machine learning* approaches?," 2023, doi: 10.1016/j.ipm.2022.103225.

[23] M. Khan, M. Q. Khan, F. Malik, and N. Rahman, "Optimized Sentiment Classification of Google Play Store App Ratings Using Advanced *Machine learning* Models," 2024.