ALGEBRA : JURNAL PENDIDIKAN, SOSIAL DAN SAINS

ISSN : 2807-663X e-ISSN : 2807-629X
Journal Homepage : https://algebra.yana.or.id/index.php/ejournal/index
Volume 6 Number 1 (2026)

EXPLORING ONLINE COMMUNITY PERCEPTIONS OF MACHINE LEARNING USE IN ADJUSTING GAME DIFFICULTY LEVELS

Mahesha Jenar Yushayahya[1], Muhammad Rizky Dirwansyah[2*], Ilham Saputra[3], Arya Farija Putra[4], Muhammad Rezy Maulidiansyah[5]
[12345]Program Studi Informatika, Fakultas Teknik dan Informatika, Universitas Bina Sarana Informatika, Jakarta, Indonesia
*Correspondence Email: muhammadrizkydirwansah@gmail.com

ABSTRACT

This study aims to explore the online community's perception of the use of machine learning (ML) in dynamic difficulty adjustment (DDA) through computational text analysis. The use of ML in DDA has become an important area in game design due to its ability to increase engagement and personalize the gaming experience, but it has sparked debate regarding the fairness and transparency of the system. This study uses a descriptive quantitative approach by analyzing 3,016 comments from the Reddit and Steam communities using sentiment analysis, topic modeling, and word frequency analysis techniques. The sentiment analysis results show a dominance of positive sentiment (63.8%), followed by negative sentiment (20.9%) and neutral sentiment (15.0%). Topic analysis identified five main themes: Gameplay & Difficulty Adjustment, General Enjoyment & Perception, Narrative Experience & Balance, Combat Mechanics & Fairness, and Technical Reflection & Suggestion. Word frequency analysis showed the community's focus on the balance between challenge (difficulty) and enjoyment (fun) in the gaming experience. The research findings indicate that the online community positively accepts the application of ML in DDA, with the important notes of system transparency, fairness of mechanisms, and balance between technical challenges and players' emotional satisfaction. This research contributes to interdisciplinary studies between game studies, artificial intelligence, and computational social science, and serves as a reference for game developers in designing adaptive systems that are technically effective and accepted by players.

Keywords: Machine Learning; Dynamic Difficulty Adjustment; Sentiment Analysis; Topic Modeling.

INTRODUCTION

The modern gaming industry landscape is undergoing a tectonic shift, driven by the increasingly proactive evolution of machine learning (ML) technology. More than just an aid, this technology has transformed into a primary catalyst for the birth of a gaming ecosystem that can "breathe"—responding to user behavior with an unprecedented level of sensitivity. This is where dynamic difficulty adjustment (DDA) plays a central role. As an intelligent manifestation of this technology, DDA enables games to automatically and real-time modulate difficulty levels. What is the ultimate goal? To create a precise balance between the challenges faced and the player's comfort level, which is adapted on the fly using their individual abilities (Mortazavi et al., 2024).

Interestingly, the integration of military elements into DDA architecture is now no longer just a complementary feature, but has taken on a very strategic position in game design research. Its potential to deepen engagement and provide a personalized experience cannot be ignored (Hossan et al., 2024). Furthermore, a number of studies underscore the effectiveness of this approach in keeping permanent players in a flow state—an ideal psychological condition in which a sense of challenge does not turn into an agonizing cognitive burden (Paraschos & Koulouriotis, 2025). Technically, this means that the system has the autonomy to adjust enemy AI patterns, damage levels, and enemy reaction speeds to resonate with the user's competence (Naseer et al., 2025). But does this technical sophistication always yield graceful results? It seems that it's not that simple.

Behind the scenes of sophisticated algorithms, there is a heated debate regarding system transparency and procedural fairness. We see a dichotomy of perceptions that differ significantly: on the one hand, some players celebrate this adaptive system as the key to gaming satisfaction; on the other hand, there are those who feel they have lost control (agency) and even question the validity of their personal achievements (Yujie et al., 2025). These discussions often take place in online communities such as Reddit and Steam, which serve as a forum for players to share their experiences and opinions on AI in games (Gu et al., 2021).

Previous research has focused more on the technical aspects of ML implementation in games, such as the development of adaptive algorithms based on fuzzy logic (Paraschos & Koulouriotis, 2025). Or reinforcement learning for dynamic difficulty settings (Yujie et al., 2025).However, studies highlighting the perceptions of online communities regarding the implementation of this technology are still limited. Understanding these perceptions is important because it can provide input to developers in designing ML systems that are not only technically effective but also positively accepted by players (Romero-Mendez et al., 2023; Sanaei & Bozorgi-Amiri, 2025).

This study was prompted by this academic gap. We intend to conduct an in-depth exploration of how online communities actually view the application of machine learning in adjusting game difficulty levels. To dissect this complexity, we use a comprehensive computational text analysis approach, which includes sentiment analysis, topic modeling, and word frequency analysis as its main tools. Based on this, this study aims to explore how the online community views the application of machine learning in adjusting game difficulty levels through text analysis involving sentiment analysis, topic modeling, and word frequency analysis.

The purpose of this study is to determine how online communities view the application of machine learning in adjusting game difficulty levels through text analysis, identify the main topics that arise in discussions using topic modeling methods, and analyze player sentiment trends to determine how this technology is considered to enhance the player experience. Academically, this research contributes to interdisciplinary studies in the fields of game studies, artificial intelligence, and computational social science. Practically, the results of this research can be used as a reference for developers in designing more effective ML-based difficulty adjustment systems that are accepted by players. Socially, this research provides an understanding of how digital communities respond to the role of AI in interactive entertainment and how it impacts the acceptance of technology in digital society (Januar Singgih Abdullah & Agus Juhana, 2025; Mondal, 2025; Schelfhout et al., 2021).

RESEARCH METHODS

Research Type and Approach

This research uses a descriptive quantitative approach based on computational text analysis. This approach was chosen because it is capable of processing large amounts of data from online communities and identifying patterns of user perception of a phenomenon through natural language processing (NLP). This method combines two main techniques, namely sentiment analysis, to

determine emotional tendencies (positive, negative, neutral) in community comments, and topic analysis (topic modeling).

Data Sources and Types

The data used in this study comes from player communities on Reddit and Steam, two of the largest online forums used for discussions about games and AI technology. All data was collected and cleaned manually and automatically, resulting in a final dataset of 3,016 comments after the cleaning process.

Data Collection Procedure

1. Data Collection (Scraping): Data was obtained using *API* and *web scraping tools* such as PRAW (for Reddit) and Steam API, with the keywords "machine learning," "AI difficulty," and "adaptive challenge."
2. Data Preprocessing: Text was cleaned of non-informative elements through the following stages:
   - Case folding (converting letters to lowercase)
   - Tokenization
   - Stopword removal
   - Lemmatization
   - Removal of punctuation, URLs, and emojis
3. Data Storage: The cleaned data is stored in the cleaned_final_dataset.csv file for further analysis.

This research began with the process of data collection from the Reddit and Steam online communities. Next, data cleaning was carried out to remove irrelevant elements such as URLs, symbols, and duplicates. Once the data was ready, word frequency analysis was performed to find the most dominant words. The next process was sentiment analysis to identify the emotions of the community, followed by topic modeling to find the main themes of the discussion. The integration and interpretation stage was then carried out to connect the results of the two analyses, and the research ended with the visualization and reporting of results stage to present the findings comprehensively.

RESULTS AND DISCUSSION

Word Frequency Analysis

Based on the results of word frequency analysis after text cleaning and removal of stopwords and meaningless common words, we obtained the words most frequently used by the community in discussions related to the application of machine learning in adjusting game difficulty levels.

The dominant words include want, difficulty, fun, story, and level. These words illustrate the community's focus on the balance between challenge (difficulty) and enjoyment (fun) in the gaming experience.

Table 1. Fifteen Most Frequently Used Meaningful Words in Community Discussions

No	Words	Frequency	Interpretation
1	want	543	Indicating players' desires or expectations regarding game features
2	first	469	Describing the sequence or priority of experiences in the game
3	something	455	Commonly used when describing game elements
4	lot	445	Indicating the intensity of opinion in a discussion
5	difficulty	440	Focus primarily on the game's difficulty level
6	things	402	Describing various aspects of the game
7	fun	389	The fun aspect of the gaming experience
8	back	347	References to previous gaming experiences
9	story	345	Discussion of the narrative and game plot
10	hard	339	Views on the level of game challenge
11	better	335	Criticism or evaluation of game quality
12	work	335	Game system performance and adaptive features
13	level	329	Discussion about the leveling system and player progress
14	playing	328	Core player activities
15	made	320	Game design or development elements

Figure 1. WordCloud Visualization of Online Community Perceptions

Figure 1 shows a visualization of the *WordCloud* resulting from word frequency analysis. The size of each word reflects its frequency of occurrence in the dataset. Words such as *difficulty*, *fun*, *story*, and *level* appear most prominently, indicating that the issue of balance between challenge and playability is a central theme in online community discussions.

These results show that the online community focuses on the aspects of challenge, enjoyment, and narrative in the game. The words “difficulty” and “hard” indicate attention to the difficulty level adaptation mechanism regulated by the machine learning system, while the words ‘fun’ and “story” emphasize that emotional and narrative experiences remain a priority for players.

These findings indicate that the application of machine learning in dynamic difficulty adjustment is positively received as long as it maintains a balance between technical challenges and players' emotional satisfaction (Fisher & K. Kulshreshth, 2025).

Sentiment Analysis

The distribution of community sentiment toward the use of ML in games is shown in Figure 2 below.

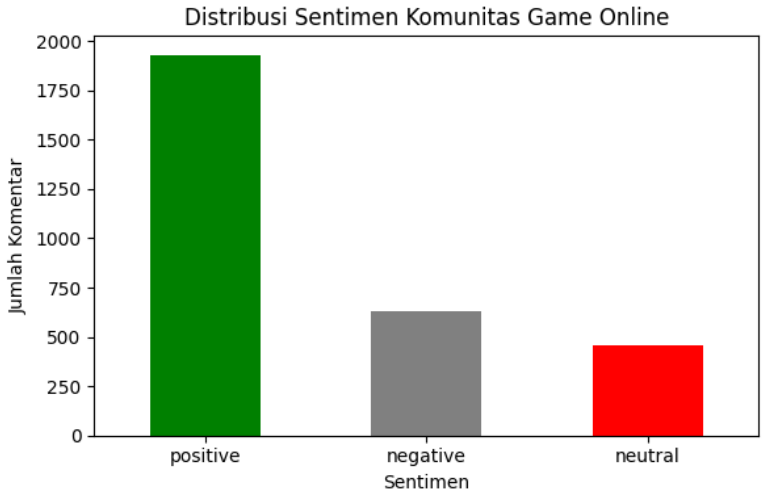

Figure 2. Distribution of Online Gaming Community Sentiment

The analysis results show the following distribution:

- Positive: 1,929 comments (63.8%)
- Negative: 632 comments (20.9%)
- Neutral: 455 comments (15.0%)

From these results, it can be concluded that positive sentiment dominates, indicating that the majority of players have an optimistic perception of the application of *machine learning* in adjusting the difficulty level of the game.

Positive comments generally highlight aspects of innovation and playing comfort, such as a more fair and personalized experience. Negative comments discuss more issues of fairness and transparency, such as concerns that AI “rigs” the game unfairly. Neutral comments are generally technical suggestions or descriptions without emotional opinions. These results are in line with the

findings of Mortazavi et al. (2024) and Hossan et al. (2024), which state that ML-based innovations in games tend to be well received as long as they do not interfere with the player's sense of control.

Topic Analysis (Topic Modeling)

Topic modeling analysis was performed using the Latent Dirichlet Allocation (LDA) algorithm (Xiao, 2025). The results produced five main topics, each with dominant keywords as shown in Table 2.

Table 2. Topic Modeling Results for Online Gaming Communities

Topic	Dominant Keywords	Thematic Label	Interpretation
1	like, zombies, difficulty, map, level, items	Gameplay & Difficulty Adjustment	Focus on difficulty level adaptation in game mode.
2	good, think, fun, people, years	General Perception & Enjoyment	General opinion and positive impressions of adaptive features.
3	story, character, way, difficulty, make	Narrative Experience & Balance	Discussion about the balance between story and challenge.
4	damage, combat, enemies, hard, played	Combat Mechanics & Fairness	Concerns about the fairness of AI systems in combat.
5	use, want, need, work, know	Technical Reflection & Suggestion	Technical advice and community reflections on ML implementation.

These five topics show that community discussions cover two main dimensions:

1. Technical aspects how AI adjusts game difficulty (Topics 1, 4, 5).
2. Player experience aspects how players feel these adjustments impact enjoyment and fairness (Topics 2, 3).

These findings are in line with research by Fisher & K. Kulshreshth (2025), which states that positive perceptions of AI depend on a balance between challenge and enjoyment.

Integration of Sentiment and Topic Analysis

The integration of the two analysis results shows that:

- Topics 1 and 2 → Dominant sentiment is positive (the community supports ML innovation in gameplay).
- Topics 3 and 4 → Negative sentiment (criticism of fairness and system control).
- Topic 5 → Neutral sentiment (technical discussions, ideas, and suggestions).

The online community's perception of the use of machine learning in game difficulty settings is moderately positive.

The community finds this technology interesting and useful, but still demands transparency and a balance of challenges so that the gaming experience remains fair and enjoyable.

These findings reinforce the results of several previous studies. Mortazavi et al. (2024) stated that ML-based DDA systems can increase player retention when they are transparent and adaptive. Paraschos & Koulouriotis (2025) emphasized the importance of fuzzy logic in maintaining difficulty balance. Gu et al. (2021) found that the digital community's perception of AI is greatly influenced by collective experiences and social opinions. Overall, the results of this study indicate that the integration of machine learning in games is positively received by the online community, especially when the system supports a more fair, challenging, and personalized gaming experience.

Clearly, this research has given us a very comprehensive picture of the online gaming community's reaction to the integration of machine learning into the difficulty adjustment system. We're not just talking about technicalities, you know.

Our findings confirm an important fact: Artificial Intelligence (AI) should no longer be viewed as merely a technical component a set of code that functions in the background. More than that, AI has now transformed into a very powerful social element. It actively shapes players' perceptions, influences their emotional experience while playing, and even sets their expectations of the game product itself. This is a shift in mindset that we must adopt.

CONCLUSIONS

Based on the results of data analysis and discussion in the previous chapter, this study successfully explored the online community's perception of the use of *machine learning* (ML) in adjusting game difficulty levels (*dynamic difficulty adjustment*) by utilizing a *sentiment analysis* and *topic modeling* approach to user comments on the Reddit and Steam platforms. The community's perception of the use of *machine learning* in games tends to be positive. Sentiment analysis shows that 63.8% of

comments are positive, focusing on improved gaming experience, adaptive innovation, and system fairness. The topics discussed by the community were divided into five main themes, namely Gameplay & Difficulty Adjustment, General Enjoyment & Perception, Narrative Experience & Balance, Combat Mechanics & Fairness, and Technical Reflection & Suggestion. These results show that users actively discuss both technical and emotional aspects when evaluating AI-based adaptive features. Keyword frequency analysis reinforces the finding that the balance between challenge and comfort is a major issue. Words such as *difficulty*, *fun*, *story*, and *level* appear dominantly, reflecting the importance of a gaming experience that is not only challenging but also enjoyable and meaningful. The integration of *machine learning* into the game's difficulty system is positively accepted as long as the system is transparent and balanced. The community supports AI-based adaptations that are player-centered, i.e., capable of adjusting to the player's abilities without eliminating the sense of achievement. Thus, this study confirms that the application of machine learning in adjusting game difficulty levels has the potential to increase player satisfaction and retention, provided that the aspects of transparency, fairness, and balance are maintained. Game developers and researchers can use these recommendations. Game developers are advised to create a customizable machine learning system while still giving players control. They should also ensure that the difficulty adjustment mechanism remains clear and consider emotional aspects when testing dynamic difficulty adjustments. The use of bigram/trigram analysis, semantic clustering, and deep learning models such as BERT or RoBERTa will improve research results for future researchers. In addition, expanding data sources to other platforms will also be beneficial. This research can also serve as a basis for creating conceptual models of AI acceptance in gaming experiences that combine technical, psychological, and social elements.

BIBLIOGRAPHY

Fisher, N., & K. Kulshreshth, A. (2025). Dynamic Difficulty Adjustment in Games: Concepts, Techniques, and Applications. *From Pixels to Play - The Art and Science of Video Games [Working Title]*. https://doi.org/10.5772/intechopen.1011703

Gu, L., Shen, X., & Jia, A. L. (2021). User Activities in Game Replay Sharing Communities and Their Implications for User Retention. *IEEE Transactions on Games*, *13*(2), 205–215. https://doi.org/10.1109/TG.2021.3058187

Hossan, M. M., Fouda, M. M., & Eishita, F. Z. (2024). Adaptive Game Design Using Machine Learning Techniques: A Survey. *Proceedings of 2024 IEEE International Conference on Internet of Things and Intelligence Systems, IoTaIS 2024*, 144–150. https://doi.org/10.1109/IoTaIS64014.2024.10799330

Januar Singgih Abdullah, & Agus Juhana. (2025). The Development and Effectiveness Evaluation of Game Labs in Learning: Content Analysis and the Impact of Gamification. *DIAJAR: Jurnal Pendidikan Dan Pembelajaran*, *4*(1), 85–93. https://doi.org/10.54259/diajar.v4i1.3414

Mondal, D. (2025). Encouraging Digital Participation of Communities in Tourism Development: The Future of AI, VR, and Blockchain for Local Communities. *SSRN*. https://doi.org/https://dx.doi.org/10.2139/ssrn.5388167

Mortazavi, F., Moradi, H., & Vahabie, A. H. (2024). Dynamic difficulty adjustment approaches in video games: a systematic literature review. *Multimedia Tools and Applications*, *83*(35), 83227–83274. https://doi.org/10.1007/s11042-024-18768-x

Naseer, F., Khan, M. N., Addas, A., Awais, Q., & Ayub, N. (2025). Game Mechanics and Artificial Intelligence Personalization: A Framework for Adaptive Learning Systems. *Education Sciences*, *15*(3). https://doi.org/10.3390/educsci15030301

Paraschos, P. D., & Koulouriotis, D. E. (2025). Fuzzy Logic-Based Dynamic Difficulty Adjustment for Adaptive Game Environments. *Electronics (Switzerland)*, *14*(1). https://doi.org/10.3390/electronics14010146

Romero-Mendez, E. A., Santana-Mancilla, P. C., Garcia-Ruiz, M., Montesinos-López, O. A., & Anido-Rifón, L. E. (2023). The Use of Deep Learning to Improve Player Engagement in a Video Game through a Dynamic Difficulty Adjustment Based on Skills Classification. *Applied Sciences (Switzerland)*, *13*(14). https://doi.org/10.3390/app13148249

Sanaei, A. H. A. B. M., & Bozorgi-Amiri, A. (2025). Designing a personalized gamification social network platform using machine algorithms (clustering) (use case: user suggestion for doing data science learning projects in work teams). *International Journal of Nonlinear Analysis and Applications*. https://doi.org/10.22075/ijnaa.2023.31702.4701

Schelfhout, S., Bowers, M. T., & Hao, Y. A. (2021). Balancing Gender Identity and Gamer Identity: Gender Issues Faced by Wang 'BaiZe' Xinyu at the 2017 Hearthstone Summer Championship. *Games and Culture*, *16*(1), 22–41. https://doi.org/10.1177/1555412019866348

Xiao, Q. (2025). *The Influence of User Experience Satisfaction in VR Serious Games: Flow Experience and Self-efficacy as Mediating Effects*. Springer Nature Switzerland.

Yujie, D., Zhou, T., & Xu, X. (2025). Research on Personalized Motion Difficulty Dynamic Adjustment Algorithm for VR Rehabilitation Sports Based on Reinforcement Learning. *IEEE Access*, *13*(April), 107783–107799. https://doi.org/10.1109/ACCESS.2025.3579160