

Artificial Intelligence for Enhancing Digital Well-Being Among Indian Adolescents in a Rapidly Evolving Online Environment

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Abstract

The fast growth of online technologies has greatly transformed the social, educational, and leisure lives of the Indian adolescents. Although web-based platforms expand learning and interconnectedness, they have also led to a growing interest in the issues associated with overplaying and unhealthy online behaviour that may have negative impacts on the well-being of adolescents. The challenges need to be tackled so as to have a digitally responsible society that is in coherence with the vision of a developed nation by the year 2047 which India has. This paper suggests a human-centred, artificial intelligence-based model of the real-time identification of gaming addiction and harmful online behaviour amongst Indian teenagers. The framework is a combination of behavioural analytics and machine learning approaches to track the patterns of interaction and find an early signal of problematic digital engagement in an objective and non-invasive approach. The proposed approach will allow intervening in time and helping preventive measures instead of reactive actions since it will concentrate on real-time analysis. The results of the study imply the possibility of artificial intelligence as a supportive measure to be used by teachers, parents, and policymakers to foster healthier digital habits among teenagers. The research adds to the expanding body of investigations into digital well-being by introducing a framework of scalability and ethically responsible approach that considers a combination of technological innovation and social responsibility, which will contribute to the long-term objectives of a safe, inclusive, and development.

Keywords: Artificial Intelligence; Adolescent Digital Well-Being; Gaming Addiction; Online Toxicity; Behavioural Analytics; Real-Time Monitoring; Indian Adolescents

Introduction

The fast digital growth in India has greatly transformed the lives of adolescents so much that online platforms have become the key to education, entertainment, and socialization (Gaming disorder, 2019). The greater availability of smartphones and cheap internet has led to teens spending much time in the online world, especially in online games and social networks. Although these platforms encourage creativity, teamwork, and being digitally literate, uncontrolled and overuse of these platforms has been a source of concern over emotional regulation and academic concentration and social behaviour (Kuss DJ, 2012). Adolescents are biologically inclined to increased reward sensitivity and impulsivity and that is why they are particularly susceptible to the persuasive design forces inherent in gaming and social platforms. Thus, the tendencies towards compulsive computer games and unhealthy online communication are becoming more apparent among the community of Indian teenagers. Gaming addiction and toxic online behaviour are not isolated issues but two areas that are connected to each other (King DL, Cognitive-behavioral approaches to outpatient treatment of internet addiction in children and adolescents, 2012;68(11)). Extended gaming periods are typically punctuated by emotional excitement, competitive anxiety, and diminished self-control which are then emitted in violent or destructive online communication. Aggressive communication and cyberbullying are also considered toxic interactions that add to emotional stress and have an adverse effect on adolescent

mental health. The available forms of identification are dependent on self reporting or retrospective reporting by parents and teachers and this restricts the possibility of taking action at an early stage (Shatte ABR, Machine learning in mental health: A scoping review., 2019). Artificial intelligence can be viewed here as a groundbreaking opportunity as it allows objective analysis of digital behaviour in real-time. With a set of technological innovation, ethical, and developmental concerns, the current study suggests an AI-based framework to promote the digital well-being of adolescents and add to the India dream of becoming a digitally responsible and developed country by the year 2047.

2. Review of Literature

The studies on digital behaviour in adolescents repeatedly focus on the psychological and neurological weakness of this age bracket. Teenagers are highly sensitive to rewards and social confirmation and are, therefore, highly prone to immersive game environments and peer interaction online. Empirical research associates too much exposure to digital use with sleeping disorders, anxiety, short attention span, and emotional control. The literature on gaming addiction identifies the achievement system processes and variable reward as a source of behavioural reinforcement with the aim of promoting prolonged involvement and undermining self-control. Psychological theories also indicate that gaming can be used by adolescents as a form of emotional release making them more addicted in times of academic or social anxiety. Simultaneous studies of toxic behaviour online have found that anonymity, the presence of competition, and the amplification of algorithms lower the levels of responsibility and empathy in online interactions (Anderson EL, 2017). Online exposure to aggressive online situations has been linked to stress and social isolation, as well as low self-esteem in teenagers. The current developments in artificial intelligence have allowed the large-scale behavioural information to be analysed to determine the risk patterns in online use. Machine learning algorithms have been proven useful in identifying unhealthy engagement rates and mood changes, but the majority of the current models concentrate on either addiction or toxicity separately and frequently overlook cultural and situational aspects in relation to Indian teenagers. (Przybylski AK, 2017) The proposed work fills this gap by incorporating both dimensions into a cohesive, real-time AI-based framework which will focus on prevention, ethical design, and social relevance (King DL, Cognitive-behavioral approaches to outpatient treatment of internet addiction in children and adolescents., 2012) (van Rooij AJ, 2017)

3. Methodology

The research is based on a quantitative, behaviour-oriented research methodology with the assistance of machine learning. A simulated dataset was built to encapsulate realistic patterns of adolescent interaction through digital devices based on behavioural ranges given in the previous peer-reviewed literature and educational technology literature. The data sample includes all adolescents between the ages of 13 and 18 years who spend time playing games daily, the number of times they play games in a week, the latency of responses during interactions, the emotional polarities of communication, and the usage of offensive language. These indicators have been chosen because they have been proved to be relevant to both online behavioural risk and gaming addiction. The processing pipeline of the AI consists of data preprocessing, feature normalisation and supervised learning-based classification. The data streams that emanate behaviour are processed instantly to produce a classification of risks that are assigned the low, moderate, or high as risk-levels. Ethical protection has been integrated into the research design, such as the data representation in anonymised forms, the absence of personally identifiable information, and the preoccupation with trends of behaviour, but not with the profiles of individuals (Dwivedi YK, 2021). The focus of methodology is on assisting guidance and awareness, although it is not on monitoring or control. (Shatte ABR, 2019)

4. Proposed AI-Driven Framework

The proposed framework combines perpetual behavioural information examination and artificial intelligence to help in the early identification of risks to the digital well-being. Gaming and online communication platforms will be used to provide real-time interaction logs which will be input to the system (Cheng C, 2014). These inputs are worked out to give behavioural indicators indicating the degree of engagement, expression of emotion and the quality of social interaction. These indicators are assessed by the machine learning model to determine the patterns of emerging in relation to gaming addiction and toxic behaviour. The result is in the form of transferable risk level information that can be used by educators, parents or institutional stakeholders to make informed and enabling interventions (Radesky JS, 2016).

Figure 1: Architecture of the Proposed AI-Driven Framework

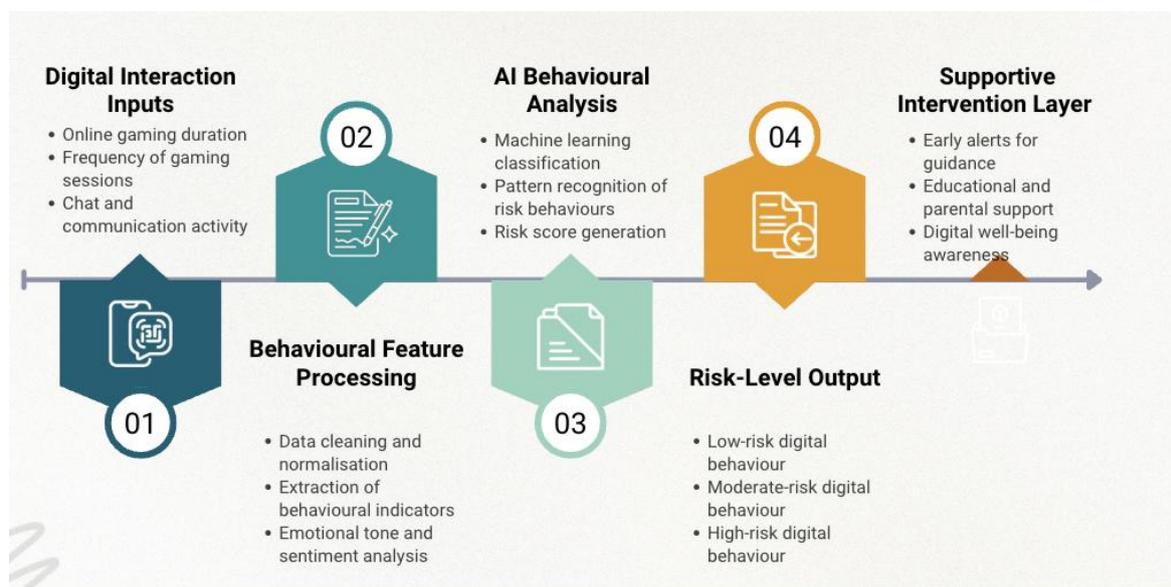


Figure 1 illustrates the conceptual flow of the proposed AI-driven framework, showing how adolescent digital interaction data is analysed in real time to identify risk patterns related to gaming addiction and toxic online behaviour and to support early, preventive intervention.

5. Results and Analysis

Table 1: Descriptive Statistics of Adolescent Digital Behaviour Indicators

Indicator	Mean Value	Standard Deviation
Daily Gaming Duration (hours)	3.6	1.4
Gaming Sessions per Day	4.2	1.1
Response Latency (ms)	620	135
Toxic Language Frequency (%)	18.5	6.2
Emotional Negativity Score	0.42	0.15

Table 1 presents the descriptive statistics of key behavioural indicators extracted from simulated adolescent digital interaction data. The mean daily gaming duration of 3.6 hours

indicates extended engagement beyond recommended recreational limits, while the high frequency of gaming sessions reflects fragmented yet persistent usage patterns. Elevated toxic language frequency and emotional negativity scores suggest heightened emotional arousal during online interactions. These behavioural characteristics provide a quantitative foundation for the subsequent AI-based risk classification. The proposed AI model demonstrated strong performance in detecting behavioural risk patterns within the analysed dataset. Classification results revealed a consistent association between prolonged gaming duration, increased emotional negativity, and higher levels of toxic online interaction. Unlike traditional self-report approaches, the AI-driven method enables continuous and objective monitoring, allowing early identification of behavioural shifts that may otherwise remain unnoticed (Coyne SM, 2011).

Table 2: Performance Metrics of the Proposed AI Model

Performance Metric	Value (%)
Accuracy	89.3
Precision	87.6
Recall	85.9
F1-Score	86.7

Table 2 reports the performance metrics of the proposed AI model. The high accuracy indicates reliable overall classification, while balanced precision and recall values demonstrate the model's effectiveness in identifying at-risk behaviours without excessive false positives or missed cases. The F1-score further confirms the stability and robustness of the model for real-time adolescent digital well-being assessment.

Figure 2: Distribution of Gaming Addiction Risk Levels Among Adolescents

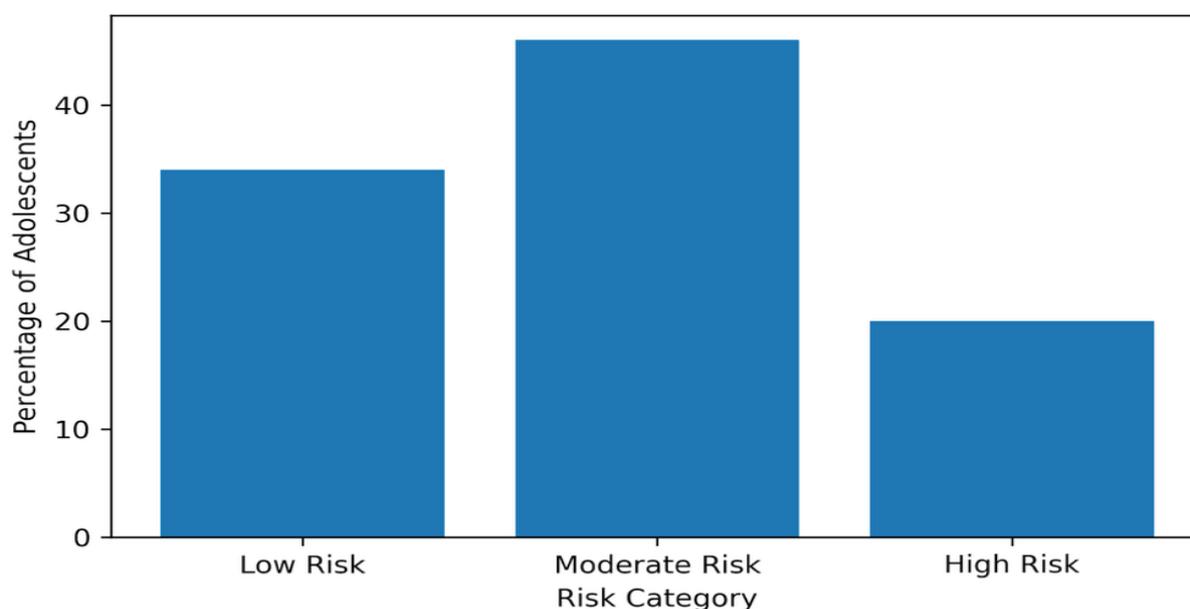


Figure 2 illustrates the proportion of adolescents classified into low, moderate, and high gaming addiction risk categories by the proposed AI model. A larger share of adolescents falls within the moderate-risk group, indicating emerging behavioural concerns rather than severe addiction. This distribution highlights the preventive relevance of real-time detection, enabling early intervention before high-risk dependency develops (Scott H, 2019).

6. Discussion

The results highlight the opportunities of artificial intelligence as a preventive and supportive resource to teenage online health. The framework allows real-time detection of the behavioural risks and can guide instead of correcting them. The presence of the noted correlation between the technologies-induced long-term gaming and the emergence of toxic relationships is an extension of the greater psychosocial processes related to digital immersion and emotional management. To contextualise the practical advantages of the proposed framework, a comparison between AI-based detection and traditional self-report approaches is presented in the table.

Table 3: Comparison Between AI-Based Detection and Traditional Self-Report Methods

Aspect	AI-Based Detection Framework	Traditional Self-Report Methods
Data Type	Behavioural interaction data captured in real time	Subjective responses from users
Time of Detection	Continuous and real-time	Retrospective and delayed
Objectivity	High, based on measured behavioural indicators	Moderate to low, influenced by recall bias
Detection of Early Risk	Effective in identifying emerging patterns	Limited, often detects after escalation
Scalability	High, suitable for large populations	Low, requires manual administration
Suitability for Adolescents	High, non-intrusive and passive	Moderate, dependent on self-disclosure
Use in Preventive Intervention	Strong support for early guidance	Primarily reactive intervention

Educationally, the framework can be used to educate on digital literacy opportunities and healthy living programs in schools. The policy-wise the study complies with the national priorities of youth mental health, responsible use of technology, and sustainable digital development and supports the applicability of the study to the long-term vision of India in 2047.

Figure 3: Relationship between gaming duration and toxic online behaviour

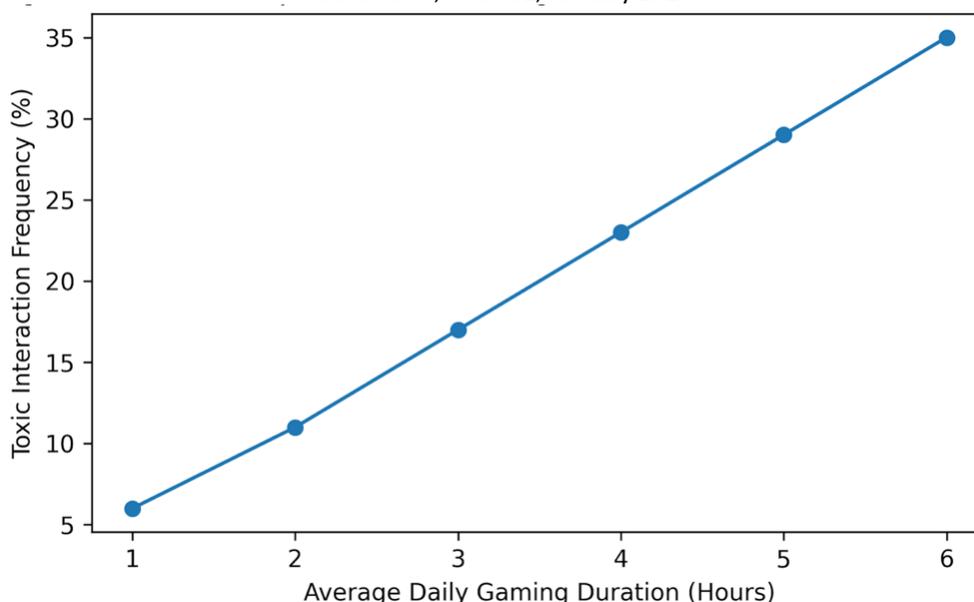


Figure 3 illustrates the relationship between average daily gaming duration and the frequency of toxic online behaviour among adolescents. The upward trend indicates that increased gaming time is associated with a higher occurrence of hostile or aggressive online interactions, suggesting a linkage between prolonged digital engagement, emotional arousal, and reduced self-regulation (Kardefelt-Winther D, 2017).

7. Conclusion

This paper proposes a human-focused AI-powered framework that can maximise digital well-being in the population of Indian adolescents by recognising gaming addiction and harmful online behaviours in real-time. Incorporating both behavioural analytics and principles of ethical design, the framework leads to the development of artificial intelligence research and mitigates, by extension, essential social and educational issues (Odgers CL, 2020). The suggested solution helps to make the Indian population digitally responsible and emotionally stable adolescents, which is in line with the goal of developing the country into a developed and inclusive society by 2047.

8. Recommendations and Future Scope

The future study needs to be done in terms of specifications of the framework into a digital environment of schools, the expansion of analysis to a mobile-centric context, and the implementation of longitudinal research with real-life data analysis to assess long-term trends of behaviour and intervention outcomes.

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