

The logo for RADemics, featuring the text "RADemics" in white on a blue arrow-shaped background pointing to the right. The arrow is part of a larger blue horizontal bar that is attached to a dark blue vertical bar on the left side of the page.

RADemics

Graph-Based Social Media Addiction Analysis and Its Impact on Academic Performance

An abstract graphic consisting of several thin, curved lines in shades of blue and grey, originating from the bottom left and extending upwards and to the right, resembling a stylized plant or a network structure.

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Graph-Based Social Media Addiction Analysis and Its Impact on Academic Performance

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Abstract

Rapid growth of digital communication platforms has transformed the interaction patterns of students and significantly influenced behavioral dynamics within academic environments. Continuous engagement with social networking platforms has raised increasing concerns regarding social media addiction and its potential impact on learning behavior, attention span, and academic productivity. Effective understanding of this phenomenon requires analytical approaches capable of capturing the complex interaction structures present within digital communication systems. Graph theory and network science provide a powerful framework for modeling social media interactions as interconnected networks where users represent nodes and communication relationships represent edges. Structural properties of these interaction networks, including connectivity patterns, interaction density, and community clusters, reveal important behavioral signals associated with persistent online engagement. This book chapter presents a graph-based analytical perspective for investigating social media addiction and its relationship with academic performance among students. Integration of graph analytics with machine learning techniques enables extraction of network-based features that support predictive modeling of behavioral patterns within digital environments. Analysis of communication networks provides insights into engagement intensity, influence structures, and cluster formation that contribute to sustained digital participation. Behavioral patterns linked with continuous social media engagement influence study routines, concentration levels, and time allocation toward academic activities, ultimately affecting student academic outcomes. Network-based analytical frameworks offer deeper understanding of how interaction structures within digital communities reinforce engagement behaviors that influence educational performance. Insights derived from graph-based behavioral analysis contribute to the development of intelligent monitoring systems capable of identifying early indicators of excessive social media engagement and supporting intervention strategies for balanced technology usage in educational environments.

Keywords: Social Media Addiction, Graph Analytics, Academic Performance, Social Network Analysis, Machine Learning, Digital Behavior Analysis.

Introduction

Rapid expansion of digital communication platforms has significantly transformed the social and academic environments of students across the world. Social networking platforms serve as

major channels for communication, information exchange, entertainment, and collaborative learning [1]. Continuous connectivity offered by mobile devices and internet-based applications has integrated social media deeply into everyday academic life. Students frequently engage with platforms for academic discussions, group coordination, resource sharing, and interaction with peers. Digital communication tools provide instant access to educational materials and facilitate collaboration beyond classroom boundaries [2]. Increased reliance on these platforms has created a digital ecosystem where learning activities often coexist with social interaction and entertainment. While these platforms offer several benefits for knowledge sharing and connectivity, excessive engagement has raised growing concerns about behavioral dependency and reduced academic focus [3]. Constant exposure to digital notifications, multimedia content, and interactive features encourages prolonged engagement that gradually alters daily routines and attention patterns. Academic environments require sustained concentration, structured study schedules, and disciplined time management, yet frequent interaction with social networking platforms introduces interruptions that affect learning continuity [4]. Such conditions create an environment where digital engagement becomes embedded within daily activities, including study sessions and classroom participation. Growing integration of social media into academic life therefore demands careful examination of its influence on student behavior and educational outcomes [5].

Social media addiction has emerged as a behavioral phenomenon associated with excessive online interaction and persistent engagement with digital platforms. Continuous exposure to rapidly updated content streams, interactive discussions, and social feedback mechanisms encourages repeated usage of networking applications throughout the day [6]. Behavioral patterns associated with addiction include frequent checking of notifications, prolonged browsing sessions, and difficulty maintaining focus on offline responsibilities. Students often encounter environments where digital interaction provides immediate social gratification through likes, comments, and shared content [7]. Such feedback systems reinforce continuous participation and create habits of repeated engagement within online communities. Persistent interaction with digital platforms gradually shapes daily behavioral routines where social networking becomes integrated into both academic and leisure activities. Over time, these routines influence attention allocation, productivity levels, and engagement with academic tasks [8]. Repeated digital interruptions reduce the ability to sustain cognitive focus during reading, writing, and analytical activities required for academic performance. Patterns of continuous online engagement also influence time distribution between academic responsibilities and digital participation [9]. Behavioral research highlights strong associations between excessive social media usage and reduced study duration, delayed completion of assignments, and lower academic engagement. Increasing recognition of these behavioral trends has stimulated growing interest in investigating the relationship between social media activity patterns and educational performance among students [10].