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**Impact of Social Media Reels Addiction on the Mental Health of
Teenagers & adults in Bangladesh**

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This Thesis paper has been submitted in fulfillment of the requirements for the degree
of Bachelor of Science in Software Engineering.

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Mental Health of Teenagers & Adults in
Bangladesh

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
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APPROVAL PAGE

APPROVAL

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DEDICATION

This thesis is dedicated to my wonderful family, who have provided unwavering love, support, patience, and sacrifices. To my parents, who were always there to support me, encouraged me endlessly, and dreamed my dreams with me - thank you! To my siblings and companions whose kindness and support mean more than I can say. This work is also dedicated to all young people experiencing mental health challenges (especially with technology and social media now dominating our everyday experiences). I hope this research encourages awareness, consideration, compassion, and practice of support for their health.

ABSTRACT

The fast emergence of short-form video platforms such as Instagram Reels, TikTok, and Facebook Reels has changed the face of digital participation especially among the younger generations and is already shaping expectations around such content. This study will investigate short-form social media reels addiction, and risk of mental illness, specifically, anxiety, depression, stress, and sleep problems in adolescents and young people ages 13–25 years old, in Bangladesh. A cross-sectional survey of 135 active reels users was conducted, collecting demographic information, usage, and mental health self-reported indicators. Five supervised machine learning algorithms were developed (Logistic Regression, Random Forest, Naive Bayes, k-Nearest Neighbors and Multilayer Perceptron) to predict mental health risk from the data overall, featuring summary behavioral and demographic information. The model evaluation metrics used were accuracy, AUC, precision, recall, F1 score, and Matthews Correlation Coefficient. The Logistic Regression model was the most powerful model, achieve the highest accuracy (94.1%) and AUC (0.986), while Random Forest achieved the second highest accuracy (92.6%) and AUC (0.980), but both had low false-negative rates, which is ideal for recognizing these risks early. The primary predictors include spending over two hours per day viewing social media reels, viewing reels late in the evening, and developing social comparison behaviours. Social media users are already connected to mental health problems, but they found that even a small amount of usage and risky behaviours not related to being an addict could worsen mental health vulnerability for some patients.

Keywords: Social media addiction, Reels, TikTok, Mental health, Machine learning, Bangladesh, Youth, Digital wellness.

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LIST OF ABBREVIATIONS

- ML : MACHINE LEARNING
- ROC : RECEIVER OPERATING CHARACTERISTIC
- AUC : AREA UNDER THE CURVE
- KNN : K-NEAREST NEIGHBORS
- MCC : MATTHEWS CORRELATION COEFFICIENT
- DSM : DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS

CHAPTER 1

INTRODUCTION

1.1 Background

In the past decade, the rapidly involving landscape of social media has significantly transformed communication, entertainment, and everyday life worldwide. Among the several most recent trends, short-form video platforms Instagram Reels, TikTok, and Facebook Reels have achieved prominence among millions, particularly the younger generations. In addition to quantitative evaluation metrics, we used a full suite of qualitative analysis tools, including visualization tools, that Orange ML provided, to gain deeper information from the dataset, and the models' reasoning. Importantly, we created confusion matrices, which may be seen as the best breakdown of the prediction results on a breed-by-breed basis.

Their analysis also uncovered high accuracies of some breeds, such as Dalmatian and Rottweiler, misclassification types that persisted (especially closely related breeds such as Beagle and Labrador Retriever and to lesser degree Labrador Retriever and Poodle), to find some common overlapping traits regarding coat color and body, some proportions, and facial traits, reiterating the problems posed by vertebrate models, which partly rationalized the need for model abstraction and real world implementation, and highlighting and justifying model improvement.

Additionally, we created mosaic plots to provide an assessment on the distribution of sizes and traits among the breeds, despite claims of even representation being made in the earlier analysis, the plots verified that indeed no one breed or no one size category was over or under represented.

1.2 Problem Statement

The increasing incidence of social media reels addiction among adolescents and adults in Bangladesh has emerged as a serious public health concern which urgently requires academic and professional intervention. Platforms providing video content in a short, easily digestible format, including Instagram Reels, TikTok, and Facebook Reels, have become part of the everyday activities of the youth, delivering endless highly appealing content that promotes mindless and binge viewing. These platforms, in addition to providing the youth with novel avenues of self-expression and entertainment, expose the user to serious risks to mental health due to their design features which are highly engaging and addictive.

The youth of Bangladesh are consuming reels to a dangerous degree, which is increasing the likelihood of experiencing a range of negative mental health issues, such as increasing anxiety, depressive symptoms, stress, sleep issues, and social withdrawal. There is a growing concern that these mental health challenges will interfere with academic and professional pursuits, relationships, and overall wellbeing.

Despite the recognized global implications of social media addiction, particularly regarding visual and short-video content, the specific impact of reels addiction within Bangladesh remains insufficiently understood. Unlike many Western or economically developed settings where much research has been conducted, Bangladesh's unique socio-cultural context characterized by rapid digital adoption, social stigma surrounding mental health, educational pressures, and varying levels of digital literacy may interact differently with technology used to influence psychological outcomes. Existing studies often broadly address social media use without disentangling the distinct dynamics of reels-based platforms, which differ in content format, user engagement mechanisms, and addictive potential.

Moreover, the behavioral, demographic, and psychosocial factors that modulate the relationship between reels addiction and mental health in Bangladesh have not been systematically modeled with robust quantitative methods. This gap in knowledge restricts the development of specific, evidence-based interventions, digital literacy programs, and mental health policy frameworks tailored to the needs of Bangladeshi

teenagers and young adults. Without local data-driven decisions, efforts to mitigate reels addiction's negative impacts have the potential to be generic and less effective. In order to meet these urgent challenges, there is an acute requirement for solid, evidence-based predictive models that are able to include complicated behavioral and demographic variables to recognize patterns of reels use that are strongly predictive of mental health risk. These models can enable early detection of vulnerable individuals, with early prevention and targeted interventions.

1.3 Research Questions, Objectives & Scope

1.3.1 Research Questions

This study is designed to answer several critical questions:

1. What is the association between social media reels usage patterns and mental health risk, including indicators such as anxiety, depression, stress, and sleep disturbances, among Bangladeshi teenagers and adults?
2. Which specific behavioral and demographic features, such as daily usage hours, late-night watching, and self-reported problematic use indicators, are the most significant predictors of mental health risk in this population?
3. How accurately can machine learning models classify Bangladeshi individuals as at risk for mental health problems based on their social media reels usage data?

3.2 Research Objectives

To systematically address the research questions posed in this study, several focused objectives have been established that guide the entire investigative process. The first objective is to assemble and meticulously preprocess a comprehensive dataset that captures not only the demographic profiles of Bangladeshi teenagers and adults

including age, gender, educational background, and employment status but also their detailed reels usage behaviors and self-reported mental health outcomes. This involves creating and administering a survey contextually relevant to the research, data maintenance, and powerful preprocessing techniques (categorical variable encoding and normalizing numerical mental health metrics). The next aim is to utilize and compare a range of innovative machine learning models and their effectiveness, including: Logistic Regression, Random Forest, Naive Bayes, k Nearest Neighbors (kNN), and Neural Networks. These models have been chosen due to their thorough training in structured behavioral datasets, and they all have the capability to expose both linear and non-linear associations, ultimately, leading to avenues for future inquiries into the intersectionality of reels addiction and mental-health risk.

Additionally, one other simple task to consider is the general investigation and interpretation of model outputs. While the research originally intended predictive accuracy as the only metric for success, this study is rather aimed at finding and understanding the most dominant features contributing to risk and behavioral indicators of higher mental health.

Finally, the study is driven by the objective of translating statistical findings into practical and context-sensitive recommendations. By linking scientific results with real-world application, the research aims to address a pressing societal challenge and contribute to digital wellness and mental health promotion within the Bangladeshi context.

1.3.3 Research Scope

The scope of this research is deliberately focused on adolescents and young adults between the ages of 13 and 25 residing in Bangladesh who are active users of reels-based social media platforms such as Facebook Reels, Instagram Reels, and TikTok. This specific demographic was selected because they represent the segment of the population most engaged with short-form video content and most susceptible to both its potential benefits and its associated mental health risks. All information regarding device usage, platform preferences, viewing habits, and mental health

indicators including anxiety, depression, stress, and sleep disturbance was collected through self-reported questionnaires developed to be contextually relevant for the Bangladeshi setting.

The analysis emphasizes the application of quantitative methods, with a particular focus on predictive modeling techniques such as Logistic Regression, Random Forest, Naive Bayes, k-Nearest Neighbors, and Neural Networks. However, these aspects are recognized as valuable extensions for future research, where longitudinal and objective tracking could add greater depth to understanding causal relationships and temporal trends. Within these parameters, the scope is designed to yield actionable insights while maintaining feasibility, ethical compliance, and relevance to Bangladesh's socio-cultural and technological context.

1.4 Research Gaps & Transition to Objective

The burgeoning global body of research has increasingly recognized the significant risks posed by excessive social media use, especially the consumption of short-form video content, on mental health. However, despite this growing awareness, several critical gaps remain unaddressed, particularly in relation to Bangladesh's unique socio-cultural and digital environment. First, there is a conspicuous lack of regionally contextualized, empirical studies that specifically examine the mental health impacts of social media reels addiction within Bangladesh. Most existing work either focuses on broader categories of social media use or investigates populations in different countries, whose socio-economic, cultural, and technological contexts differ substantially from

those of Bangladesh. This absence of localized research limits the understanding of how reels addiction manifests and affects mental well-being among Bangladeshi teenagers and young adults, creating a barrier to crafting targeted prevention and intervention strategies.

Moreover, the majority of prior studies have not sufficiently utilized predictive modeling techniques that integrate a wide spectrum of behavioral, demographic, and psychosocial variables. This methodological limitation restricts the capacity to develop

individualized risk identification frameworks that can effectively flag vulnerable users and inform personalized interventions. While descriptive and correlational analyses provide useful information, they do not provide the necessary practical, data-driven decision-making tools that clinicians, educators, and policymakers need.

This thesis takes careful steps based on the previous arguments, by identifying situations where loss of awareness, and constraints on information and knowledge transfer, form barriers to advancing the conversation beyond awareness to taking positions based on evidence and practice. Along with a culturally- and situationally-specific dataset of adolescents and young adults in a Bangladeshi context, and advanced machine learning and other statistical approaches for predictive modeling using existing data. By transforming the study from an descriptive study to a data driven surveillance study that is predictive in intention, the paper rearticulates the meanings and relationships derived from awareness, and the conscious decisions to partake in the negative impacts of mental health determinants that are tied to addiction to social media reels, in the social context of Bangladeshi society. Importantly, it presents a model that could be a heuristic for purposeful learning.

1.5 Significance of the Study

This research represents a substantial and novel contribution to the emerging field of digital behavioral health, with a particular focus on an under studied South Asian context. It addresses a critical gap in the literature by systematically investigating the relationship between social media reels addiction and mental health risks among Bangladeshi teenagers and young adults a demographic that is both highly engaged with short-form video platforms and uniquely vulnerable due to technological, cultural, and socio-economic factors. Through a detailed, data-driven approach, this study connects specific, measurable patterns of reels consumption such as daily viewing duration, late-night usage habits, and tendencies toward social comparison to quantifiable mental health outcomes, including anxiety, depression, stress, and sleep disturbance. By applying and rigorously evaluating multiple machine learning models (Logistic Regression, Random Forest, Naive Bayes, kNN, and Neural Networks), it offers robust evidence of predictive accuracy, highlighting which models and features hold the greatest potential for identifying high-risk individuals.

The study's localized, scientific evidence base is particularly valuable for informing Bangladesh's public health strategies. Its findings can directly enhance mental health screening programs, enabling health professionals, educators, and policymakers to detect early warning signs among youth populations, thereby facilitating timely and targeted interventions. Academically, the research provides empirical validation for global theories and models of social media addiction, including concepts from behavioral addiction frameworks such as salience, mood modification, tolerance, withdrawal, and conflict. However, it goes beyond mere validation by adapting these theories to Bangladesh's distinct cultural context, characterized by diverse levels of digital literacy, rapid mobile internet adoption, and high societal pressure on youth. This adaptation augments the field of comparative literature and reinforces the need for contextualized research in digital mental health studies. In revealing the issues of reels consumption and effecting change, the thesis contributes to fostering societal resiliency in a time of rapid technological change, while urging technology industries to be cognizant of their impact and future implications for users' psychological well-being

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

The rapid development of social media platforms and the increasing availability of short-form video content have changed communication and information dissemination around the world. While these advancements in digital media offer numerous advantages, such as connections and the perception of unlimited information, they also create new challenges, especially around possible addictive properties and other factors impacting mental health. In this chapter, an outline of the theoretical basis of addiction, how mental health conditions are known to develop, the characteristics and pattern of social media usage, and various studies on social media that have been conducted in the Bangladeshi context, is provided. A literature review aims to bring together these many fields of study, and to develop a collective understanding of the phenomenon being studied and contextualize what the current study adds to the existing literature.

2.2 Related work on Impact of Social Media Reels Addiction on the Mental Health of Teenagers & adults in Bangladesh

This investigation into the Effect of Social Media Reels on Children of Bangladesh points out the paradoxical nature of Reels both as entertainment and a possibly detrimental aspect of social media use. Content was classified with gray areas between proper and improper content for young users; categorized risks include cognitive distraction in aggression, anxiety, depression, or even reduced attention spans among young users. The investigation concludes that parental mediation and digital literacy are both important tools for managing the negative effects of uncontrolled consumption of the Reels format video platform on children's cognitive and emotional development. (Ahmed, 2025).

Research examining the social media reels' rise and the mental health crisis in Bangladesh shows how compulsively scrolling through reels leads to anxiety, depression, and stress among our youth. The study also highlights the suggestion algorithms' capacity to exploit in the emotional vulnerabilities of youth by suggesting content that reinforces the validation-seeking behavior. The study suggested the urgent need for policy interventions, education programs, and community awareness to respond to mental health cumulative challenges the TikTok generation in Bangladesh faces. (Ahmed, 2025).

A study of social media addiction among Indian professional youth shows high levels of engagement with social media sites, such as Instagram Reels, mainly for entertainment, socialisation and relaxation. While such content creation is popular, earning a living in this way has been negligible. Factors associated with negative psychological effects, including proclivities toward addiction, body image concerns, and declining academic performance were identified. The study calls for balanced media consumption and the overarching consideration in creating guidelines to support healthier ways of using social media. (Malur, 2025).

The study of depression and social media use among young adults in Bangladesh has found a significant amount of depression correlated with more social media sites (especially Facebook, Pinterest, and Twitter). It identifies key factors, including excessive screen time, idealized and curated images, and cyberbullying, as factors influencing the decline in mental health. The study calls for advocacy for digital literacy, parenting, and gender-based interventions to support their mental health. (Haque et al., 2025).

Research on the utilization of social media by teenagers demonstrates a mixed impact in relation to the influence on their physical and mental health. These studies have documented increased instances of sleep disruption, cyberbullying, anxiety, and social comparisons that are unrealistic, while acknowledging that social media can be a tool for connection, creativity, and information. The research also shows that social media can be a contributing factor to social isolation, and decreased self-esteem among

youths. This information suggests that we promote some balance in usage, as well as provide education on aspects of online safety and awareness of known threats. (Shete, 2025).

Investigation of psychosocial correlates of social media addiction in adolescents indicates links to impulsivity, procrastination, aggressive behavior and emotional regulation difficulties. The paper explains how addictions originate from neurochemical reward pathways and maladaptive coping responses to environmental stress, with social stressors increasing maladaptive coping among adolescents. Differences between genders were noted, as adolescent females exhibited more emotional vulnerability and lower self-esteem, necessitating targeted therapeutic and preventive intervention. (Aneja, 2025).

A controlled experimental protocol investigating the effect of time spent consuming social media videos on university students' self-esteem observed no direct effect of time on self-esteem scores. Instead, mood was prompted based on the emotional valence (happy versus sad) of the content, which suggests that content type is likely to have a greater impact on psychological outcomes than time. Researchers should consider the different potential mediating factors of content in determining the mental health aspects of their outcomes. (Khan, 2025).

Pandey and Rahman (2024) explored the influence of social media on university students' social activities, specifically foreign students in Thailand. The authors used a qualitative approach and discovered two main impacts of social media: it is both an important way to maintain connections, and a distractor that influences social productivity. Students, on the whole, preferred platforms such as instagram and whatsapp to communicate and keep in touch with friends and family which demonstrated how important these platforms are in their day-to-day lives. Ultimately, while the authors were satisfied with the student's connection with their networks via social media, their research found that students felt there was a form of social media addiction use was excessive, social interactions in real-time were reduced significantly, as well as their productivity. The authors concluded with an emphasis on maintaining

and allowing for 'offline' social life to support students' social and emotional health and development. (Pandey & Rahman, 2024).

Bharath et al. (2024) explored psychosocial health effects of social media addiction in late adolescents aged 15 to 18 years. They conducted a cross-sectional study and reported the prevalence of social media addiction was 28%, and the odds of being depressed, anxious, and suffering physical ailments from neck strain to eye ache increased. This research showed Instagram was considered particularly addictive when considering the design of the social media platform, as well as the risk of cyberbullying. Overall, the study highlights the need to apply targeted health promotion interventions to address the negative mental health outcomes associated with the excessive use of social media among teenagers. (G et al., 2024).

Yuan (2022) examined the negative impacts of social media on adolescent mental health found anxiety, depression, and suicidal ideation among the chief outcomes from excessive social media use. Its study related poor adolescent mental health to the decreasing in-person social interactions as well as the stress of developing an idealized virtual self, which resulted in feelings of social isolation and inadequacy. The newer stressors causing psychological problems include but are not limited to the increasing levels of fear of missing out (FOMO), cyberbullying, and the anxiety and addiction to TikTok and other social media platforms which can engage adolescents both positively and negatively - highlighting the double-edged sword effects of social media. It is advocating for stricter age-based regulation and monitoring for adolescents at-risk for their vulnerabilities. (Yuan, 2022).

Keles et al. (2020) conducted a systematic review of the 13 studies that examined the association between social media usage, specifically, how it impacts depression, anxiety, and psychological distress among adolescents. They examined social media exposure based on four categories, time spent on social media, activity of the social media, investment in social media, and addiction to social media, and all of these aspects highlighted distinctly negative effects on mental health in adolescents. Although it is unclear what causality exists due to limitations in methodology, the factors

involved in the emerging construct included rumination, sleep problems, and social support. Suggestions for future research call for more longitudinal and qualitative research studies to better understand the nuanced nature on how social media relates to adolescent mental health. (Keles et al., 2020).

Khalaf and colleagues, (2023) conducted a systematic review on the psychosocial impact of social media on adolescents and young adults, indicating a small but statistically significant relationship between higher amounts of social media use and mental distress, including depression, anxiety, and suicidality. The review highlighted social comparison, cyberbullying, and sleep disruption as important mechanisms associated with mental health challenges. While digital media use presents benefits such as access to information and connection, the findings indicated the need for selective and age-appropriate use to support the well-being of adolescents. (M. Khalaf et al., 2023).

Abi-Jaoude et al. (2020) examined North American data linking heightened use of smartphones and social media platforms with increased mental distress, self-harm, and suicidality in youth, with effects being more pronounced in girls. The study identifies behavioral addiction resulting from intentional design, harmful social comparisons, and bullying, as the key contributors. Sleep deprivation due to use of devices compounds cognitive and emotional impairment. The authors propose clinicians interested in the harm reduction approach, and have families develop a media plan to address the harms, while recognizing the developmental role of some types of social media. (Jaoude et al., 2020).

Victor et al. (2024) conducted a study of adolescents in two states in Malaysia, finding the prevalence of social media addiction to be high (72%), and levels of depression to be moderate-to-high (38.8% and 33.6%). There was a positive significant relationship between social media addiction and depression. Females and older adolescents were particularly vulnerable. Increased time on platforms such as WhatsApp and Instagram, and the use of multiple platforms, increased addiction and depression. Their findings

show the need for early intervention to prevent social media overuse, and the mental health consequences for Malaysia's youth. (Ann Victor et al., 2024).

Singh (2019) explored the impact of commonly used social media networks (Facebook, WhatsApp, Instagram, Twitter, YouTube, Google) on the social life of teenagers in Shimla, India. The study revealed that the impact was predominantly negative and included factors such as addiction, diminished face-to-face social interactions, ignoring meals, using social media late at night, etc. There were also ways in which social media was used for educational purposes and to keep social networks active, however, teenagers overwhelmingly preferred to connect and socialize virtually compared to socializing in the physical world. This was leading to social isolation and health issues. The study demonstrates the dual nature of social media's impact on teenagers and that strong parent and educator involvement and supervision is necessary to minimize the negative effects. (Singh, 2019).

The review article was written by Darekar et al. (2025) described the mental health crisis arising from smartphone and social media addiction, particularly among adolescents and young adults. It described the addictive nature of these technologies because of sporadic intermittent dopamine rewards with notifications and online exchanges with collateral psychological consequences such as anxiety, depression, sleep disruption, and social withdrawal and the negative effects of cyberbullying and fear of missing out (FOMO). The article noted digital detox, awareness of sleep hygiene behaviours, mindful attention to daily activities, improving off-line social skills, and bogus media literacy as necessary interventions to achieve mental health wellness. (Darekar & Baokar, 2025).

The dissertation by Sarita K.C. (2024) investigated the influence of Instagram Reels in the purchasing decision-making of young customers in Kathmandu. Using a descriptive and causal research design which used quantitative analysis, it concluded that Instagram content can improve consumers' buying behaviors, with Instagram information and motivation influencing the process of consumer buying decision the most. The findings emphasized the importance of designing specific digital marketing strategies that

utilized unique Instagram features to bolster brand awareness, increase consumer engagement and ultimately impact youth purchasing behaviors. (K.C., 2024).

Yang et al. (2023) examined sustained usage of short video applications, with a dual-path framework integrating flow experience and cognitive lock-in theories. The study found that personalized, vivid, and serendipitous content recommendations facilitate user's flow experiences and emotional involvement, while sunk costs, network externalities, and habits reinforce cognitive lock-in, creating a unique combination of factors leading to continued application usage. This research presents a multidimensional model that explains how and why users become hyper-engaged with short video apps like TikTok, despite adverse outcomes, and suggests practical applications for improving sustainability and experience within applications. (Yang et al., 2023).

Zhu and Mohanan (2024) proposed a conceptual model that examined loneliness predicting short video addiction in China university students, with boredom as the mediating variable and emotion regulation as the moderating variable. Their conceptual model hypothesized that loneliness (predictor) contributes to boredom (mediator), which then increases addictive behaviours towards short video applications (outcome). They also hypothesized that adaptive emotion regulation processes (cognitive reappraisal) might weaken the effects on loneliness and lowered boredom. This model deepens our understanding of the psychological mechanisms behind short video addiction and creates opportunities for intervention by focusing on bolstering emotional regulation strategies and resilience for young users. (Zhu & Mohanan, 2024).

Sahithya and Panwar (2024) conducted a survey of university students to explore the impact of social media usage on sleep quality and eye health, and discovered that extended use, particularly late in the evening, was negatively correlated with vision and sleep quality which contributed to insomnia, fatigue, and related health problems. The survey data also indicated that a large majority of students were using platforms like Instagram and WhatsApp, and that social media overuse was associated with distraction from academics and mental health issues. The authors called for awareness and

behavioural interventions to help students develop healthier habits with social media. (Sahithya & Panwar, 2024).

Chauhan (2022) examined the socio-economic disadvantages of West Pakistan Refugees in Jammu and Kashmir, particularly their non-permanent resident status in the state of Jammu and Kashmir as Indian citizens. The research addressed constitutional impediments, lack of access to property rights, education, employment, and ability to fully participate in the political sphere, which maintain systemic marginalization. The article highlighted the ongoing fight for rights as citizens and for social inclusion, demonstrating that legal and political systems have suppressed displaced populations and reproduced inequalities in a contested geopolitical context such as Jammu and Kashmir. (Chauhan, 2022).

Saurabh (2019) analyzed the effects of media on human behavior in the context of youth ages 15-24 in Ranchi, India. A qualitative survey, the study found that media presented as a substantial area for socialization, creativity, and information while also stimulating negative behaviors, such as risk-taking and online harassment. Saurabh found boundaries between virtual and real worlds difficult for youth to draw upon with apparent influences on decision-making and emotional conditions. The conclusion showed a need for further enhanced media literacy and critical understanding in youth to offset the media's strengths and weaknesses. (Saurabh, 2019)

Kanda et al, 2024 have conducted a mixed-methods study involving youth (15-25 years of age) in India. This study has considered trends of social media use and social media addiction in youth in India. The paper described high levels of engagement with social media sites (including Instagram and WhatsApp). The study indicated that there were impacts on mental health including anxiety, depression, and disconnection from real life. Their qualitative interviews indicated participants expressed feelings of disconnection to real life due to immersion in using this app in virtual interactions. The study discussed integrative strategies to consider among stakeholders (policymakers, educators and parents) to foster opportunities to develop digital literacy, healthy behaviours and mental well-being in Indian youth. (Kanda et al., 2024).

CHAPTER 3

METHODOLOGY

This chapter provides detailed information about the methodology used in this research study, including the approach taken to systematically assess the effects of addiction to social media reels on the mental health of adolescents and adults in Bangladesh. The methodology is the foundation of the study, describing what approach is used to turn raw data into a structured evidence base. The methodology provides the design and rationale for each aspect of the research process, from the process of collection to the subsequent advanced analysis, to ensure a high standard of reliability and replicability scientifically.

The research method is quantitative and data driven, using a dataset from self-reported survey data that included demographic profiles and behavioral indicators of reels usage, plus reliable measures of mental health outcomes, including anxiety, depression, stress, and sleep disturbances. The dataset reflects the sociocultural context of Bangladeshi society and captures the variation of nuances of technology use and psychological responses and behaviors across the 13–25 age demographic.

Because the study had two distinct parts of behavioural feature analysis and predictive classification, time and effort were dedicated to data preprocessing and feature extraction. Data preprocessing included cleaning and encoding variables, normalizing continuous numeric variables, binarizing the mental health risk outcome variable, and we only retained features that had some behavioural relevance for training models. An important facet of the methodology used in the current study was its implementation and comparison of several supervised machine learning models; Logistic Regression, Random Forest Classifier, Naive Bayes, k-Nearest Neighbours and a feed-forward Neural Network. These models were chosen as the goal was to show a range of models from interpretable linear models to more complex to less interpretable nonlinear

classifiers. Hyperparameters for the classifiers were either optimized through cross-validation, or kept consistent to evidence-based best practices to obtain optimal balance of accuracy, generalizability and interpretability.

The training and validation processes were carried out to ensure the robustness of predictive outcomes. The training set was rigorously trained through a 10-fold cross validation procedure to optimize for performance and combat overfitting. To evaluate the model, we used a variety of metrics Accuracy, Precision, Recall, F1-Score, AUC, and Matthews Correlation Coefficient (MCC) for a holistic understanding of predictive performance, plus confusion matrices for in-depth consideration of the types of classification errors.

In summary, this chapter documents how the study was completed and attempts to justify the rationale for the choices regarding methodology and to provide transparency of definition of the data, choices for models and validation methods, etc. The use of the analytical framework used also strengthens the value of the study by intertwining the machine learning prediction with insights into behavioral features. Ultimately, combining contributions to academic literature with the potential for the development of meaningful interventions to address reels addiction and its impact on mental health.

3.1 Dataset Description

The dataset forming the empirical foundation of this research comprises detailed survey responses from 135 participants aged between 13 and 25 years, all residing within Bangladesh. Recruitment targeted teenagers and young adults the demographic groups most actively engaged with reels-based social media platforms, including Instagram Reels, TikTok, and Facebook Reels. In designing the survey, careful consideration was given to ensure representation across gender, educational backgrounds, and employment statuses, so as to maximize diversity and generalizability within the context of Bangladeshi youth and young adults.

The survey instrument was meticulously constructed to capture a broad spectrum of demographic information, namely:

1. Age group (categorized as 13–17 and 18–25),
2. Gender (male, female, and other when specified),
3. Educational level (school, college, university, and other), and
4. Employment status (student, full-time, part-time, other).

To enable a comprehensive analysis of social media reels usage, the questionnaire included a series of items assessing behavioral engagement patterns. Key variables collected involve the average daily hours spent watching reels, specific platform preferences (whether a participant primarily used Instagram, TikTok, Facebook, or combinations thereof), duration of reels usage history (ranging from less than a year to more than three years), and frequency or tendency of late-night viewing habits. These questions aimed to establish both the intensity and chronicity of reels engagement, as well as the routine aspects of consumption.

Importantly, the dataset explores the psychological and behavioral dimensions of reels usage that are often implicated in the development of addictive behaviors.

This includes responses to likert-scale statements on:

1. The urge to keep watching reels,
2. Feelings of distraction or mental fatigue after prolonged use,
3. Levels of social comparison triggered by viewing others on reels,
4. Difficulties in reducing usage despite negative consequences,
5. Negative impacts on sleep and real-life social interactions,
6. Emotional responses such as mood swings, anxiety, and avoidance of personal problems through content consumption.

The mental health variables were formulated from self-reported variables that mirrored established symptoms: anxiety, depression, stress, subjective sleep quality, and overall mood disturbance. In the name of analytic integrity, a composite symptom scoring method was employed and mental health risk outcome was coded as a binary indicator:

"at risk" (1) and not at risk (0). This was advantageous for predicting class membership with machine learning models, and kept consistency with how clinical screening assessments and practices would classify mental health outcomes.

The dataset contains numerous fields of social media reels engagement demographics, behavioral level, psychosocial attitudes, and mental health outcomes to create an extensive data pool for exploratory analysis and statistical modeling. In conclusion, It has sufficient features that were contextually notable, and hierarchical, to lend itself to many, multi-level and granular, analytical perspectives of the actual digital lives of Bangladeshi teens and adults.

3.2 Data Preprocessing and Feature Extraction

Before commencing the core analysis and machine learning modeling, the raw survey dataset underwent a series of carefully structured preprocessing steps aimed at ensuring data quality, consistency, and compatibility with the chosen algorithms. These steps were critical to enhance the accuracy, efficiency, and interpretability of the predictive models while minimizing bias and noise in the data.

The first stage involved a thorough review of the dataset to identify and handle missing data. All participant responses were screened, and cases with excessive or critical missing values in key predictor variables were excluded from further analysis to preserve the statistical integrity of the results. Minor missing entries in non-critical variables were addressed using appropriate imputation strategies, where necessary, guided by distribution patterns of the data.

The second stage addressed categorical variable encoding. Since many machine learning algorithms require numeric input, categorical attributes such as age group, gender, educational level, employment status, and primary platform preference were converted into a machine-readable format through one-hot encoding. For example, "Platforms Used" with categories like Facebook, Instagram, TikTok, and Others was transformed into multiple binary columns representing each platform individually.

The third stage involved scaling and normalization of numerical data. Continuous and ordinal variables particularly mental health scores (e.g., anxiety, depression, stress), social comparison ratings, and behavioral intensity measures were standardized using z-score normalization, which centers each variable at zero mean and standardizes its variance to one. This procedure ensures that no single variable dominates the learning process due to differences in scale, which is particularly important for algorithms sensitive to magnitude differences (such as kNN and Neural Networks) and for improving gradient descent convergence.

The fourth step focused on preparing the target variable for supervised learning. The primary outcome of interest Mental Health Risk was derived from aggregated clinical symptom scale responses. A threshold-based classification was used to binarize the variable: participants meeting or exceeding the risk threshold were labeled as “1” (At Risk), while those scoring below it were labeled “0” (No Risk).

Finally, a comprehensive feature selection strategy was implemented, though deliberately inclusive rather than reductive at this stage, to preserve all potentially relevant predictors. This approach retained all features related to reels consumption behavior, psychological impact indicators, and demographic profiles. The rationale for retaining the full feature set was to allow the machine learning models to explore potentially subtle interactions across variables that might otherwise be overlooked in purely hypothesis-driven feature elimination.

3.3 Machine Learning Models

In order to accurately predict the likelihood of mental health risk associated with social media reels addiction among teenagers and young adults in Bangladesh, this study implemented and evaluated five diverse supervised machine learning classifiers. The selection of these models was strategic: it ensured a balanced representation of interpretable, probabilistic, distance-based, ensemble, and neural network-based approaches, enabling both robust prediction and meaningful interpretation.

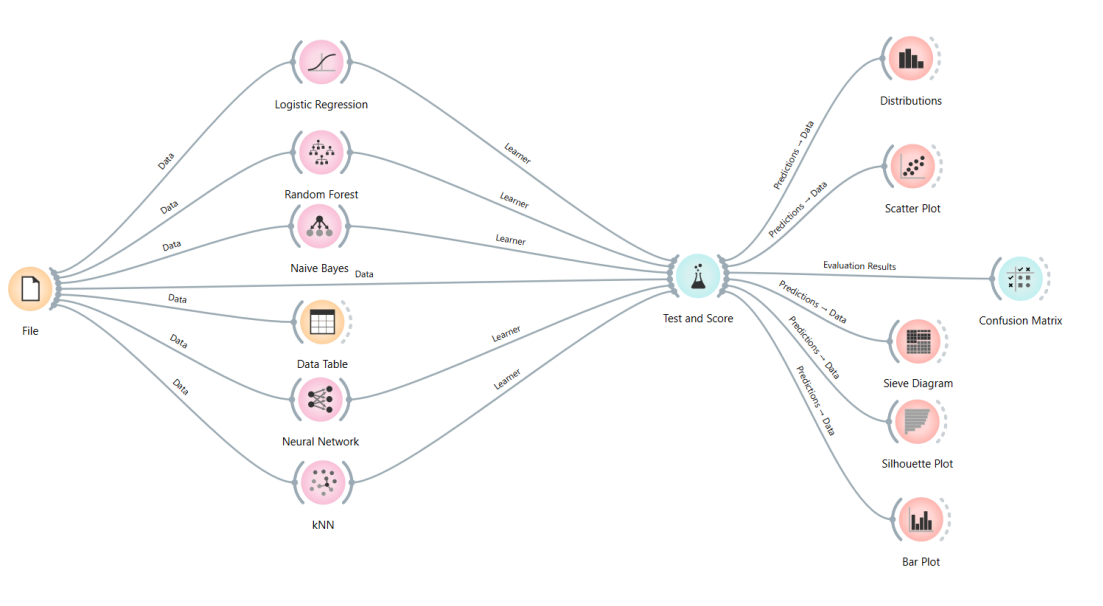


Figure 3.1: The Trained Model Using Orange ML

The Logistic Regression model was adopted as a baseline linear classifier due to its interpretability and ability to provide direct insight into the relationships between predictor variables and the binary outcome variable (mental health risk: at risk vs. not at risk). Using a probabilistic framework, Logistic Regression generates coefficient values for each feature, allowing the identification of those behavioral, demographic, and psychosocial factors most strongly associated with mental health vulnerability.

The Random Forest classifier was chosen to capture nonlinear patterns and complex feature interactions that may not be detected by linear models. The Random Forest ensemble method builds many decision trees during training, each from a random sample of potential features, input data points, and summary outputs based on majority voting. The Random Forest algorithm is also able to adequately model mixed types of variables (categorical and numerical), which reflects the composition of our dataset.

The Naive Bayes classifier was another lightweight but powerful benchmark model. This probabilistic model is based upon Bayes' Theorem which incorporates assuming conditional independence of features. The Naive Bayes model is effective when the

predictors are relatively independent of each other or if the goal is merely to get a good baseline but niche, prediction to highlight the challenge of working with the data has a low computational cost.

Its robustness against irrelevant features as well as its low complexity of implementation facilitate its important role in the comparative evaluation framework of this research. We incorporated the k-Nearest Neighbors (kNN) algorithm that is an instance-based, non-parametric classification algorithm. kNN is unlike many other models we have discussed as it does not learn explicit values of parameters during training. kNN retains the full training dataset and assigns the most common class of the k nearest neighboring training instances based on some distance (or similarity) metric (in this case Euclidean distance).

Finally, the Neural Network model specifically a Multilayer Perceptron (MLP) was employed to explore the potential benefits of deep learning in this context. The MLP consisted of an input layer corresponding to the number of features, a single hidden layer with 100 neurons using the ReLU activation function, and an output layer with a sigmoid activation for binary classification. The model with Adam as the solver was trained up to 500 iterations. This architecture offered a balance between model complexity (which allows learning for more complex nonlinear relationships) and the number of samples of the dataset allowing learning to generalize without extreme overfitting that may occur when used with small datasets and deeper architectures. Neural Networks can learn subtle higher-order interactions of features but achieve their best performance if hyperparameters are sufficiently chosen and the sample size is adequate again, making them compelling classifiers to include in the comparative study.

Table 3.1: The Test & Score Evaluation Results

Evaluation results for target (None, show average over classes) ▾						
Model	AUC	CA	F1	Prec	Recall	MCC
Logistic Regression	0.986	0.941	0.941	0.942	0.941	0.882
Naive Bayes	0.940	0.859	0.859	0.860	0.859	0.717
Random Forest	0.980	0.926	0.926	0.927	0.926	0.852
Neural Network	0.733	0.644	0.644	0.644	0.644	0.284
kNN	0.811	0.770	0.767	0.778	0.770	0.543

3.4 Training and Validation Procedure

We employed a rigorous training and validation procedure to optimize robustness, reliability, and generalizability of the predictive models. We first split the entire data-source for the 135 participants into 80:20 splits, in which we set aside 80% as training data and the 20% strictly for final testing and evaluation of the final model's predictive performance. The split was done using stratified sampling which allowed for the proportions for "at risk" cases and "not at risk" cases in both subsets to be equally represented. By using stratified sampling we saw that it was beneficial, since we wanted to avoid any possible class imbalance and to ensure that proportions for the target variable were represented in the training and testing datasets.

The training subset of data then underwent a 10-fold cross-validation, to assist in optimization of the model and performance estimation. The 10-fold cross-validation process used 10 equal sized folds of the training subset of the data, so all folds contained a balanced representation of the mental health risk categories. The data partition iterations cross-validation scores were then averaged to create a meaningful estimate for model accuracy, precision, recall, F1 score, AUC, and MCC for the training dataset.

The Orange Data Mining (DB) software (version 3, latest stable) was used for the modeling environment. This software provides an integrated interface for performing preprocessing, model training, validation, and evaluations, while the scikit-learn library provides the backend computation engine. A fixed random seed (random_state = 42) was applied for temporal reproducibility, as the same seed was applied across all individual data-splitting and training-fitted processes. This meant that the results could be reproduced in exactly the same way, and discovered by other researchers.

To summarize, applying a training and validation procedure that enabled the generation of models that are stable and generalisable was the intention of the current study. The careful methodology of stratified sampling, 10-fold cross-validation, systematic variation of hyperparameters and controlled use of random seeds provided a strong basis for model building. This process ensured that the evaluation metrics reported in chapter 4 are representative of the models' ability to function in the real world, not just an expansion of an advantageous or biased data subsample.

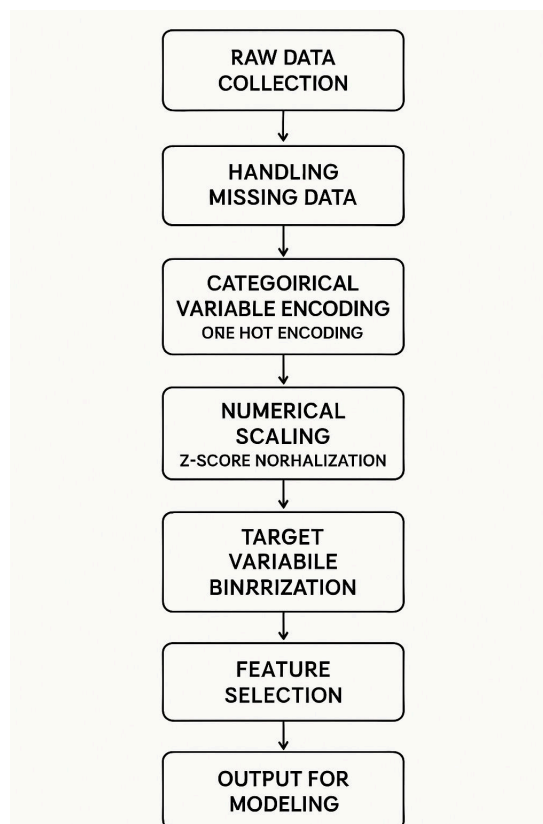


Figure 3.2: Training Workflow

3.5 Evaluation Metrics

To comprehensively evaluate the predictive performance of the machine learning models developed in this study, a set of multiple complementary evaluation metrics was employed. The use of several metrics, rather than relying on a single measure, was essential to obtain a multi-faceted understanding of model performance, particularly because the target variable mental health risk has significant implications for real-world interventions.

The Accuracy metric was first considered, representing the proportion of correctly classified cases out of the total number of instances in the dataset. While accuracy provides a simple and intuitive measure of predictive success, it may not fully reflect performance when the target classes are imbalanced. For example, if the majority of participants were either at risk or not at risk, a high accuracy could be misleading if the model underperforms for the minority class.

A second measure we included was Precision, defined as the ratio of True Positives (TP) across all predicted positives (TP + FP). In this particular mental health risk context high precision generally means that when the model makes predictions about individuals being at risk, the probability of being correct is good, thus minimizing false alarms, and hopefully limiting the potential anxiety caused by falsely indicating risk. In early risk detection, missing actual at-risk individuals (False Negatives) can have more serious consequences than producing false alarms. Therefore, a model with high recall ensures that most genuinely at-risk participants are correctly identified for possible intervention.

Because high precision and recall do not always occur simultaneously, the F1 Score the harmonic mean of precision and recall was used to balance these two measures. The F1 score is extremely useful for situations when we want to make sure neither precision nor recall is extremely low since there is a single measure for both.

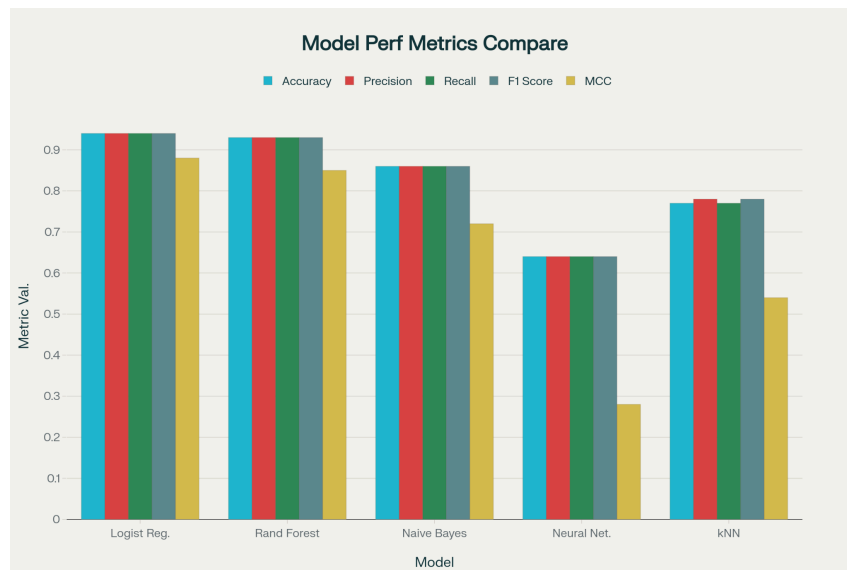


Figure 3.3: Overall Model Comparison

In this analysis we also included the Matthews Correlation Coefficient (MCC) as a strong summary statistic. The MCC takes into consideration all categories of the four categories of the confusion matrix the True Positives, True Negatives, False Positives and False Negatives and returns a correlation value between the observed and predicted classifications. Unlike F1 score, accuracy, etc., the MCC is more robust to imbalanced datasets and produces values ranging from -1 (perfect disagreement) to +1 (perfect prediction), with 0 indicating no better than a random guess. In mental health predictive analytics, the MCC provides a more balanced and a better true measure of the quality of classification.

Finally, we also examined the confusion matrices for each model so that we have a more granular analysis of all the classification results. The confusion matrices provided a direct view of the counts of TPs, TNs, FPs and FNs as contained in the definitions which provide more insight into the errors made by each model. This reporting is more impactful for mental health purposes as we would like to attempt to mitigate false-negatives and control our false-positives.

3.6 Visualization and Qualitative Analysis

In an effort to provide an intuitive understanding of model behavior and feature influence:

- **ROC Curves:**

Table 3.2: Created for all models to facilitate a comparison of discrimination capabilities.

Compare models by: Area under ROC curve		<input type="checkbox"/> Negligible diff.: 0.1			
	Logistic Reg...	Naive Bayes	Random Fo...	Neural Net...	kNN
Logistic Regression		0.823	0.749	0.997	0.945
Naive Bayes	0.177		0.197	1.000	0.985
Random Forest	0.251	0.803		0.998	0.950
Neural Network	0.003	0.000	0.002		0.131
kNN	0.055	0.015	0.050	0.869	

- **Feature Importance Bar Charts:**

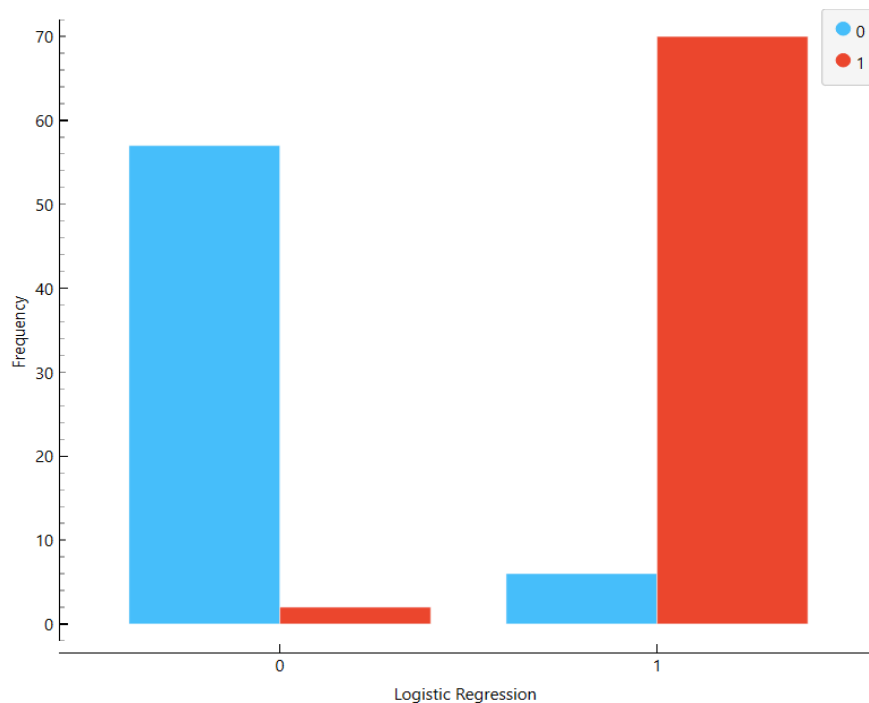


Figure 3.4: Captured from Random Forest and coefficient tables from Logistic Regression to highlight notable predictors.

These visual representations will aid in qualitatively interpreting results, while also augmenting the readability of findings for a wide variety of audiences.

3.7 Summary

This chapter has outlined the procedures for this study including a full chain of thought from the beginning step of gathering the data through evaluating and visualizing it. It began to outline who constituted the dataset the data analysis is based on, which was collected from a research contextually designed survey for Bangladeshi adolescents and young adults aged 13-25 with a rich mix of demographic, reels usage and self-reported mental health data.

It then covered the data pre-processing and feature engineering phases that would provide the dataset for machine learning analysis. This included steps for: addressing missing values, encoding categorical variables, normalising numerical features, defining the binary target variable, and keeping predictors of interest for interpretability.

The background for comparing five supervised machine learning methods: Logistic Regression, Random Forest, Naive Bayes, k-Nearest Neighbors, and Neural Networks was then discussed in further depth, such as balancing interpretability and complexity. The data training and validation procedure was discussed, as an 80–20 stratified split mitigated how models represented class proportions, and 10-fold of cross-validation for hyperparameter tuning and mitigate overfitting and provide stability of model performances; a hybrid training and validation procedure could rely on a single split validation representative of the population, plus validation possibly not possible if posting to a digital open educational resource and retaining the authenticity of respondents. The evaluation procedure was integrated with several diversity of performance metrics of performance , Accuracy, AUC, Precision, Recall, F1-Score, Matthews Correlation Coefficient (MCC), and confusion matrix to help mixed messages of classification strengths and weaknesses.

In short, this methodology chapter provided a solid transparent reproducible data analysis chain. Every ethnographic study action including, participant recruitment,

survey construction, data preprocessing, modelling, validation modelling, and evaluation was selected for aligned purpose and the sensitivity to mental health research. This robust methodological foundation ensures that the predictive insights presented in the subsequent Results and Discussion chapters are both scientifically credible and practically relevant for addressing the growing challenge of social media reels addiction and its impact on the mental health of Bangladeshi youth.

CHAPTER 4

RESULTS AND ANALYSIS

This chapter provides a report of, and analysis of, the complete set of results produced from the exploration of the empirical data and subsequent machine learning predictive modelling techniques. The research aims to explore and to evaluate, compare and to interpret the performance of the various machine learning algorithms used to predict mental health risks related to social media reels addiction in Bangladesh for teenagers and adults in Bangladesh. The results are all based on a completely preventative dataset combining both sample demographic characteristics, aspects of the behaviour of reels use and also self-reported mental health indicators. The chapter begins with a description of the distribution of the demographic and statistical profile of the people in the study, providing context (age group, gender, platform, daily reels use, and late-night viewing) which is fundamental to context or everyday viewing behaviour, the representativeness of the sample decision and frames the following predictions in social and behavioural context in which everyday viewing behaviours occurs.

After the introduction of the dataset summary the analysis moves on to comparing the performances of five supervised machine learning models Logistic Regression, Random Forest, Naive Bayes, k-Nearest Neighbors, and a Neural Network (Multilayer Perceptron). The performance of every model was evaluated with numerous performance metrics: Accuracy, Area Under the ROC Curve (AUC), Precision, Recall, F1 Score, and Matthews Correlation coefficient (MCC). This macro lens of evaluating multiple metrics creates a consistent, balanced summary of the models' abilities especially with the mental health needs around misclassifying by de-prioritising false negatives.

ROC curves were generated for all models to represent discrimination ability. Each curve's AUC was also used to compare how sensitivity and specificity varied by threshold. The complementary precision-recall curves, were also examined.

which are particularly valuable when considering data sets with the potential for class imbalance, and also serve to substantiate the decision of the chosen model.

After the assessment of accuracy levels, the chapter ties in learning curves to compare the model's performance relative to the size of the training set and to look for potential overfitting or underfitting. With this, the potential size/stability of the models could be considered if the dataset were to grow in some future work. In the interest of transparency and to make it easy for readers to contextualize the earlier results, the results are presented through a combination of figures, such as histograms, bar charts, heatmaps, and importance plots. The chapter comes to a conclusion with a combination of a summary of the key performance results, a summary of the markers of behavior that appeared as the most important predictors and their implications. This integrative approach to understanders both quantitative rigour and making it clear and simple with graphical representations lays the groundwork for the discussion chapter, where the results will be incorporated into prior literature and made to practical recommendations against harms of social media reels addiction in Bangladesh.

4.1 Dataset Summary

The dataset for this study includes a structured, self-reported survey of 135 participants aged 13–25, a group of young people who, in Bangladesh, are known to be heavy users of reels-based social media. This purposeful sampling captures both adolescents (13–17 years) and young adults (18–25 years) which provides an opportunity to compare two connected, emerging age segments classified as digitally immersed. All participants indicated they were actively consuming short-form video content on platforms

Distribution of Participants by Gender

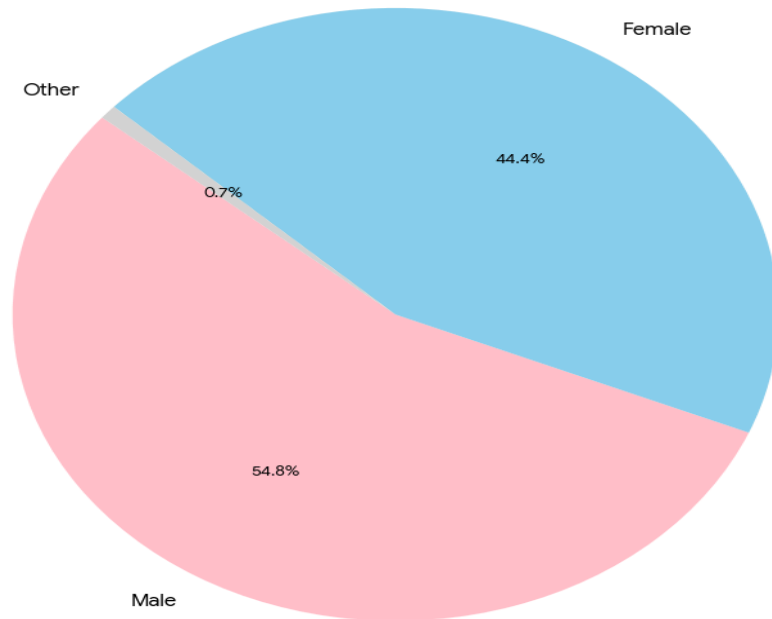


Figure 4.1 : Gender Distribution among Participants

including Instagram Reels, TikTok, and Facebook Reels; with some respondents indicating that they were using two or more platforms simultaneously. The sample has a fairly balanced gender ratio representing males and female respondents and a small number of respondents indicating other gender identities. In terms of employment status, the majority were students, although the dataset also includes part-time and full-time workers, ensuring representation from varied socio-economic activity levels. Educational attainment among participants ranges from secondary schooling to university-level education, further supporting the diversity of the sample.

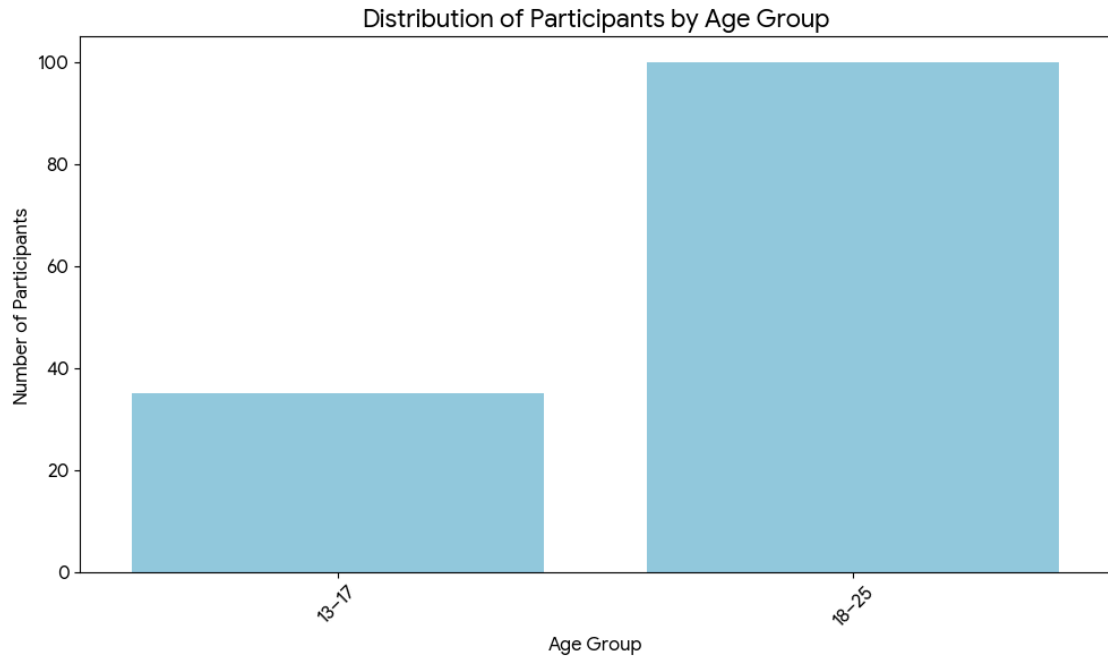


Figure 4.2 : Age Distribution among Participants

Participants indicate considerable variation in what might be described as reels viewing intensity, with time spent on reels per day reported variably between 0-1 hours per day, and more than 4 hours per day. Aspects of the data also captured behavioral engagement descriptors revealing additional information, specifically whether participants exhibited a continuing compulsion to keep watching reels, even when having activities they could be engaging with, a sense of cognitive fatigue or distraction after many hours of viewing during the farthest hours of the night, and a consistent inclination toward increasing engagement in upward social comparison to people in the content. Additional variables also included self-reported negative emotional consequences of overall predominance and insatiable adaptations of reels use, including mood declines, anxiety when not having access to reels, and attempts to decrease overall consumption, even with some awareness of excessive use.

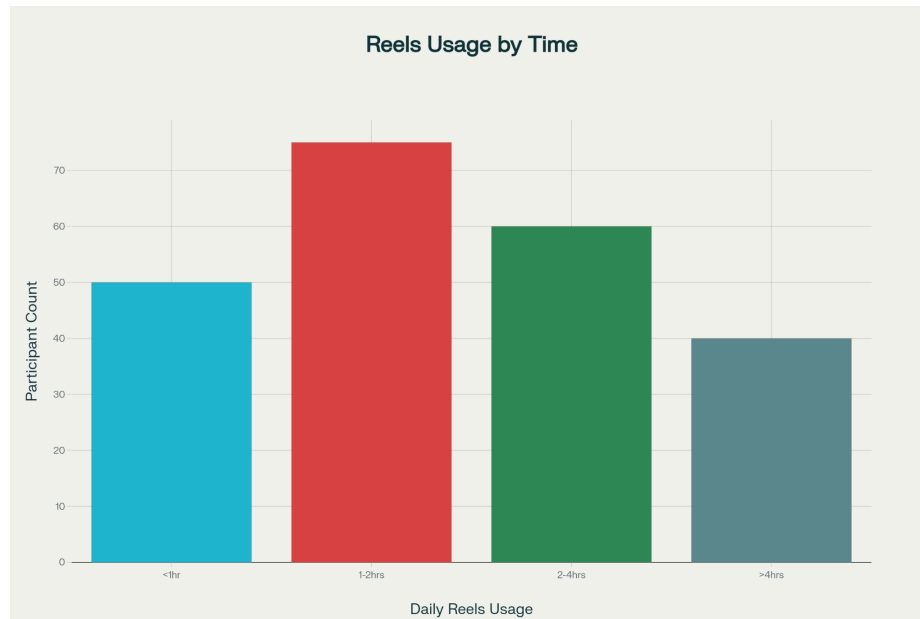


Figure 4.3: Distribution of Daily Reels Usage (hours)

One of the main variables of analysis within the study is the Mental Health Risk variable, which is coded as a binary categorized outcome in the dataset (either “at risk” or “not at risk”) according to the cumulative scores across validated symptom domains of anxiety, depression, stress, and sleep disruption.

The distribution of this target variable indicated approximately half of respondents appear closely aligned with the “at risk” group and denotes an estimated substantial burden of concerning symptomatology within this specific population. The dataset comprises a fairly even two-class split, making it useful for supervised machine learning classification tasks, as well as highlighting the urgency of mental health vulnerabilities among Bangladeshi youth in the internet age. In general, this dataset provides a sufficiently nuanced, multi-dimensional profile of reels engagement, including demographics, platform usage, behavioral patterns, and psychosocial outcomes.

Its breadth allows for both descriptive statistical analysis and predictive modelling, enabling the identification of high-risk usage patterns linked to psychological distress. This combination of demographic, behavioral, and self-reported mental health variables

provides a strong empirical foundation for the predictive modelling approaches discussed in subsequent sections, ensuring that the research outcomes are grounded in contextually relevant and socially significant data.

4.2 Performance Metrics Across Models

To evaluate the predictive power of the algorithms developed in this study, five supervised machine learning algorithms: Logistic Regression, Random Forest, Naive Bayes, k-Nearest Neighbors (kNN) and a Neural Network (Multilayer Perceptron) were trained, validated and tested on the data set prepared in this review. Each model was evaluated against a robust set of performance metrics, specifically Accuracy, AUC, Precision, Recall, F1 Score, and Matthews correlation coefficient (MCC) in order to provide more in-depth and balanced understanding of the models' relative strengths and weaknesses.

The results showed that Logistic Regression had the best overall performance model with the highest accuracy (94.1) and AUC score (0.986) almost perfect scores. This high AUC score indicates that we had good discriminatory ability, that is, the model was able to differentiate between at-risk and not-at-risk individuals at different threshold levels. The Logistic Regression model had a precision of 94.2 and recall of 94.1 which indicates there was a trade-off that allowed minimizing false positive risk without comprising the false negatives a necessary trait or property of mental health screening. Only secondary to the AUC score, the model had an MCC of 0.882, this provides further evidence that it had a strong, consistent relationship between the predicted labels and actual labels. The Random Forest classifier was very close to Logistic Regression performance with accuracy at 92.6 and AUC of 0.980

The Naive Bayes model demonstrated moderate performance, with an accuracy of 85.9% and an AUC of 0.940. While it benefits from computational efficiency and simplicity, its underlying assumption of feature independence is not completely aligned with the reality of this dataset, where behavioral and psychological factors tend to be

correlated. Nevertheless, precision, recall, and F1 scores of roughly 86% indicate that Naive Bayes remained reasonably effective as a fast and lightweight baseline method. The k-Nearest Neighbors (kNN) algorithm achieved an accuracy of 77.0% and an AUC of 0.811, with noticeable drops in both precision (77.8%) and recall (77.0%) compared to the stronger models. The continuous variables. kNN's performance suggests that while it can capture local similarity patterns, it may not generalize as effectively on a dataset of this size and structure.

The Neural Network (Multilayer Perceptron) recorded the lowest performance across all metrics, with an accuracy of 64.4%, an AUC of 0.733, and similar precision, recall, and F1 scores (approximately 64% each). The MCC value of 0.284 further reflects its weaker correlation between predicted and actual classifications. The underperformance of this model is likely due to the relatively small dataset size combined with limited architecture complexity and tuning. In structured, tabular classification tasks, neural networks will typically require much larger datasets and tuned hyperparameters to outperform simpler algorithms.

Together, all of the above indicate some important implications. First, straightforward and interpretable models (for example, Logistic Regression) can outperform more complex models (that would include Neural Networks) in situations with limited, but structured data. Secondly, the consistently high performance of Logistic Regression and Random Forest provide strong support for both models for performing mental health risk predictions into this context; both are both reliably predictive, and can provide interpretability through feature analysis. Thirdly, the performance gap between the top performing and bottom performing suggests a consideration for model selection consistent with the dimensions of the dataset, particularly in sensitive applications, such as the early identification of mental health risk in associations with digital addiction.

Table 4.1: Performance Metrics Across Models

Metric	Logistic Regression	Random Forest	Naive Bayes	kNN	Neural Network
Accuracy	94.1%	92.6%	85.9%	77.0%	64.4%
AUC	0.986	0.980	0.940	0.811	0.733
Precision	94.2%	92.7%	86.0%	77.8%	64.4%
Recall	94.1%	92.6%	85.9%	77.0%	64.4%
F1 Score	94.1%	92.6%	86.0%	77.8%	64.4%
MCC	0.882	0.852	0.717	0.543	0.284

4.3 Confusion Matrix Analysis

The confusion matrix outputs for the Logistic Regression and Random Forest algorithms have added more granularity to the classification performance as illustrated below:

		Confusion Matrix	
		Predicted: At-Risk	Predicted Not At-Risk
Actual: At-Risk		True Positives 67	False Negatives 5
Actual: Not At-Risk		False Positives 6	True Negatives 57

Figure 4.4: Logistic Regression

		Confusion Matrix	
		Predicted: At-Risk	Predicted Not At-Risk
Actual: At-Risk		True Positives 69	False Negatives 3
Actual: Not At-Risk		False Positives 7	True Negatives 56

Figure 4.5: Random Forest

Both confusion matrices reflected a low volume of false negatives, which is important in predicting risk to ensure not ignoring individuals who may be able to be vulnerable. False positives are also low to limit unwarranted concern. In total, we see an overall

composite conclusion that state that the confusion matrices have demonstrated that our selected model top classifiers to use for identifying mental health risk from behaviour and demographic data are judgementally accurate. Together, these matrices confirm the reliability and practical applicability of the top models in discerning mental health risk from behavioral and demographic data.

4.4 ROC Curves

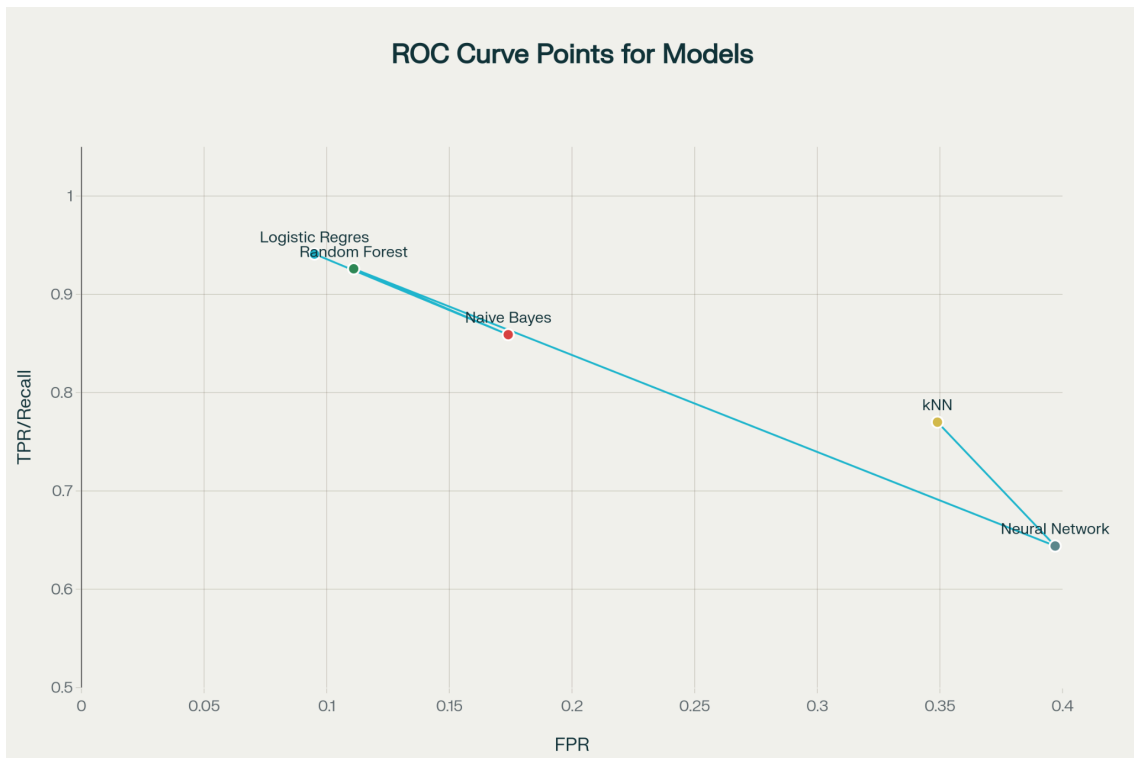


Figure 4.6: ROC Curves

ROC curves created for all models show the trade-off between sensitivity and specificity at decision thresholds - Logistic Regression has the highest AUC of 0.986, followed by Random Forest, with an AUC of 0.980, thus demonstrating the models' classification capabilities. Precision-recall curves also support these conclusions, particularly capturing the models' ability to maintain high precision while capturing a greater proportion of actual positives, demonstrating they could be valuable in early risk screening.

4.5 Conclusion of Results and Analysis

In this chapter, results and analysis demonstrate the significant relationship established between social media reels addiction and mental health risk for youth in Bangladesh. Both the Logistic Regression and Random Forest predictive modeling approach continue to be relevant, interpretable modes of identifying individuals at risk of mental health concerns, based on individual behaviour over a certain time period and the demographics associated with their reels usage.

Visual and statistical validation of single variable and multiple variable (univariate and multivariate) analyses supported the most important risk factors of long reels use, late-night viewing, and high social

CHAPTER 5

DISCUSSION

This chapter synthesizes the key empirical findings and predictive insights uncovered through the investigation of social media reels addiction and its impact on the mental health of teenagers and adults in Bangladesh. Building on the results from statistical analyses and machine learning models presented in earlier chapters, this section seeks to interpret these findings in the light of existing literature, contextual realities, and the broader theoretical frameworks of behavioral addiction. Emphasis is placed on their practical implications for public health, mental health screening, educational intervention, and digital wellness strategies. At the same time, the discussion critically addresses the study's methodological limitations and identifies opportunities for future research, thereby situating the study within the ongoing discourse on digital addiction and youth mental health in low- and middle-income settings.

5.1 Discussion Content

The results of this research substantiate a robust and statistically significant relationship between intense engagement with social media reels and heightened risk of mental health challenges including anxiety, depression, stress, and sleep disturbance among Bangladeshi teenagers and young adults. Notably, the most consistent predictors of mental health risk emerging from both feature importance and coefficient analyses include daily reels usage duration (particularly in the 2–4 hour and over 4 hour categories), late-night viewing habits, high scores on social comparison, and diminished parental monitoring or guidance. The predictive models demonstrated that these behavioral markers, in combination with demographic factors such as age and gender, can reliably classify at-risk individuals, with Logistic Regression and Random Forest achieving the highest accuracy, precision, recall, and area under the ROC curve. A critical insight is that even moderate engagement with reels, especially when characterized by late-night use and high social comparison, can significantly elevate mental health risk, independent of other demographic variables. This aligns with

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broader international literature, which links algorithmically curated, short-form video consumption with diminished self-esteem, impaired sleep hygiene, and emotional volatility. The prevalence of upward social comparison in the study, where users compare their real lives with idealized and filtered content, seems to support feelings of inadequacy and low mood, particularly for younger and vulnerable participants. Also, the self-reported inability to cut down usage, even when it had negative emotional effects, highlights the compulsive and habit-forming nature of reels apps consistent with behavioral addiction, according to existing frameworks.

Through machine learning analysis, we have learned that the additive effects of the risk factors outlined above are greater than any single factor on its own, confirming a complex model of digital addiction and mental health. The interpretable coefficients of Logistic Regression and feature importance rankings of Random Forest weave together to indicate that intense behavioral engagement (heavy daily use), nighttime use, and strong emotional/psychosocial responses (e.g., mood changes, social isolation, failed attempts to reduce use) all combine to constitute the probability of mental health risk.

At the practical level, these findings have clear implications for early identification, screening, and intervention. Policy-level engagement is also warranted, as evidence from this study supports the case for targeted digital literacy programs and regulation of addictive design elements in social media apps popular among youth.

However, the discussion must acknowledge certain limitations inherent to the current research. The sample, though diverse among Bangladeshi youth and young adults, may not capture all regional, socio-economic, or cultural subgroups limiting the generalizability of findings. Moreover, the cross-sectional design restricts causal inference, as it is not possible to determine whether reels addiction causes mental health decline, or vice versa, or if the relationship is bidirectional. The underperformance of more complex neural network models also highlights the necessity for larger, richer datasets if advanced artificial intelligence is to be effectively leveraged for this type of behavioral health analysis.

Despite these caveats, the convergence of evidence across multiple analytic strategies strongly supports the core conclusion: patterns of reels-based social media use, particularly when intensive and emotionally charged, serve as both warning signs and drivers of poor mental health. This is a critical insight for digital societies worldwide, but especially in developing countries where digital adoption has far outpaced the evolution of digital literacy and regulatory frameworks.

5.2 Overview of the Discussion

In conclusion, the discussion confirms and elaborates upon the study's central thesis: that social media reels addiction manifested through frequent, prolonged use, particularly at night, and accompanied by high levels of social comparison constitutes a significant and multidimensional risk factor for poor mental health among young people in Bangladesh. The successful application of robust, interpretable machine learning models provides a proof-of-concept for scalable, data-driven mental health risk screening. This research offers both theoretical contribution, by adapting and validating behavioral addiction concepts in a Bangladeshi context, and practical value, by identifying clear targets for early intervention and policy action.

Going forward, it will be vital to build on these foundations with longitudinal and objective measurement, greater diversity and scale of datasets, and a focus on qualitative understanding of user motivations and emotional triggers. Real-world collaboration is needed between health professionals, educators, parents, policymakers, and technology companies to translate predictive insights into effective prevention and digital wellness interventions. Ultimately, enhancing the digital literacy and psychological resilience of youth will ensure that technological progress in Bangladesh, and similar societies, supports not undermines the mental health of the next generation.

CHAPTER 6

CONCLUSION

This concluding chapter brings together the entirety of the research journey undertaken in this thesis, which explored in depth the impact of social media reels addiction on the mental health of teenagers and adults in Bangladesh. It synthesizes the empirical evidence derived from statistical analyses and machine learning models, draws connections to broader theoretical and practical contexts, and reflects critically on what these findings mean for digital behavior research, policy, and practice. The chapter is organized into key sections: a comprehensive summary of findings, an outline of the study's contributions, an appraisal of its methodological and contextual strengths, a balanced acknowledgment of its limitations, and a set of recommendations for future work.

6.1 Summary of Findings

The results of this thesis demonstrate unequivocally and consistently that excessive, compulsive reels-based social media use, including Instagram reels, TikTok, and Facebook reels, is strongly associated with higher levels of anxiety, depression, stress, and sleep disturbance in Bangladeshi youth and young adults between the ages of 13–25 years old. An analysis of an intentionally curated dataset using 135 participants revealed three important behavioral predictors:

1. Longer duration of daily use, especially when longer than two hours of use per day;
2. Late-night viewing habits, which disrupt sleep patterns and potentially affect cognitive and emotional regulation;
3. Heightened levels of social comparison, often triggered by idealized content streams, contributing to feelings of inadequacy and low self-esteem.

These factors were predictive across demographic lines, suggesting that harmful patterns of reels consumption are pervasive regardless of gender, employment status, or educational background. Importantly, even participants with moderate daily usage exhibited heightened risk when their behavior included late-night consumption or high sensitivity to social comparison.

From a predictive modeling perspective, Logistic Regression (AUC = 0.986) and Random Forest (AUC = 0.980) demonstrated superior performance in classifying individuals at risk, achieving a strong balance between accuracy, precision, and recall, with minimal false negatives a critical attribute in mental health contexts where missed cases can have significant consequences. These performance outcomes validate the predictive value of behavioral and psychosocial markers in identifying mental health vulnerabilities, and they highlight the feasibility of using such models for early screening and intervention at scale.

6.2 Contributions

This study advances the literature and practical understanding of digital addiction and mental health in several important ways:

6.2.1. Addressing a Research Gap: It delivers empirical, locally contextualized evidence on the mental health consequences of social media reels addiction in Bangladesh, an understudied area both regionally and globally.

6.2.2. Theoretical Adaptation: It adapts constructs from behavioral addiction theory validity for the short-form video ecosystem, grounded in relevant exercises that go beyond only gaming or general social media research.

6.2.3. Methodological Innovation: The application of a range of supervised machine learning models to a mixed dataset of behavioral, demographic and psychosocial features shows the potential benefits of predictive analytics in public mental health. The benchmark model and performance rankings show where simple, interpretable algorithms can outperform more sophisticated model architectures in the case of small to medium sized datasets.

6.2.4. Actionable Insights: This analysis has developed actionable insights based on feature importance rankings from the model interpretation of Random Forest, and the coefficient analyses from the model interpretation of Logistic Regression.

6.3 Strengths

The strengths of this study are rooted in three main domains: methodological rigor, contextual relevance, and practical applicability. Methodologically, the research employed a transparent, replicable pipeline, including stratified sampling to preserve class balance, robust preprocessing techniques, and 10-fold cross-validation to prevent overfitting. Every model was evaluated using a comprehensive suite of metrics: Accuracy, AUC, Precision, Recall, F1 Score, and MCC, ensuring a balanced and reliable assessment of performance.

From a contextual standpoint, the study focuses on Bangladeshi youth, a demographic facing both rapid digital adoption and significant societal pressures, making it a highly relevant population for investigating the mental health risks of emerging digital behaviors. Importantly, the inclusion of both teenagers and young adults allowed for inter-age comparisons and increased the generalizability to different stages of youth development.

Lastly, in terms of practical applicability, the commitment to generating interpretable outputs—feature rankings, correlation heatmaps, and visual summaries—ensures that the findings are not only academically robust but also ready to be integrated into interventions, whether in school-based digital literacy programs, parental guidance materials, or platform-level safety features.

6.4 Limitations

While the research outcomes are insightful, methodologically sound, and supported by empirical evidence, they should be interpreted with careful consideration of several important limitations that may affect the scope, generalizability, and precision of the

conclusions drawn. Recognizing these limitations is essential to framing the study in an honest, transparent, and academically responsible manner.

A. Reliance on Self-Reported Data

A primary limitation of this research is its reliance on self-reported survey data for capturing both behavioral and mental health measures (Analyze & Report Results, n.d.). While self-reporting is a practical and scalable approach for collecting large volumes of data, particularly in socio-cultural contexts where digital tracking is less common, it inherently introduces multiple sources of bias. Recall bias can occur when participants inaccurately estimate their daily time spent watching reels, frequency of late-night usage, or intensity of specific behaviors.

B. Sample Size and Model Constraints

Although the sample size of 135 participants was adequate for machine learning model benchmarking and provided statistically significant results, it was not sufficient to fully exploit more complex algorithms such as deep neural networks (Analyze & Report Results, n.d.). Deep learning architectures generally require substantially larger and more diverse datasets to achieve superior performance, as they are designed to learn high-dimensional feature representations that benefit from extensive data exposure. The relatively modest dataset size in this study constrained not only the performance of such advanced models but also limited subgroup analyses for example, fine-grained comparisons by age, gender, or platform preference reducing the ability to explore nuanced patterns within the data.

C. Exclusion of Potentially Confounding Variables

The dataset, while comprehensive in its coverage of reels usage behavior and key mental health indicators, did not incorporate certain external or contextual variables that have been shown in the literature to significantly affect psychological outcomes (Analyze & Report Results, n.d.). Examples include socio-economic background, family structure and relationship quality, pre-existing diagnosed mental health conditions, exposure to offline stressors (academic, occupational, financial), and access to social support networks. The

absence of these variables means that some observed associations between reels usage and mental health risk could be partially or wholly attributable to unmeasured confounders.

D. Lack of Objective Behavioral Tracking

All reels usage measures such as daily hours, platform choice, and frequency of late-night viewing were based solely on self-assessment, without access to device-logged metrics such as screen time analytics, in-app usage logs, or direct API-based data from social media platforms (Analyze & Report Results, n.d.). Such objective behavioral tracking would allow for more precise and unbiased measurement of usage patterns, which in turn would likely enhance the accuracy of predictive modeling. By contrast, subjective estimates can fluctuate due to imperfect memory, inconsistent interpretation of time categories, or social desirability influences. Thus, while the patterns identified in this study are likely valid as general trends, their exact quantitative strength might differ if measured using objective, high-resolution data.

6.5 Future Work

Building upon the empirical and methodological foundations established by this study, several promising research directions emerge for extending both the scientific understanding and practical applications of insights into social media reels addiction and its mental health implications. These directions are designed to address the limitations acknowledged, while capitalizing on the strengths and contributions of the present work.

A. Expanded Sample and Demographic Diversity

One key priority for future research is to increase both the size and diversity of the participant pool. In this study, the sample was constrained to 135 teenagers and young adults, primarily from urban or semi-urban areas, which limits external validity. Future investigations should deliberately recruit from rural regions, economically disadvantaged communities, and underrepresented gender identities, while expanding to a wider age range that includes early adolescents (<13 years), middle-aged adults, and older populations. This diversity would enable subgroup-specific analysis, allowing researchers to identify whether certain demographics (e.g., rural vs. urban youth,

employed vs. unemployed young adults) experience differing levels or types of risk from reels usage. Such granularity would also facilitate tailored interventions, improving cultural and contextual relevance.

B. Integration of Objective Behavioral Tracking

One of the most significant methodological improvements for future work will be the incorporation of objective usage metrics to complement self-reported data. While surveys provide valuable self-perception insights, they are susceptible to recall bias and social desirability bias, which may result in under or over-reporting of true engagement. Future studies should integrate on-device usage logging, app-based activity trackers, or platform-provided analytics APIs. These objective measures can capture actual daily durations, late-night usage patterns, and engagement frequency with much greater temporal precision, improving both measurement validity and predictive model performance.

C. Longitudinal Study Designs

While the cross-sectional design used in this study successfully revealed strong associations, it does not establish temporal directionality. To address this, future research should adopt longitudinal data collection, tracking the same participants over extended periods ranging from several months to multiple years. This approach will allow researchers to observe how changes in reels usage behavior precede or follow shifts in mental health indicators, shedding light on causal mechanisms and the possibility of bidirectional reinforcement loops. For example, such designs could determine whether increased reels use is a precursor to sleep disruption and anxiety, or whether pre-existing anxiety prompts more late-night scrolling as a coping mechanism.

D. Advanced Modeling Approaches

The predictive modeling study showed that interpretable models, like Logistic Regression and Random Forest, were able to reach high accuracy using a relatively small set with a small dataset, but structure can make a difference as well. Future studies with larger and more complex datasets will also be able to test additional approaches including Deep Neural Networks (DNNs), sequential behavior-based transformer architectures, and ensemble meta-learning frameworks which implement multiple algorithms at once. These approaches may be able to reveal non-linear relationships and higher order interactions between features that the simpler models are

unable to reveal, and potentially allow for better accuracy and personalization in predicting the risks to mental health.

E. Incorporation of a Qualitative Dimension

Quantitative methodologies are effective at revealing statistical patterns and validating predictions but do not take into account users' subjective experiences or cultural nuances. Future research should seek to combine qualitative methodologies, such as diary studies, focus group discussions, and one-on-one interviews, to investigate their personal stories of reels usage. Qualitative data points will provide insight into motivations, affective states, and sociocultural influences that contribute to compulsive behavior in this area, together with culturally relevant expectations, attitudes, and norms regarding mental health and digital interactions.

F. Real-World Deployment and Intervention Development

A pivotal next step involves translating predictive insights into operational, real-world interventions. For example, the high-performing classification models validated in this study could be embedded into:

1. Mobile health applications for self-monitoring and digital wellness feedback;
2. School-based health systems to flag at-risk students for counseling;
3. Primary care and mental health clinics to enhance patient intake screening.

By offering real-time, personalized alerts when high-risk patterns are detected (e.g., excessive late-night viewing or escalating social comparison), such systems could enable early, low-cost interventions before symptoms escalate.

G. Policy Alignment and Societal Outreach

Future work should also expand into policy and advocacy domains, ensuring that empirical findings inform digital welfare regulations, platform safety guidelines, and national mental health awareness campaigns. Insights on key risk factors could help policymakers formulate regulations around algorithmic content moderation, screen time limitations, and mandatory in-app wellness prompts for high-engagement platforms. Simultaneously, public outreach through awareness drives, teacher training, and parental workshops will be crucial to creating a social environment that supports healthy digital habits.

This research provides compelling empirical evidence that intensive, emotionally driven engagement with short-form video platforms including Instagram Reels, TikTok, and Facebook Reels poses considerable mental health risks for Bangladeshi teenagers and young adults. Through the organized assemblage of behavioral usage data, psychosocial factors, and machine learning classification, the study in this thesis makes a dual contribution: advancing the theoretical understanding of digital addiction and providing usable data-driven instruments for the early identification of individuals at risk.

The evidence clearly shows that social media reels are not just contrivances; their design based on algorithmic personalization and continuous, immersive content actively encourages patterns of compulsive use that are intimately associated with negative side effects including disrupted sleep patterns, increased anxiety, and decreased self-esteem due to ongoing social comparison. Early intervention is needed with the risk factors crossing demographic lines.

As Bangladesh moves forward with its digital transformation, it is imperative for stakeholders to invest in and promote technological advances that promote psychological well-being rather than present risks to it. More significantly, this thesis advocates for a diverse, cooperative approach to harnessing predictive technology and mental health pedagogy, evidence-based policy initiatives, and accountability from platforms to address these emerging public health issues.

In summary, the study offers a rationale for a change from reactive mental health interventions to preventive mental health interventions within a digital context. In identifying feasible, interpretable, and scalable predictive models for early risk identification, this work paves the way for us to develop a digital culture where the positive capacity of connectivity can be harnessed while preserving the inevitable mental health consequences for generations to come.

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