Unraveling Nomophobia: An Exploratory Data Analysis using Python.

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***Abstract*— Smartphone addiction poses a threat to the mental health and overall well-being of an individual, thus urging for focused research and exploration.**

. This study employs an EDA-driven technique using python to offer informative viewpoints on intervention and preventive strategies for excessive smartphone usage and its detrimental effects on well-being utilizing a diverse primary dataset encompassing behavioral attributes and usage patterns among 602 engineering students at Mahatma Jyotiba Phule Rohilkhand University, Bareilly, collected through a survey.

This research aims to reveal the essential elements affecting addictive behaviors to make a substantial contribution to the knowledge of smart phone addiction. This study's findings provide the groundwork for following research projects and creating tailored interventions to address smartphone addiction.

Keywords—Nomophobia, Smartphone addiction, Machine learning, KNN, SVM, Exploratory Data Analysis

I. INTRODUCTION

This study addresses the prevalent issue of smartphone addiction, particularly among students and young adults, by examining the intricate dynamics of Nomophobia, which denotes the fear of being without a smartphone. Employing machine learning algorithms and Exploratory Data Analysis (EDA) techniques, the research seeks to uncover key indicators and risk factors associated with smartphone addiction.

Utilizing a dataset comprising 602 Engineering Students from MJP Rohilkhand University, Uttar Pradesh, the study analyzes various demographic attributes, usage patterns, app preferences, and psychological parameters. Through EDA, correlations between user behaviors, demographics, and addictive tendencies, with a specific emphasis on Nomophobia, will be explored. The findings will guide the selection and optimization of features for machine learning model.

Ultimately, the research aims to contribute to proactive interventions aimed at mitigating smartphone addiction, particularly Nomophobia. By offering actionable insights into the multifaceted dimensions of this issue, leveraging machine learning and data analysis, the study seeks to deepen our understanding of smartphone addiction and enable the development of informed strategies to address it effectively.

II. RESEARCH METHODOLOGY

1. Sample

The study aims to understand the prevalence of Nomophobia in 602 engineering students (165 females and 437 males). The samples consisted of engineering students from various age groups. The data was collected using a questionnaire survey that consisted of questions related to smart phone usage patterns among college students.

2. Procedure

The objectives and purpose of the study were communicated to the participants who consented to be part of the study. The questionnaire was sent to participants online. They were instructed not to skip any questions. The data collected was kept confidential and was put through further analysis.

III. LITERATURE SURVEY

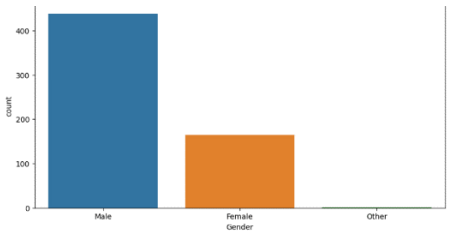
1. A study in Manipur found 10.5% mild, 60.4% moderate, and 27.9% severe nomophobia among college students, impacting academic performance. No significant associations were found with sociodemographic factors or usage characteristics, suggesting a need for awareness programs [1].
2. Indian students aged 15 to 35 showed 74.8% moderate and 18.9% severe nomophobia, with males, urban dwellers, and heavy phone users more affected. Prompt intervention is urged to protect well-being [2].
3. Smartphone use patterns correlated with nomophobia among university students, emphasizing the need for preventive measures and educational programs [3].
4. Nomophobia affects 40.5% of South Indian pharmacy college students, highlighting increasing dependency [4].
5. Mobile phone usage among engineering students correlates with health issues, with 52% using phones for over 11 hours daily [5].

6. Medical students exhibit a high prevalence of nomophobia, highlighting the need for awareness and further research [6].
7. A study using smartphone usage data and classification models achieved over 80% accuracy in assessing smartphone addiction among university students [7].
8. In India, 15.2% experience severe nomophobia, with females and students aged 18-24 most affected, emphasizing the need for awareness and prevention [8].

IV. RESULTS AND DISCUSSIONS

The study found the following patterns of smart phone usage among college students.

1. *Graph 1: Representation of responses in terms of gender of the total sample.*

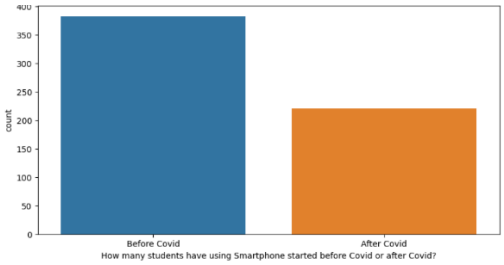


Graph 1 illustrates the distribution of survey participation, showcasing a comparative representation between male and female respondents (165 females and 437 males).

2. *Graph 2: Representation of responses in terms of age group of the total sample.*

Graph 2 portrays the responses' distribution by age group within the total sample. Notably, the age group of 18-24 years constitutes the majority, accounting for 88.4% of the surveyed students, while students aged 25 and above comprise a minor proportion, representing 0.332% of the surveyed cohort.

3. *Graph 3: Representation of responses regarding how many students have used smartphones before or after COVID19.*

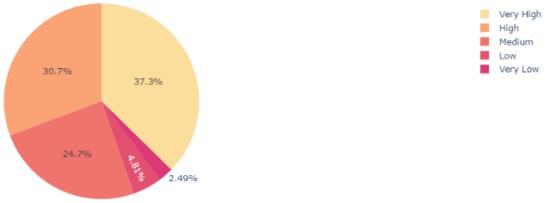


Graph 3 delineates the distribution of responses indicating the commencement of smartphone usage concerning the COVID timeline. It illustrates the division between individuals who began using smartphones before the Covid era and those who initiated usage after the onset of the pandemic.

4. *Graph 4: Representation of responses regarding the impact on students' online studies before the COVID-19 pandemic.*

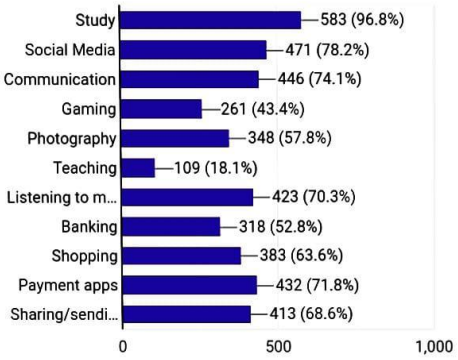
Graph 4 provides a comprehensive view of utilization of online modes for academic studies before the COVID-19 pandemic. The data showcases varying degrees of usage, with 36.8% of respondents indicating a medium level of engagement, followed by 22.2% reporting very high usage. Additionally, 18.6% reported high usage, while 14.9% and 7.46% reported low and very low utilization. This distribution reveals a diverse spectrum of engagement levels among students in leveraging online resources for their academic pursuits before the pandemic.

5. *Graph 5: Representation of responses regarding the impact on students' online studies during COVID and after the pandemic.*



Graph 5 presents an insightful breakdown of the impact of the COVID-19 pandemic on students' online studies, depicting varied levels of perceived influence. Remarkably, 37.3% of respondents reported a significantly high impact, followed closely by 30.7% expressing a high impact. Additionally, 24.7% highlighted a medium impact on their online learning experiences during the pandemic. Conversely, a smaller subset of participants, comprising 4.81%, indicated a low impact, while merely 2.49% reported a shallow impact on their studies post-pandemic. This graph illuminates the diverse perspectives regarding the pandemic's effect on students' online academic endeavors, underscoring the substantial influence experienced by a significant portion of the surveyed population.

6. *Graph 6: Representation of responses regarding what students use their smartphones for (each participant could choose multiple options)*



Graph 6 delineates the diverse array of purposes for which students utilize their smartphones, showcasing a multifaceted spectrum of activities. Among the prominent reasons reported, communication emerges as a prevalent function, with 446 respondents highlighting its significance. Additionally, social media engagement and the use of smartphones for academic endeavors, indicated by 471 and 583 respondents, respectively, underscore the integral role of technology in both social interactions and educational pursuits. Notably, a substantial number of participants, 423 and 432 individuals, utilize their smartphones to listen to music and employ payment apps, showcasing the devices' entertainment and financial utility. Moreover, activities such as photography, shopping, and sharing media content are notable aspects of smartphone usage, as reflected by 348, 383, and 413 respondents. The diverse range of functionalities students utilize underscores the multifaceted nature of smartphones in fulfilling various needs within their daily lives.

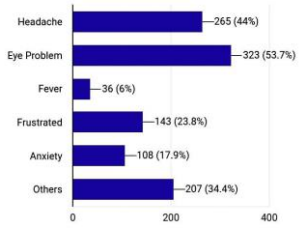
7. *Graph 7: Representation of responses regarding how much time the students use their smartphones (In hours)*

In Graph 7, the data illustrates the distribution of responses regarding the duration of time students spend using their smartphones in hours. The analysis indicates that a significant portion of the surveyed population, accounting for 43.8%, spends 3-4 hours on their smartphones. Following closely behind, 27.7% of students use smartphones for 5-7 hours. A smaller but notable proportion, 12.1% of respondents, use their smartphones for 0-2 hours. Additionally, 9.12% and 2.82% of students reported spending 8-10 hours and 10-13 hours, respectively, whereas a minority of 4.48% of respondents indicated using their smartphones for 14 or more hours. This distribution highlights varying smartphone usage among the surveyed student population, with a substantial segment dedicating several hours to their devices daily.

8. *Graph 8: Representation of responses regarding how much time the students use social media (In hours).*

Graph 8 provides a breakdown of responses regarding the duration of time spent by students on social media platforms. The majority, comprising 76.6% of the surveyed individuals, reported spending 0-2 hours daily on social media. A smaller percentage, approximately 17.7%, indicated spending 3-5 hours, while 3.32% allocated 5-8 hours to social media engagement. A minority segment, constituting 1.66%, reported spending 9-12 hours, and a mere 0.663% allocated 13 hours or more on social media daily. This distribution illustrates varying degrees of social media usage among the surveyed students, emphasizing a predominant trend towards lower daily engagement durations.

9. *Graph 9: Representation of responses regarding the Physical and psychological Problems encountered during smartphone usage (each participant could choose multiple options).*



Graph 9 depicts the range of physical and psychological issues encountered during smartphone usage, allowing participants to select multiple options. The data showcases prevalent problems reported by respondents. Among the cited concerns, headaches were the most cited issue, with 265 occurrences, followed by eye problems, reported by 323 individuals. While fever and frustration were noted by 36 and 143 respondents, respectively, anxiety was reported by 108 participants. Additionally, a category labeled 'others' accounted for 207 responses. This graph underscores the diverse array of challenges individuals encounter, emphasizing the spectrum of both physical and psychological difficulties associated with smartphone usage.

10. *Graph 10: Representation of responses regarding whether a participant watches Social Networking Sites before studies and engages in them longer than intended.*

Graph 10 presents a breakdown of participant responses on their engagement with Social Networking Sites (SNS) before studying, indicating varying degrees of agreement or disagreement. Approximately 38% of respondents agreed that they use SNS before studying and exceed intended durations, with 9.29% strongly agreeing. Conversely, 18.7% disagreed, stating they don't engage in SNS before studying or exceed intended time, while 6.14% strongly disagreed. A notable 27.9% remained neutral. This spectrum of responses highlights the diverse impact of SNS engagement on study routines among participants.

11. *Graph 11: Representation of responses regarding whether a participant feels relaxed when on Social Networking Sites.*

Graph 11 delineates participants' sentiments regarding their emotional state while engaging on Social Networking Sites (SNS). The data unveils a spectrum of attitudes toward relaxation levels during SNS usage. Surprisingly, a considerable 37% of respondents held a neutral stance, indicating an equivocal sentiment regarding feelings of relaxation on these platforms. However, a collective 33.27%—27.3% agreeing and 5.97% strongly agreeing—expressed a sense of relaxation during SNS interaction. Conversely, 33.3%—26% disagreeing and 7.3% strongly disagreeing—exhibited a contrary view, indicating a lack of relaxation while engaged in social networking. This diverse range of responses underscores the variance in individuals' emotional experiences on SNS, highlighting the complexity of emotions experienced during these online interactions.

12. *Graph 12: Representation of responses regarding spending more time on Social Networking Sites and skipping eating, exercising, and studying continuously.*

Graph 12 elucidates participants' perspectives concerning spending extended periods on social networking sites (SNS) and forgoing activities like eating, exercising, and continuous study sessions. The data reveals a diverse spectrum of viewpoints among respondents. Notably, 21.4% adopt a neutral stance on this issue, indicating a lack of solid inclination towards or against this behavior. Conversely, a combined 23.17%—17.7% agreeing and 5.47% strongly agreeing—acknowledge the propensity to spend excessive time on SNS, potentially leading to neglecting essential activities. On the contrary, a considerable proportion, comprising 55.4%—37.8% disagreeing and 17.6% strongly disagreeing—expressed a divergence in behavior, emphasizing their prioritization of fundamental activities over prolonged engagement on Social Networking Sites. This disparity underscores individuals' varying attitudes regarding the trade-off between extensive SNS usage and essential daily routines.

13. *Graph 13: Representation of responses regarding spending long hours on Social Networking Sites to stay satisfied.*

Graph 13 delineates respondents' perspectives concerning the necessity of spending extended periods on Social Networking Sites (SNS) to maintain satisfaction. The data portrays a diverse spectrum of attitudes among participants. Notably, a considerable portion, accounting for 25.2%, assumed a neutral standpoint. Conversely, a combined 27.88%—22.9% agreeing and 4.98% strongly agreeing—acknowledged the potential need to spend prolonged hours on SNS for satisfaction. Contrarily, a significant percentage, totaling 46.9%—35.3% disagreeing and 11.6% strongly disagreeing—expressed dissent, indicating a lack of reliance on spending extensive time on Social Networking Sites for contentment. This variance in viewpoints emphasizes the diversity in perceptions regarding the correlation between prolonged SNS usage and personal satisfaction levels among respondents.

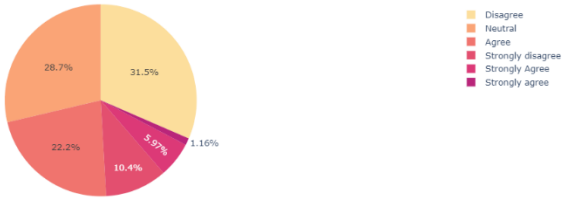
14. *Graph 14: Representation of responses regarding feeling frustrated interacting with people when not on Social Networking Sites.*

Graph 14 depicts participants' sentiments regarding feeling frustrated when interacting with people outside of social networking sites. The data reveals a spectrum of opinions among respondents. Notably, a significant portion, comprising 24.9%, expressed a neutral stance on this matter, suggesting a degree of ambivalence. Conversely, a notable proportion, totaling 19.05%—15.4% agreeing and 3.65% strongly agreeing—acknowledged experiencing frustration when interacting with others in non-digital settings. On the contrary, a substantial majority, constituting 56%, expressed disagreement with feeling frustrated during face-to-face interactions, with 39.1% disagreeing and 16.9% strongly disagreeing. This variance in attitudes underscores the complex interplay between social networking behaviors and offline social interactions, highlighting individuals' nuanced relationship with digital communication platforms.

15. *Graph 15: Representation of responses regarding finding it challenging to return to studies after accessing social networking sites.*

Graph 15 illustrates participants' sentiments regarding the difficulty of returning to studies after engaging with social networking sites. The data unveils a diverse range of perspectives among respondents. Notably, a significant portion, constituting 25.5%, remains neutral on this issue, suggesting a balanced viewpoint. Conversely, 30.14%—comprising 24% agreeing and 6.14% strongly agreeing—acknowledge facing challenges in transitioning back to their studies after accessing social networking platforms. In contrast, a sizable proportion, totaling 44.2%—32.3% disagreeing and 11.9% strongly disagreeing—expresses a contrary opinion, indicating minimal difficulty in resuming academic tasks post-social media interaction. This disparity underscores the varied impact of social networking usage on individuals' academic focus and highlights the need for further exploration into factors influencing post-social media study habits.

16. *Graph 16: Representation of responses regarding depriving oneself of sleep because of wanting to spend longer hours on Social Networking Sites.*



Graph 16 illustrates participants' perspectives regarding sacrificing sleep to extend their time on social networking sites. The data depicts a range of attitudes among respondents. Notably, 28.7% adopt a neutral stance on this behavior, indicating a lack of solid inclination towards sacrificing sleep for social media use. Conversely, a combined 29.33%—22.2% agreeing and 7.13% strongly agreeing—acknowledge engaging in this behavior to some extent. Conversely, a notable percentage, totaling 41.9%—31.5% disagreeing and 10.4% strongly disagreeing—expressed opposition to sacrificing sleep for prolonged social media use. This distribution underscores individuals' diverse perspectives regarding the trade-off between sleep and social media engagement, highlighting the complexities surrounding this issue in contemporary society.

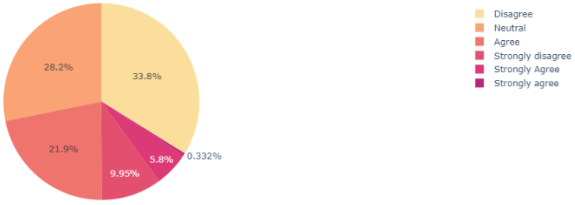
17. *Graph 17: Representation of responses in terms of finding it difficult to retain what one has learned and forget quickly.*

Graph 17 presents participants' perspectives regarding the difficulty retaining learned information and the tendency to forget quickly. The data illustrates a spectrum of opinions among respondents. Notably, a significant portion, comprising 30.3%, expressed a neutral stance on this matter. However, a substantial segment, totaling 41.09%—32.8% agreeing and 8.29% strongly agreeing—acknowledged facing challenges in retaining learned information and experiencing rapid forgetfulness. Conversely, a notable percentage, amounting to 28.51%—23.2% disagreeing and 5.31% strongly disagreeing—holds contrary views, suggesting a lesser degree of difficulty in retaining knowledge and a slower rate of forgetting among these individuals. This disparity underscores individuals' varying perceptions and experiences regarding retaining and recollecting learned information.

18. *Graph 18: Representation of responses in terms of feeling anxiety and low esteem while one tries to cut Social Networking Sites' usage.*

Graph 18 illustrates respondents' sentiments regarding feelings of anxiety and low self-esteem when attempting to reduce their usage of Social Networking Sites (SNS). The data showcases a spectrum of opinions, with 28.4% expressing a neutral stance on this issue. Conversely, 26.5%—comprising 20.7% agreeing and 5.8% strongly agreeing—acknowledge experiencing anxiety and low self-esteem when attempting to curb their SNS usage. Conversely, a notable proportion, totaling 45.1%—34.7% disagreeing and 10.4% strongly disagreeing—rejects the notion of experiencing such feelings when reducing their SNS usage. This divergence in responses highlights the complexity of individuals' psychological responses to efforts to reduce their reliance on social media platforms.

19. *Graph 19: Representation of responses regarding the inability to cut time using Social Networking Sites, which increased the prospect of low performance during exams.*



Graph 19 illustrates participants' sentiments regarding the impact of their inability to reduce time spent on Social Networking Sites (SNS) on their academic performance, particularly during exam periods. Notably, 28.2% expressed a neutral stance. Conversely, a significant proportion of respondents, totaling 28.032%—comprising 21.9% agreeing and 6.132% strongly agreeing—acknowledged that their inability to curb SNS usage correlated with decreased academic performance during exam periods. Conversely, a notable percentage, amounting to 43.75%—33.8% disagreeing and 9.95% strongly disagreeing—held contrary views, suggesting that excessive SNS usage did not significantly impact their academic performance during exams. This diversity of perspectives underscores the complex interplay between SNS usage habits and academic outcomes, warranting further investigation into mitigating factors and potential interventions.

20. *Graph 20: Representation of responses in terms of fear of losing mobile.*

Graph 20 illustrates respondents' sentiments about losing their mobile devices. The data reveals a significant proportion of participants, comprising 70.8%, expressing apprehension about the possibility of losing their smart phones. Conversely, a smaller yet notable segment, representing 29.2%, reported not experiencing such fear. Interestingly, a substantial portion of respondents, accounting for 28.2%, expressed a neutral stance on this matter. This dichotomy in responses underscores individuals varied psychological responses toward the prospect of losing their mobile devices, suggesting a nuanced relationship between users and their smartphones.

21. *Graph 21: Representation of responses in terms of whether mobile wastes time.*

Graph 21 illustrates respondents' perspectives regarding whether they perceive smart phones as time-wasting devices. The data reveals a notable divide in opinions, with 53.4% of participants agreeing that smart phones indeed squander time, while 46.6% disagree with this notion. This dichotomy in viewpoints underscores individuals' diverse perceptions regarding the efficiency and utility of mobile devices. Such insights are crucial for understanding the multifaceted relationship between individuals and their mobile technology, highlighting potential areas for intervention or education regarding time management and technology use.

V. CONCLUSION AND FUTURE SCOPE

Smartphones have become integral tools in our daily lives, offering diverse applications for information, communication, education, and entertainment. However, the growing dependence on smartphones raises concerns about addiction, colloquially known as "nomophobia" or the fear of being without one's smartphone. This addiction often arises from excessive internet usage or internet addiction disorder.

Studies focusing on smartphone addiction among youth highlight an increasing reliance on these devices within this demographic. Excessive smartphone usage has been associated with various health issues. While it is challenging to definitively label respondents as addicted, uncontrolled smartphone use can worsen the situation, potentially isolating youth from society.

Like all inventions, smartphones have positive and negative aspects. It is essential to mitigate the adverse effects of smartphone use and harness their potential for positive purposes. Responsible and productive smartphone usage can address addiction issues, ensuring that youth benefit fully from these devices.

Further we will be developing machine learning based models for the detection of the percentage of Nomophobia among engineering students.

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