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Screen-Time Data Analysis

Priyansh Mehta, Prem Shah, Rishi Lakhani, Nirav Pocha and Lynette D'Mello

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Priyansh Mehta
Computer Engineering
SVKM's Dwarkadas J. Sanghvi College of Engineering
Mumbai, India
priyanshmehta986@gmail.com

Prem Shah
Computer Engineering
SVKM's Dwarkadas J. Sanghvi College of Engineering
Mumbai, India
premshah1019@gmail.com

Rishi Lakhani
Computer Engineering
SVKM's Dwarkadas J. Sanghvi College of Engineering
Mumbai, India
rishilakhani2001@gmail.com

Nirav Pocha
Computer Engineering
SVKM's Dwarkadas J. Sanghvi College of Engineering
Mumbai, India
niravpocha1@gmail.com

Prof. Lynette D'mello
Computer Department
SVKM's Dwarkadas J. Sanghvi College of Engineering
Mumbai, India
lynette.dmello@djsce.ac.in

***Abstract*—Mobile phone use has increased dramatically in these times when keeping up with the newest technology is critical. The use of mobile phone applications has expanded dramatically, particularly during the COVID pandemic. Youngsters are becoming addicted to smartphone games, as are adults to social media and gaming applications. This can be harmful to their mental and physical well-being. The goal of this paper is to understand the above-mentioned changes and provide adequate measurements to limit these changes. In this paper, we analyze screen time and conclude whether the person is addicted to using mobile or not, if yes then in which genre of application, and to what extent they are addicted.**

I. Introduction

"Use of ICT infrastructure to improve human health, healthcare facilities, and wellness for persons and populations" is how digital health is described [1]. It is a new subject that brings together specialists from several fields such as computer science, technology, machine learning, journalism, finance, medicinal chemistry, global health, ecology, and others.

The use of digital welfare apps is becoming a crucial trend, and the sector is swiftly increasing, thanks to the increased interest in self-health care management. Digital wellbeing apps have the ability to improve a variety of mental and social health qualities, including cognitive performance and communication skills.

Digital addiction is described as a problem with digital technology that is characterised by excessive, compulsive, impulsive, hurried conduct that is linked to harm to the individual and their social circle. Loneliness, worry, and unhappiness are all signs of digital addiction. The software development industry gathers information about consumers and produces knowledge in order to stimulate interest, extend and intensify usage, and, in certain circumstances, create an addicting behaviour.

The same data may be leveraged to build anti-addiction treatments and promote digital wellness, according to the researchers. Researchers began looking at the practicality of building digital wellness solutions to positively impact consumers' attitudes and behaviours around the usage of cellphones since the technology may be part of the solution, leveraging the same user data. Through interactive statistics and dashboards, digital wellbeing apps generally concentrate on offering users a better awareness of real-time spent on digital devices.

SPACE Break Phone Addiction, Google Digital Wellbeing, NUGU, FamiLync [2], MyTime, and Lock n'LoL are a few examples of these projects. Furthermore, both Apple and Google released a variety of tools and programmes to assist people to avoid distractions and improve their digital well-being [3].

In this research, we conduct a qualitative study and analysis to aid us in designing a new digital well-being application which may contain similar features of already existing applications and improve on the various fields where most of them are lacking. As cellphones become a vital part of our existence digital well-being activities are becoming more essential than ever. Hence we intend to foster communal digital welfare with our application.

II. Literature Review

Digital health is a new discipline that draws together experts from several professions such as biomedical science, health-care research, neuroscience, economics, technology, and information science. We need creative interdisciplinary development techniques to embrace the digital potential of and enhance people's well-being and health [1].

A. Overgeneralize of digital devices

The advancement of technology provides a tremendous opportunity to promote well-being and life satisfaction by increasing independence, and social connection, and improving psychological health, especially stress and depression. It also promotes a healthy lifestyle by increasing the level of freedom in working activities that support healthy habits such as physical exercise and nutritional eating. However, despite many beneficial inventions, harmful patterns of technology usage can emerge. This involves decreased attention span, fear of losing out (Feelings of inadequacy), and digital obsession. Social contact and sociology are combined in cognitive science.

An earlier study has investigated the relationship between the length of time spent using diverse applications and mood, discovering that a longer period of smartphone use is associated with worse mental stability, particularly a sad mood. Reduced smartphone use may help long-term users retain a healthy psychological state. The research looked at the relationship involving e - mail application time and mood and found that the lesser time spent on the email that same day, the more pleasant the impact balance.

B. Perception of digital usage

The research shows a link between technology usage and strain [4]. Using a pertaining analysis method, digital presence information was utilised to anticipate stressors based on smartphone application usage. The findings attained an average accuracy of 75 percent and precision of 85.7 percent. It may be used to assess overall workplace stress levels and, as a result, guide organisational stress reduction programmes, particularly when considering the association between stress and productivity of employees [5].

The paper [6] focuses on how digital psychiatry is being used more frequently outside of clinical settings, including in fields including education, employment, financial services, social media, and the digital well-being industry. In addition, examine the ethical difficulties of applying digital psychiatry in various fields, highlighting significant issues and chances for public health, and make suggestions for defending and advancing public health and well-being in the information society.

[7] utilised psychiatric evaluation results provided by the clinic to investigate correlations between the patient's behaviour prior to and following the psychiatric evaluation as well as changes in smartphone usage, specifically app usage, and how these changes correspond with the self-reported patient condition. The results provided by [7] demonstrate a significant relationship between app usage patterns and many elements of patients' mood, sleep, and irritation. On the other hand, there are noticeable differences between the patients' pre- and post-evaluation application usage patterns.

C. Digital well-being innovation

Digital wellness encourages the development of goods that help individuals build a positive connection with technology. Constructive computing and optimistic technology act as "virtual mentors," assisting people in achieving their goals and contributing to their distinctive ways of living and acting at work. Such evolving technologies necessitate understanding in a wide range of disciplines, including psychology, aesthetics, and social relationships. Finally, these solutions seek to promote well-being and should be emphasized as a necessity and norm in the development of digital media and technological advances.

The software engineering business recognised the need of promoting digital health as a part of their corporate social responsibility and in order to increase user loyalty and trust. Apple and Google, the two biggest IT corporations, have begun to include digital health features in their products. These features vary from simple screen time limits to detachment tactics, time management, productivity, and parental control. The Google Digital Wellbeing project aspires to be an innovative approach to software development processes. The solution consists of a collection of functions, concepts, resources, platforms, and pieces of legislation aimed at promoting digital well-being. In addition to Google's solutions, Android operating systems include wellness applications in the Google Play Store to help reduce and optimise smartphone usage.

Paper	Methodology	Result
Digital screen time and sleep health of individuals during Covid-19 pandemic: Empirical study among different demographic classes in India [8].	Survey responses were investigated using Frequency analysis, Cross Tabulations, and ANOVA statistical analyses, which are utilised to capture the difference in insomnia caused by increased screen time exposure across different demographic groups.	The younger responders had more screen time. The proportion of other respondents, which included housewives, retired and unemployed persons, and those looking for work, were lower.
Direct Measurements of Smartphone Screen-Time: Relationships with Demographics and Sleep [9].	Linear Regression	Screen time varies by age, race, and ethnicity. For some people, screen time is more prevalent at night.
Digital wellbeing tools through users lens [3].	The study chose two popular programmes, SPACE and GDW, and thoroughly studied them to gather evidence of their capabilities, design, and prospective usage.	The findings revealed that the installation of use awareness functions has a beneficial impact on the acceptability of wellness applications.
Internet addiction: A new clinical phenomenon and its consequences [4]	Research investigates the addictive properties that sustain drug and alcohol misuse, compulsive gambling, and even video game addiction; but, due to the Internet's relative newness, little is known about the habit-forming nature of the Internet and its potential for abuse.	This article defines Internet addiction and, as a clinical novel phenomenon, investigates the key effects caused by Internet addiction, such as online affairs, student Internet abuse, and employee Internet abuse.

TABLE I: Some important research papers

III. Research

The goal of this study is to evaluate digital wellbeing apps from the standpoint of users. To do so, two popular programmes, SPACE and Google Digital Wellbeing were chosen and thoroughly researched in order to gather proof of their capabilities, design, and future uses. The number of installs, the volume of user evaluations, and the extent to which they are feature-rich were used to determine their popularity. SPACE is a smartphone application that allows users to self-regulate their usage and achieve phone-life balance. To keep you motivated, it has goal-setting and daily progress tracking capabilities. The Google Digital Wellbeing is a tool that allows users to reduce technology distractions, visualise their digital behaviours, and empower them to go off the grid. It keeps track of how often you use it when you get notifications, and how far you've progressed on your goals. By thematically evaluating reviews provided by its end-users, we investigated the acceptance and rejection aspects of SPACE and Google Digital Wellbeing.

IV. Implementation

The main objective of this research was to determine whether users were addicted to the mobile application by assessing their screen time and comparing it to the average usage of that app in the dataset. Google Digital Wellbeing and other apps just provide information about the user's screen-time usage and do not indicate whether the user is addicted to that app. So we used a machine learning method to train the model and offer users the graphical representation of the app's addiction as well as recommendation links to assist them to reduce their app usage.

The project started with the creation of the user interface, with the goal of making it as easy to understand as possible. React-JS and the Material-UI toolkit were used to create the front end. The regression graphs were shown in React-JS using the Chart-JS extension. Node-JS and Express-JS were used to build the backend. The function of the back-primary end was to temporarily store the information entered by the client and securely send it to our data set. In this situation, we used MongoDB data collection. It is an outstanding presentation NoSQL database. MongoDB cloud administrators were set up using the Node-JS mongoose module. Both machine learning methods, linear regression and gradient descent, were employed to analyse user input.

A. Workflow

The following outline addresses the progression of the undertaking on how the project will operate.

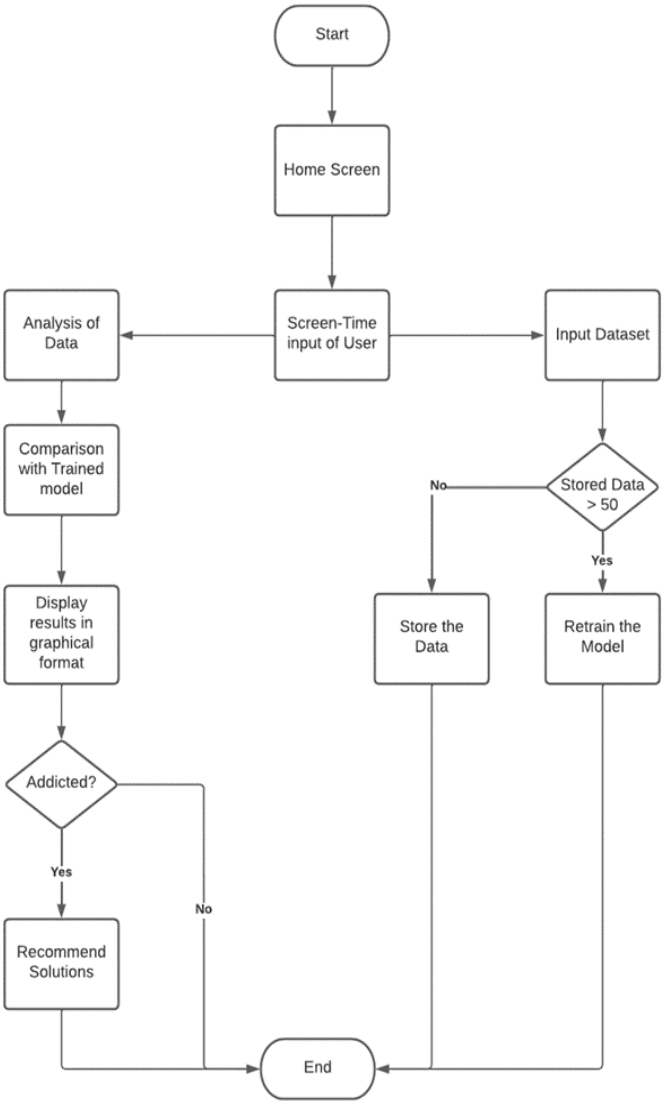

Fig. 1: Workflow

B. Implementation flow

1) Data Collection
2) Data analysis with linear regression / gradient decent using python.
3) Front-end
   - User Interface creation using React-JS.
   - Created a graph for display using Chart-JS.
4) Back-end
   - Process the input data using Node-JS.
   - Update the Training model.

C. User Interface

The user interfaces developed for the research are shown below.

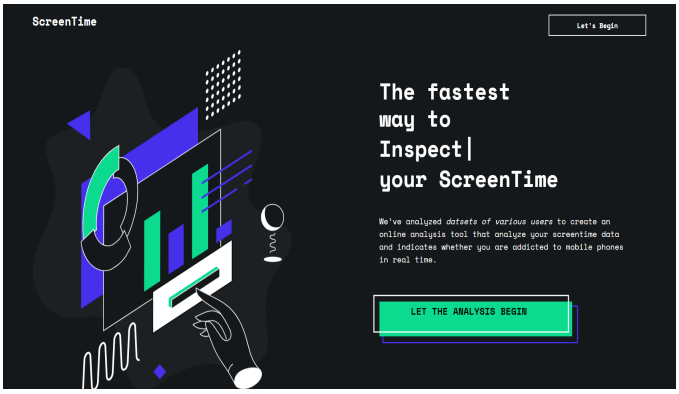

Fig. 2: Homepage

(a) The landing page shows the outline of what the application is about

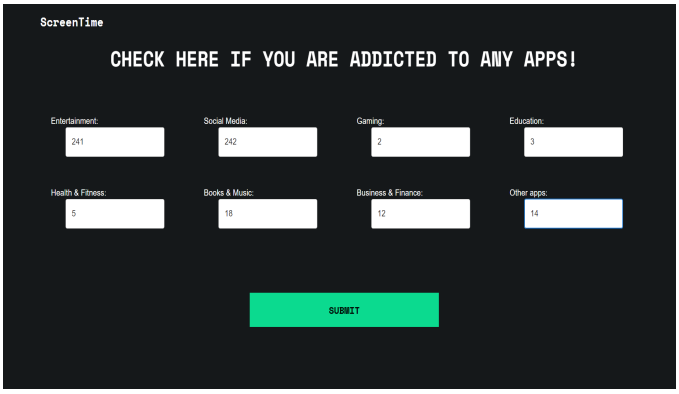

Fig. 3: Data Entry

(a) User enters the screen-time of each application classified according to the genre, which aids in their expectation of enslavement to that type of application.

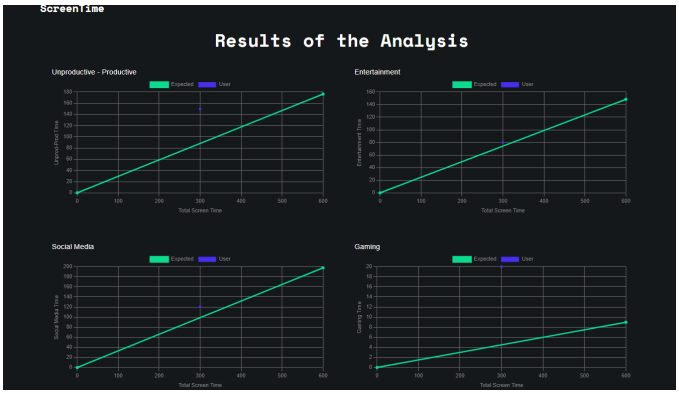

Fig. 4: Graphical Representation

(a) The Graph represents a regression line of the average screen-time of the app and also shows the user whether he/she is overusing that app based on the average usage. There are four graphs: one for productive vs. unproductive, one for entertainment, one for social media, and one for gaming. People are primarily addicted to these genres.

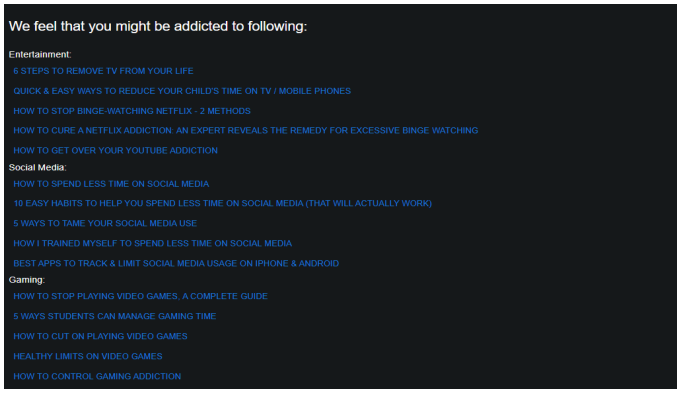

Fig. 5: Recommendation System

(a) The Recommendation system will only provide links if the screen-time usage of an app is above the regression line i.e the user uses that app more often than average

V. Discussion

The COVID-19 epidemic has changed the way many of us function permanently. Separating work and personal life has proven difficult for people who have converted to working from home. Furthermore, lockdowns have conditioned us to spend the majority of our time in front of a screen, making it simpler than ever to go down a rabbit hole, especially from the convenience of our smartphones. There's no denying that our obsession with smartphones has had a negative impact on our productivity and mental health.

In the last year or so, companies such as Facebook, Apple, and Google have developed tools to help consumers limit their screen time, recognising that many users have expressed concerns about how they use technology."We think technology should enrich life, not distract it," Google says. According to a recent research study, there are 367 applications and browser extensions that might assist users in combating internet temptations.

Despite the fact that digital wellbeing tools promote individual responsibility, many participants believed they should only be used as a last option. When individual variations are considerable, such as when a technology that improves one person's wellbeing diminishes another's, it may be especially crucial to preserve the centre of control at the individual level. Organizations that impose technology on others (e.g., schools and workplaces) should think about how it affects people's well-being and design rules that cater to a variety of requirements. Schools have a responsibility to teach, and that education should reflect the subtleties of digital wellbeing rather than promote unrealistic "abstinence only" programs.

The findings suggest that the functions built into the digital wellbeing apps were mostly focused on boosting digital usage awareness. The analysis of the user comments implies that increasing self-awareness to be more conscious of self-responses might lead to beneficial behavioural change if technology takes into account the elements mentioned in the findings section.The functions of reflection for self-awareness, reinforcement through self-tracking, signals to action, e.g.,

reminders, motivational and skills impacts, and behavioural activation states were reported by users to promote awareness and behaviour modification [10].

Gamification features, such as feedback and goals, were also considered beneficial as a motivation and awareness approach by users [11].

Throughout this conversation, we can compare digital well-being to food. There are some basic psychological demands that technology can assist with meeting, but how and how frequently they are utilized, as well as by whom, is a key factor in determining their impact on wellbeing. As a consequence, it may be easier to identify and assess innovations based on their prospective effects. Certifications and assessments may also help individuals in organisations advocate more effectively for policies that promote well-being.

VI. Conclusion

Applications for digital wellbeing are a type of assistive technology that employs usage data to raise awareness, empower users, and boost productivity. We provide an in-depth analysis of digital wellbeing technology in this article.

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