IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 3, January 2026
Impact Factor: 7.67

Detecting Human "Digital Burnout" from Device Usage

Kajal Chavan, Rutuja Kadam, Sanjana Kulkarni, Ms. Shrdhaa Gavkare, Pratiksha Bansode
Department of Computer Engineering
Pimpri Chinchwad Polytechnic, Pune
kajal.chavan156@gmail.com, rutujaskadam06@gmail.com, Sanjana21kul@gmail.com
shraddhagavkare13@gmail.com, bansodepratiksha23@gmail.com

Abstract: *The age of prevalent use of digital technology, excessive use of electronic gadgets, affects productivity and mental health significantly. The prevalence of digital burnout, characterized by feelings of mental exhaustion, loss of concentration, irritability, sleeping disorders, and emotional depletion, is often a result of persistent use of smartphones, laptops, and digital platforms. The system developed here is known as the Digital Burnout Detection System, a smart system designed for usage analysis and early detection of burnout symptoms.*

To analyze variables such as screen time length, application switching rate, response to notifications, and time taken to take breaks, the proposed system utilizes machine learning algorithms. This system categorizes levels of burnout into Low, Medium, and High Risk based on prominent features extracted from usage data. This system also takes the initiative to design notifications and recommendations to maintain healthy usage behavior when it recognizes that a user is under high risk of burnout. This proposed system strives to ensure that digital wellbeing is enhanced with real-time detection and prevention of burnout.

Keywords*:* Stress detection, machine learning, digital wellbeing, device usage analysis, digital burnout, and user behavior analysis

I. INTRODUCTION

Digital devices have become a prerequisite in modern life. They range from computers to smart gadgets such as mobile phones. They are utilized by people for learning purposes, office work, video conferencing, social media platforms, gaming, and many other purposes. As a result of their rampant use by people, many people find themselves spending many hours a day in front of the screen.

One of the issues that result from overuse of devices is Digital Burnout. This happens when the brain becomes exhausted from prolonged interaction with digital devices without taking frequent breaks. Symptoms of Digital Burnout include being perpetually tired, losing attention, being irritated, experiencing stress, head, visual, sleeping, and loss of motivation problems, among others.

Students studying for exams, employees working long hours, or people working from home are prone to digital burnout. Currently available solutions like screen time trackers are limited to showing the usage duration of a device. The system lacks understanding of usage patterns of a device or any notification of mental burnout. Hence, there is a requirement of a smarter system to analyse device usage patterns to detect mental burnout at an early stage.

This particular project will bridge this gap by presenting an intelligent system for detecting burnout as a digital wellbeing assistant that will enable users to balance their usage of technology and personal lives.

Ease of Use

Automatically in the background without interfering with what a user is normally doing. The user does not have to fill out any details by hand because the system is automatically obtaining usage statistics.

DOI: 10.48175/IJARSCT-30912

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If unhealthy usage behaviour is identified by the system, the system triggers friendly notifications. They could contain tips such as taking a break, exercising eye relaxation, limiting notifications, and cutting down screen time. The notifications are helpful and non-stressful.

The level of burnout is presented in three easy levels:

• Low Risk – Healthy usage behaviour

•Medium Risk – User should be careful

• High Risk – Immediate action required

This enables a simple categorization of users so that they can easily recognize and correct their mental status regarding digital habits.

II. LITERATURE SURVEY

Device Usage and Mental Stress

Long screen exposure, different research studies prove, and continuous digital activity elevate mental stress. Very frequent app switching and instant responses to notifications are indicative of a lack of focus and high mental pressure. Monitoring device usage behaviour is an effective way to detect early signs of burnout without directly questioning the user.

Role of Machine Learning

Machine Learning is widely used for analysing user behaviour and predicting mental health issues. Random Forest, SVM, and Neural Networks are algorithms that are used for analysing patterns in large data sets to classifying levels of burnout or stress. These models get more accurate with time while analysing user behaviour.

Additional Indicators

In certain systems, a physical cue such as eye movement, typing speed, or body position is utilized to recognize stress. While these techniques increase the accuracy of results, they also increase their costs due to the extra device or sensors needed. In contrast to such sophistication, the proposed project remains straightforward by concentrating on device use data.

Drawbacks of Current Tools

Existing systems are limited to giving basic information like screen time reports only. They do not track burnout predication, reminders, or personalized recommendations. The current project is an advancement over these systems and offers smart analysis and preventive measures.

III. METHODOLOGY

The Digital Burnout Detection System has a well-structured and automated process to monitor the users in their digital device usage and to detect the levels of digital burnout. The system has been designed in such a way that it runs in the background without bothering the user and without the need for human input. The system helps in detecting digital burnout by monitoring the behaviour of the users and gives timely support to prevent mental exhaustion.

1. Data Collection

Data gathering is the foundation of the entire system. In this process, the system keeps track of the online activities of the user as it runs independently in the background. The user does not require any information to be inputted manually.

It tracks data like total screen time in a day, cumulative usage time without any breaks in between, number of times the app is opened and switched, number of notifications received and time to respond, typing behaviour, touching behaviour, and idle time or break time. The variables are useful in identifying how much time is being consumed in operating the device.

In order to ensure the privacy of users, the system does not collect any data related to personal conversations, calls, images, or videos, but it is based on behavioural data only. The data will be collected with prior permission from users.

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2. Data Preprocessing

The resultant raw data could have errors, missing data, or redundant data. Hence, data pre-processing is carried out for cleaning and preparation of properly organized data for analysis.

In this step, any incorrect or misleading data is removed, missing data is treated, and data of any kind is made uniform. Data is represented in an organized way so that it can be analysed easily by the system. This not only adds to the quality of the data, but it also provides assurance that the procedure for burnout detection has integrity.

3. Feature Extraction

"Feature extraction centres on finding patterns relevant to digital burnout within the processed information. The system employs extracted behavioural features that show mental stress and workload as opposed to utilizing the information directly."

Lack of continuous use without a break, fewer breaks between uses, app-switching patterns that indicate a lack of focus, notification reaction patterns that indicate a sense of force, unusual usage patterns, and patterns of usage at late nights that affect sleeping patterns.

These aspects assist the system in identifying not only the usage level of the device but also how the device is being used.

4. Feature Selection

Not all the features extracted are of the same level of importance in the detection of burnout. It is at this point where the system only extracts the most important features while omitting the insignificant ones.

Feature selection makes the system less complicated, enhancing processing speeds and prediction accuracy. It also prevents cases of overfitting. The selected features are then subjected to the machine learning algorithm for classification.

5. Burnout Classification Using Machine Learning

At this stage, a machine learning system processes the identified features with a view to identifying the level of burnout that a user is suffering from. The machine learning system is trained using labelled databases that have already been classified based on usage patterns considering burnout categories.

On the basis of learned patterns, it predicts the level of burnout the user is experiencing at the moment. The more it learns from usage patterns over time, the better it becomes at predictions.

6. Decision Making

The system then proceeds to compare the burnout levels with predetermined threshold values. Depending on the values, a decision is made by the system to act or not.

If the burnout intensity is low, the system silently carries on with the observations. If the intensity is medium, a warning message pops up. If the intensity is high, the system starts issuing alerts and suggestions for stress relief immediately.

7. Alert Generation and Recommendation

If the risk level identified is medium or high, the system delivers alerts related to the aspect of burnout being addressed in these tips in a friendly and easily comprehensible form. The tips provided could be related to taking short breaks, decreasing screen time, avoiding notifications, relaxation exercises, or time offline.

The objective is to assist people with stress management and promoting healthier digital habits while avoiding creating stress or fear.

8. Continuous Learning and Improvement

It continuously updates its machine learning model, adding more and more new usage data. In this way, it can adapt to changes in user behaviour, lifestyle, and work patterns.

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Over time, the system is enriching its intelligence, accuracy, and personalization to be effective in long-term detection and prevention of digital burnout.

IV. CONCLUSION

The proposed project, "Detecting Human Digital Burnout from Device Usage," clearly shows that there is an increased need for AI systems that are tasked with monitoring the effects of digital burnout on users. In modern society, in which people spend so much time on smartphones, laptops, and other forms of digital devices, digital burnout in the form of mental fatigue, irritability, lack of sleep, and lack of productivity has become a common phenomenon. Using traditional software in which users are only required to track their screen time only yields basic data that is unable to define a user's level of burnout. This project is more accurate in its assessment.

The addition of machine learning capabilities means that it is possible to categorize the degree of burnout into either low, medium, or high, ensuring that alerts and suggestions relevant to it can be provided. The benefits derived from it include its ability to assist users in taking corrective and easy measures with regard to their use of technology and technology-enabled devices. The main advantage of the system is that it is essential for students and professionals who spend a significant amount of time using technology.

But it also tends to promote the responsible use of technology and makes people understand the threats of excessive screen time, thus cultivating awareness. With time and continued use of the system, long-term behavioural change, enhancement in focus, productivity, and better wellbeing can be achieved.

The prospects of the project are bright, hence, in the near future. Wearable sensor data, for heart rate, sleep patterns, activity level, may be able to provide even more useful context in making more precise inferences about the state of mind of a user. Development of a mobile application would make the system more accessible, allowing real-time monitoring and intervention. Besides, the incorporation of adaptive recommendation engines would make suggestions more personalized based on individual habits, lifestyle, and stress patterns, thus making interventions more effective and relevant.

ACKNOWLEDGMENT

We would like to extend our sincere thanks to our mentor, **Prof. Shrdhaa Gavkare**, from the Department of Computer Engineering at Pimpri Chinchwad Polytechnic. Her technical knowledge and mentorship were essential factors in the success of this project, especially in terms of her knowledge about Weighted Scoring Algorithm and system architecture.

We also want to thank the Head of the Computer Engineering Department and the Principal of Pimpri Chinchwad Polytechnic for their contributions. We appreciate their support in ensuring that the necessary lab environment was in place for our academic development.

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