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AI-Based Child Behaviour and Mental Health Monitoring System

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Abstract - Children increasingly use smartphones for communication, entertainment, and learning. Although digital devices provide useful opportunities, excessive or unsuitable use may affect daily routines and expose children to inappropriate content. Parents may find it difficult to understand these patterns through occasional observation alone. This paper presents an Android-based prototype, Safeguard, designed to support parental awareness of children's smartphone behaviour. The system focuses on application-use monitoring, content-safety screening, behavioural indicators, and parent notifications. App activity is organized to provide a view of usage patterns, while text-related safety signals are screened using a rule-based approach. The system is intended to highlight potentially concerning patterns for review rather than make a clinical diagnosis. Prior research has explored mobile mental-health applications, emotion-aware typing analysis, social-media text classification, and child mental-health surveillance. These studies inform the design of the proposed system, particularly the need for continuous observation, accessible reporting, and careful interpretation of automated indicators. The prototype's current functionality is described, together with its limitations and a proposed evaluation plan. No clinical validation or measured predictive accuracy is claimed. The system is intended as an assistive tool for caregivers, with further work required to assess usability, reliability, privacy, and effectiveness.

Keywords - children's behaviour, mental health monitoring, Android application, smartphone usage, content safety, parental awareness, behavioural indicators.

I. INTRODUCTION

Mental health and well-being involve emotional, psychological, social, and behavioural functioning. Childhood and adolescence are important developmental periods during which family relationships, school experiences, peer interactions, and digital environments can influence well-being. Surveillance research has emphasized that child mental health is multidimensional and that no single indicator can represent a child's overall condition [1].

Smartphones have become a common part of children's daily activities. They support education and communication, but prolonged or poorly supervised use may interfere with sleep, physical activity, study routines, and family interaction. Digital-use monitoring research has demonstrated how applications can help users observe their own usage and make more informed decisions about screen time [2]. However, usage duration alone does not describe the context of an activity or whether a child may be encountering potentially harmful content.

Machine learning and natural language processing have also been investigated for mental-health-related analysis. Mobile applications have explored self-assessment and supportive recommendations [3], while research on social-media text has investigated linguistic patterns associated with depressive tendencies [4]. Other work has explored physiological signals for stress monitoring [5] and typing behaviour as a source of emotion-related features [6]. These studies demonstrate possible computational approaches, but their results cannot be directly transferred to children or to a different application without suitable evaluation.

This paper presents Safeguard, an Android prototype designed to provide caregivers with a structured view of smartphone-use behaviour and selected content-safety indicators. The system is intended to support awareness and communication between caregivers and children. It is not designed to diagnose depression, anxiety, or any other mental-health condition.

The main contributions of this work are: (1) a smartphone-use monitoring approach that organizes application activity into understandable usage information; (2) a content-safety screening component that checks selected text signals using a rule-based method; (3) a parent-awareness workflow intended to surface potentially concerning patterns for human review; and (4) a discussion of implementation limitations, privacy considerations, and a future evaluation framework.

II. RELATED WORK

A. Smartphone Usage Monitoring

Potapova, Cetinkaya, and Liebchen presented a mobile application for monitoring and controlling smartphone usage [2]. Their prototype allowed users to view usage duration and configure preferences, with the aim of raising awareness and supporting self-control. Their work provides a basis for treating usage information as an understandable behavioural indicator rather than an isolated number. Safeguard applies a related monitoring principle in a caregiver-oriented context.

B. Mobile Mental Health Applications

Mendis et al. described a mobile application intended to help users identify stress, anxiety, and depression levels and access supportive activities [3]. Their approach included standardized scales and machine-learning methods. This work highlights the value of mobile accessibility and user support. However, a child-monitoring application should not present usage observations as a clinical assessment unless it has been validated using appropriate methods and professional oversight.

C. Text-Based Mental Health Analysis

Ghaswala et al. investigated depression-related text classification using natural language processing and a bidirectional long short-term memory model [4]. Their paper reports precision of 98% and recall of 99% for its own dataset and experimental setup. These reported values are specific to that study and should not be interpreted as evidence of equivalent performance in Safeguard. Text classification is affected by language, context, dataset composition, and the way emotional expression differs between individuals.

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D. Emotion-Aware Smartphone Interaction

Ghosh et al. proposed EmoKey, an Android keyboard that inferred four emotion states from typing interactions using a personalized model [6]. Their in-the-wild study included 22 participants and reported an average AUCROC of 78%. The work demonstrates that interaction patterns may contain signals associated with emotion. It also raises privacy considerations because typing activity can be highly sensitive. Safeguard does not claim to reproduce EmoKey's model or its results.

E. Child Mental Health Surveillance

The report Mental Health Surveillance Among Children—United States, 2013–2019 describes child mental health as a broad continuum and notes that no single indicator can define the mental health of a child [1]. Pinjarkar et al. also discussed an Android-based child well-being monitoring approach involving behavioural tracking and assessment [7]. Together, these works support a cautious design: automated indicators should provide context for caregivers, not replace professional assessment.

III. PROBLEM STATEMENT AND OBJECTIVES

A. Problem Statement

Caregivers may not have a continuous or structured view of a child's smartphone activity. Manual supervision can be inconsistent, while screen-time totals alone may not indicate the nature of app usage or the presence of potentially concerning text signals. There is a need for an accessible system that organizes selected digital-behaviour indicators and communicates them in a way that encourages appropriate caregiver review.

B. Objectives

The objectives of Safeguard are: to monitor application-use activity supported by the Android environment; to organize usage information into a form that can be reviewed by a caregiver; to screen selected text-related signals for predefined safety keywords or patterns; to identify rule-triggered events and make them available for parent awareness; to provide a supportive, non-diagnostic view of digital behaviour; and to identify privacy, usability, and evaluation requirements for future development.

IV. PROPOSED SYSTEM

Safeguard is designed as an Android-based application with components for usage monitoring, local data management, safety screening, and parent-facing awareness.

A. System Architecture

The proposed workflow contains the following stages: (1) Activity observation: the application obtains supported usage information from Android. (2) Data organization: usage events are organized into application-level activity records. (3) Safety screening: selected text signals are checked against configured safety terms or rules. (4) Indicator generation: a rule-triggered event or usage pattern is identified for review. (5) Caregiver awareness: the application presents relevant information or a notification. (6) Human review: a caregiver considers the indicator in context and communicates with the child where appropriate.

The system should not treat a single event as proof of distress, harmful intent, or a mental-health condition.

B. Application-Use Monitoring

Application-use information provides a measurable description of digital activity. The monitoring component is intended to help organize activity by application and duration. This approach follows the general awareness principle described in smartphone-use monitoring research [2].

Usage duration is only one contextual signal. A long session may correspond to educational work, communication, or entertainment. Therefore, the application should avoid interpreting duration alone as evidence of a behavioural or mental-health problem.

C. Content-Safety Screening

The prototype includes a rule-based screening approach for selected text-related safety signals. A screening pipeline can normalize text, compare it with configured keywords or patterns, and mark matching content for review. Text normalization may include converting text to a consistent case and removing selected punctuation or formatting differences.

Rule-based screening is computationally straightforward and can be explained to users. However, it may produce false positives when a word is used in a harmless context and false negatives when a concerning message uses unfamiliar language, slang, spelling variations, or indirect expression. The screening result should therefore be treated as an indicator requiring context, not as a definitive classification.

D. Behavioural Indicators and Notifications

The application's awareness workflow is designed to make selected activity and screening signals visible to a caregiver. A notification should communicate what triggered it and avoid making unsupported claims about the child's emotional state. The caregiver should be encouraged to review the surrounding context and, where suitable, speak with the child.

The system's purpose is to support responsible supervision and early awareness. It does not replace parental judgement, school counselling, or professional mental-health assessment.

V. IMPLEMENTATION OVERVIEW

The project is implemented as an Android application referred to as Safeguard. The implementation described in the project context uses Kotlin and Android application components, with Jetpack Compose for interface construction, Room for local data storage, and WorkManager for scheduled background work where applicable.

The application is organized around the following functional areas: usage monitoring, which collects supported application-use information; local persistence, which stores relevant records for application use and review; safety screening, which applies predefined rules to selected text-related signals; indicator handling, which organizes rule-triggered events for review; and parent awareness, which presents usage or safety information through the application workflow.

Android permissions and background-execution restrictions affect what can be monitored reliably. Some features may depend on device settings, operating-system version, user consent, or permitted access. The paper therefore describes a prototype rather than claiming universal monitoring coverage across all devices.

VI. DISCUSSION

The proposed system combines digital-use awareness with selected content-safety indicators. This design differs from research that focuses exclusively on a clinical screening questionnaire, social-media text classification, typing-based emotion inference, or physiological sensing. The purpose is to provide a practical caregiver-facing view of selected smartphone behaviour.

The system's main strength is the explainability of its rule-based screening. A caregiver can be shown the type of rule that generated an indicator, making it easier to understand why an event was surfaced. The approach also has limitations. Keyword-based screening does not fully understand context, sarcasm, cultural differences, or a child's individual communication style. Usage patterns can vary widely according to age, school requirements, and family routines.

A further limitation is that digital behaviour is not a direct measure of mental health. The CDC surveillance report emphasizes the broad and multidimensional nature of child mental health [1]. Therefore,

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Safeguard should not label children as depressed, anxious, addicted, or psychologically unwell based solely on application activity or text matches.

VII. PRIVACY AND ETHICAL CONSIDERATIONS

Children's digital activity and mental-health-related information are sensitive. A monitoring application should collect only information needed for its stated purpose and should clearly explain what is collected, why it is collected, and who can access it.

The following safeguards are recommended for further development: obtain appropriate guardian consent and provide age-appropriate explanations to children; minimize collection and retention of sensitive text or activity data; prefer local processing when feasible; protect stored information and communication using appropriate security controls; restrict caregiver access to authorized accounts; provide a clear way to review and delete stored information; avoid presenting automated indicators as medical diagnoses; and include human review before taking consequential action.

The system should be designed to support a child's safety and well-being without unnecessarily invading privacy or encouraging punitive monitoring.

VIII. EVALUATION PLAN

A formal evaluation is required before claims can be made about reliability, usability, or effectiveness. The following evaluation is proposed.

A. Functional Testing

Each supported feature should be tested against expected behaviour. Test cases should include application-use recording, persistence, notification triggering, permission handling, and recovery after application or device restart.

B. Screening Evaluation

The content-safety component should be evaluated using a carefully constructed, consented, and appropriately anonymized test set. The evaluation should include both matching and non-matching examples. Precision, recall, F1-score, and false-positive rate should be reported where valid ground-truth labels are available.

C. Usability Evaluation

Caregivers and, where ethically appropriate, children should be invited to provide feedback on clarity, usefulness, and ease of use. The study should include consent, age-appropriate procedures, and safeguards for sensitive data.

D. Limitations of Current Evaluation

No measured accuracy, clinical validation, participant study, or quantified usability result is claimed in this paper. The evaluation plan above describes future work and should not be reported as completed testing.

IX. CONCLUSION AND FUTURE WORK

This paper presented Safeguard, an Android-based prototype intended to support caregiver awareness of children's smartphone behaviour. The system focuses on application-use monitoring, rule-based screening of selected text-related safety signals, and the presentation of indicators for human review. Its design is informed by research on smartphone-use monitoring, mobile mental-health applications, text-based depression analysis, emotion-aware smartphone interaction, and child mental-health surveillance.

The system is an assistive awareness tool and is not a diagnostic system. Its current limitations include the context sensitivity of rule-based screening, dependence on Android permissions, and the absence of formal evaluation results. Future work should include broader functional testing, privacy and security review, usability evaluation, and validation of screening performance using an ethically prepared dataset. Collaboration with child-development and mental-health professionals would also help ensure that the system's indicators and caregiver guidance are appropriate.

REFERENCES

[1] R. H. Bitsko et al., "Mental Health Surveillance Among Children—United States, 2013–2019," Morbidity and Mortality Weekly Report, Supplement, vol. 71, no. 2, Feb. 2022.

[2] K. Potapova, D. Cetinkaya, and G. Liebchen, "Monitoring and Controlling Phone Usage to Raise Awareness and Combat Digital Addiction," in Proc. 7th Int. Conf. Behavioural and Social Computing (BESC), 2020, doi: 10.1109/BESC51023.2020.9348314.

[3] E. S. Mendis, L. W. Kasthuriarachchi, H. P. K. L. Samarasinha, S. Kasthuriarachchi, and S. Rajapaksa, "Mobile Application for Mental Health Using Machine Learning," in Proc. 4th Int. Conf. Advancements in Computing (ICAC), 2022, doi: 10.1109/ICAC57685.2022.10025036.

[4] M. Ghaswala, C. Gomes, S. M. Kumar, and S. Sweta, "Depression Detection from Social Media Text using NLP and Deep Learning Techniques," in Proc. First Int. Conf. for Women in Computing (InCoWoCo), 2024, doi: 10.1109/INCOWOCO64194.2024.10863118.

[5] B. Venkataramanaiah, K. Giridhar Reddy, S. Kumar, K. Ramakrishnan, S. M., and S. Rajesh, "Real Time Mental Health Monitoring System using Machine Learning," in Proc. Second Int. Conf. on Intelligent Cyber Physical Systems and Internet of Things (ICoICI), 2024, doi: 10.1109/ICOICI62503.2024.10696460.

[6] S. Ghosh, S. Sahu, N. Ganguly, B. Mitra, and P. De, "EmoKey: An Emotion-aware Smartphone Keyboard for Mental Health Monitoring."

[7] P. C. Pinjarkar, K. A. Sonwane, K. V. Shinde, and D. A. Sananse, "Mental Health and Well-Being Surveillance, Assessment, and Tracking Solution Among Children," International Journal for Research in Applied Science & Engineering Technology, vol. 13, no. III, Mar. 2025, doi: 10.22214/ijraset.2025.67873.

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