Engineering on Intelligent Machine Learning Framework for Age-Responsive Internet Access Control

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1 Abstract

The Age-Responsive Internet Access Control System is an intelligent program designed to control internet access based on a user's age, leveraging machine learning model. This system captures real-time face data from users, processes it using pre-trained machine learning models, and accurately predicts their age by passing through pre-trained machine learning models. Then, the internet feature will be allowed according to the user's age.

2 Introduction

The Age-Responsive Internet Access Control System is a versatile tool designed for use in households, educational institutions, and organisations seeking to create a safer and more responsible digital environment. By integrating machine learning technology, it offers a scalable, efficient, and privacy-respecting approach to internet access management.

3 Problem Statement

- Young generation get addicted on some internet service whom are not enough aged to get those service.[1]
- By browsing some adult site, they lost their social morality.[2]
- Government can't take any step to reduce the addiction because it's very difficult to imply a rule for a certain amount of people.[3]
- Most of the guardian can't do anything due their inefficiency in modern device.[4]

4 Motivation

- Protecting young generation from Harmful content.
- Encouraging Responsible Digital Behavior.
- Ensuring Privacy and Security.
- Enabling Personalized and Dynamic Access Management.

5 Objective

- To develop and implement a machine learning model for age detection to regulate internet access based on user age.

6 Literature Review

Table 1: Literaure Review for our proposed System

Author	Contribution	Limitation
Sharma et al.[1]	Proposed a framework for multimodal biometric authentication systems with template protection.	Focuses on authentication; does not address age determination specifically.
J. Liu and P. Zhang (2023).[2]	Explored hybrid multimodal fusion techniques for enhancing biometric system accuracy.	No specific application for age determination or internet access control.
C. S. Lee et al. (2023).[3]	Addressed biometric data security in real-time authentication systems with advanced encryption.	Focuses on security; lacks detailed application to internet access control or user management.

7 Tools and Technology

Category	Tool/Technology
Mobile App Development	Android Studio, Java
UI Design	XML (Android Layouts), Material Design
Machine Learning	DeepFace (pre-trained model)
Face Detection	OpenCV, FaceNet (via DeepFace)
Graphical Visualization	draw.io
Data Handling	SQLite, SharedPreferences
Access Control	Android PackageManager APIs
Anti-Spoofing (Optional)	Liveness detection techniques (basic)
Testing	Manual Testing, Android Emulator
Version Control	Git, GitHub

Figure 1: Tools and Technologies Used

8 Backend Design (ER-Diagram)

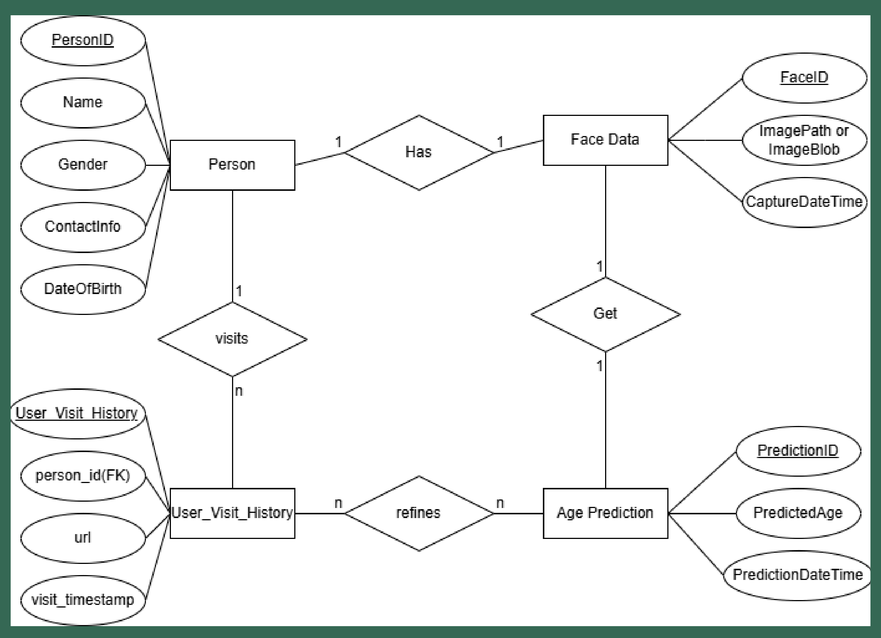

Figure 2: Entity Relationship Diagram for Our Seystem

9 Implementation

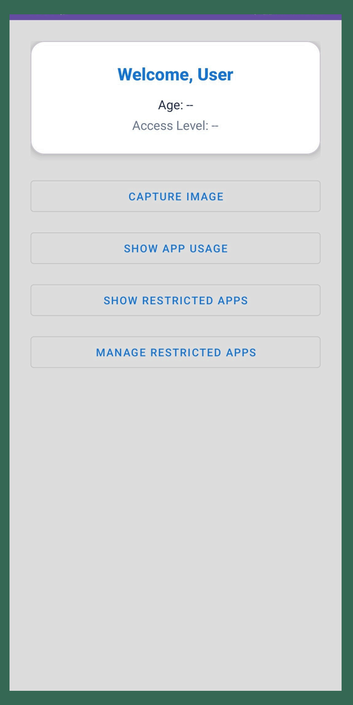

Figure 3: Welcome Page Before Face Scan

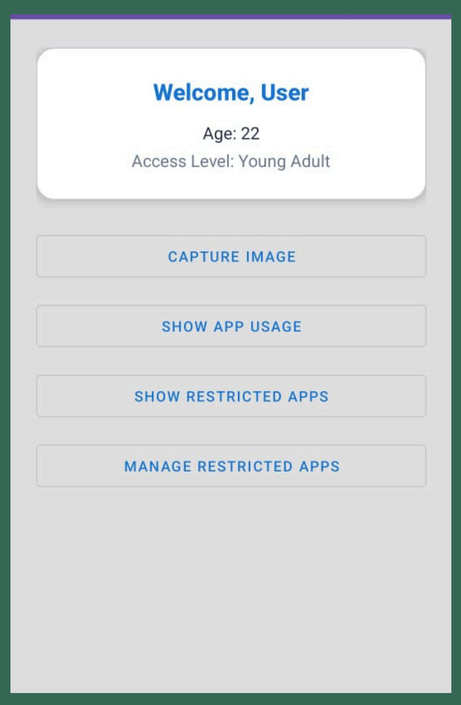

Figure 4: Welcome Page After Face Scan

Implementation(Cont.)

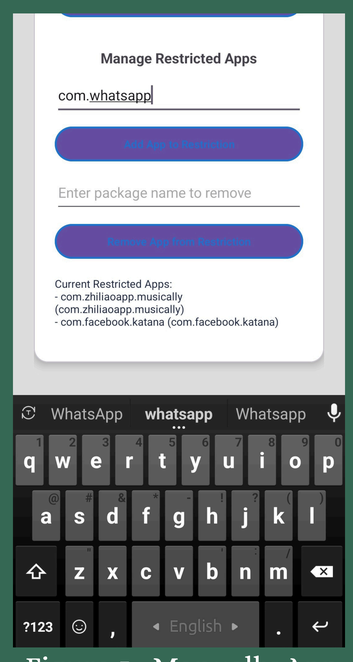

Figure 5: Manually App Restriction

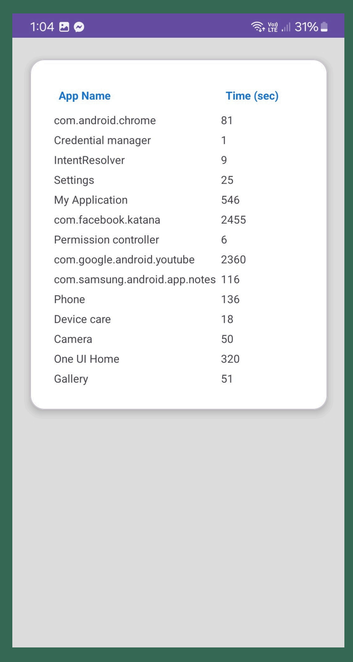

Figure 6: User Visit History

10 Social Impact

- Safer Digital Environment for younger.
- Improved Digital Literacy and Responsible Internet Usage.
- Government can't take any step to reduce the addiction because it's very difficult to imply a rule for a certain amount of people.
- Most of the guardian can't do anything due their inefficiency in modern device.
- Young generation lost interest on education.

11 Conclusion

The Age-Responsive Internet Access System ensures secure, age-based access using machine learning model while safeguarding privacy. It addresses digital challenges and aims to improve accuracy and expand accessibility through future advancements.

12 Reference

1. A. K. Sharma, R. Yadav, and S. Kumar, "A Framework for Multimodal Biometric Authentication Systems With Template Protection," IEEE Transactions on Biometrics, Behavior, and Identity Science, vol. 6, no. 1, pp. 12-23, Jan. 2024.
2. S. N. Patil, M. Joshi, and A. Gupta, "Multi-modal Biometric System for Face and Fingerprint using Convolutional Neural Network," in Proceedings of the IEEE International Conference on Recent Advances in Biometric Applications, Hyderabad, India, Jan. 2024, pp. 34-41.
3. J. Liu and P. Zhang, "Enhanced Biometric Systems Using Hybrid Multimodal Fusion Techniques," IEEE Access, vol. 11, pp. 34567-34579, 2023.
4. T. Wilson, H. Nguyen, and A. Morales, "Age-Informed Biometric Access Control: Integrating Machine Learning and Privacy Preservation," IEEE Access, vol. 10, pp. 144532-144540, Nov. 2022.

13 Testing

Test Case ID	Test Scenario	Test Steps	Expected Result	Actual Result	Status	Testing Score (Out of 10)
TC001	Face Scan Initialization	Open the app and initiate face scan	Camera opens and begins scanning	Camera opens correctly	Pass	9
TC002	Face Not Detected	Try scanning with camera blocked	Error shown: 'Face not detected'	Error shown	Pass	7
TC003	Age Detection (Under 18)	Scan a teen user face	Age estimated < 18	Age correctly estimated < 18	Pass	8
TC004	Age Detection (Adult)	Scan an adult user face	Age estimated ≥ 18	Age correctly estimated ≥ 18	Pass	8
TC005	App Restriction (Minor)	Login as user < 18	Restricted apps are hidden or locked	Access blocked	Pass	10
TC006	Full Access (Adult)	Login as user ≥ 18	All apps accessible, customization enabled	Access allowed	Pass	9
TC007	Customization Feature	Adult user sets allowed apps for minors	Minor user sees only allowed apps	App list is filtered correctly	Pass	9