<FaceAdmin>

<Nuraly Baktygaliyev>

<22066772>

UXCFXK-30-3

Digital Systems Project



# Abstract

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# Acknowledgements

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# Introduction

Traditional entry methods using keycards and PIN codes are very prone to problems like unauthorized sharing, loss of tokens, and human error in log maintenance. These signal an urgent need for a more robust and reliable solution that reduces administrative overhead while enhancing workplace security. Recently, it has emerged as a viable alternative to address such issues: facial recognition technology, which identifies individuals by their unique biometric features. A well-designed face recognition system will speed up the verification processes and eliminate the use of physical tokens, hence smoothing operations and reducing unauthorized access attempts significantly.

The project in the report covers a face recognition integrated system for use in offices. Its main focus is to automate and simplify the management of employee attendance and visitors' access, powered by the capabilities of deep learning models and web technologies. The goal is to develop not just a functional prototype that would be able to detect and verify people's identities reliably but also an easy-to-use administrative dashboard that will enable the office managers and other authorized personnel to stay in control of the system. This includes real-time monitoring, data analytics, and role-based access to the platform, ensuring sensitive information is protected from unauthorized manipulation.

A review of related literature on the face recognition system shows the immense accuracy the deep learning methodologies, especially using Convolutional Neural Networks, have gotten while identifying minute facial features. Similarly, training and deploying such models by using TensorFlow and Keras, and efficient preprocessing and capture using libraries like OpenCV, remain paramount. This is where powerful tools are implemented within a system that has architectural consistency and scalability. Attention must also be given to the security aspect and user experience. Besides, research in the area shows potential issues of bias, privacy, and regulatory compliance; any such successful system would have to balance strong technological underpinnings with steadfast ethical boundaries.

A hybrid approach to development was followed for handling the multidimensional nature of the problem. This puts a lot of emphasis on iterative and incremental improvements so that adjustments in model performance or user interface design can be rapidly integrated. The system backend is built using Django and Django REST Framework, providing a secure set of API endpoints for face recognition requests, user administration, and session management. The admin dashboard and office employee portal are based on React, with Vite employed to work on build performance. Containerization with Docker is used to ensure that the whole solution-from the database layer into the face recognition engine-can be deployed consistently in different environments, such as local servers or the cloud. By partitioning the system into modular containers, scalability and maintenance become much easier, allowing updates and monitoring to be easily achieved.

It is expected that this project will result in a working prototype capable of recognising authorised employees in real time, recording attendance data and providing the administrator with a user-friendly web-based dashboard to control this data. This development is focused solely on the office environment, although given its modular design, it can easily be adapted to other environments should this be required in the future. Ultimately, the project is intended to illustrate how new biometric technologies can be utilised to improve security and administrative efficiency. It is equally important to demonstrate a design philosophy based on ethical responsibility and compliance with data protection regulations.

This report is structured according to a sequence starting with the problem statement and ending with a detailed description of the implementation steps, testing procedures and evaluation of the results. Chapter two provides a critical literature review, analyses various existing face recognition systems, discusses the basic principles and identifies the gaps that this project seeks to fill. Chapter three describes the functional and non-functional system requirements, assumptions and limitations. Chapter four details the methodology, project management strategies, and specific tools used for data collection and processing. Chapter five discusses the architecture of the overall system, the design decision made, which shows how the various components interact to create a holistic solution. Chapter six describes the technical aspect of the implementation, including the organisation of the code base, model integration and deployment methods. Chapter seven describes testing and evaluation procedures to validate the functionality, performance, and security of the system. Chapter eight critically assesses the extent to which the project achieved its objectives, highlighting the problems found and comparing the proposed solution with existing options. Finally, chapter nine of the report summarises the results of the work on the system and identifies areas for further work in this area.

# Literature Review

# Requirements

# Methodology

# Design

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# Appendix A: First Appendix