INTEGRATED ATTENDANCE APPLICATION BASED ON FACE RECOGNITION AND ARTIFICIAL INTELLIGENCE WITH ACADEMIC SYSTEM

THESIS

Submitted to fulfill part of the requirements to obtain a Bachelor's degree in the field of Electrical Engineering

Written by:

Afdal Rezki

NIM 1900206

BACHELOR PROGRAM IN ELECTRICAL ENGINEERING

FACULTY OF TECHNOLOGY AND VOCATIONAL EDUCATION

UNIVERSITAS PENDIDIKAN INDONESIA

BANDUNG

2023

INTEGRATED ATTENDANCE APPLICATION BASED ON FACE RECOGNITION AND ARTIFICIAL INTELLIGENCE WITH ACADEMIC SYSTEM

Written by

Afdal Rezki

A thesis submitted to fulfill one of the requirements for obtaining a Bachelor's degree in Electrical Engineering in the Electrical Engineering Undergraduate Study Program

Universitas Pendidikan Indonesia

August 2023

PAGE OF APPROVAL

AFDAL REZKI

1900206

INTEGRATED ATTENDANCE APPLICATION BASED ON FACE RECOGNITION AND ARTIFICIAL INTELLIGENCE WITH ACADEMIC SYSTEM

Approved and validated by the supervisors:

Supervisor I

Didin Wahyudin, Ph.D.

NIP. 19760827 200912 1 001

Supervisor II

Rabu Sidang
3 Agustus 2023 .

Dr. Siscka Elvyanti, M.T.

NIP. 19731122 200112 2 002

Acknowledged

Head of Program

Iwan Kustiawan, S.Pd., M.T., Ph.D

NIP. 19770908 200312 1 002

STATEMENT OF AUTHORIZATION

I, Afdal Rezki, as the researcher responsible for the thesis titled "**INTEGRATED ATTENDANCE APPLICATION BASED ON FACE RECOGNITION AND ARTIFICIAL INTELLIGENCE WITH ACADEMIC SYSTEM**" hereby affirm that I am the sole author of this thesis and all its contents. I assure that I have not engaged in any form of plagiarism or improper citation that deviates from the scientific ethics upheld by the linguistic community. I acknowledge that in the event of any violation of scientific ethics or if any claims are raised regarding the authenticity of my work by other parties, I am willing to accept the associated risks and potential sanctions.

Bandung, August 2023

Afdal Rezki

NIM. 1900206

ACKNOWLEDGEMENTS

First of all I would like to express my deepest gratitude to the Almighty God, Allah SWT for His blessings and mercy so that I was able to complete this thesis journey to completion. Not to forget also endless prayers and greetings are always poured out to the prophet Muhammad SAW, his friends, family, and people.

The author acknowledges that there are still many aspects that can be enhanced in this thesis. Consequently, they are receptive to criticism and suggestions from various parties to improve it in the future. The author also recognizes the importance of striking a balance between the smoothness of writing this thesis and the assistance, motivation, and guidance provided by different individuals. At this opportunity, the author expresses gratitude to those who have contributed to the preparation of this thesis, ensuring its successful completion.

To my parents and my family, thanks beyond measure to all of you who have always loved, encouraged and assisted me in completing this thesis. Without your love, I wouldn't be able to complete this journey.

Many thanks to Mr. Didin Wahyudin, Ph.D., and Mrs. Dr. Siscka Elvyanti, M.T., as my supervisor and Co-Supervisor who always provides guidance, direction, advice and input for the me with great patience, so that the author can complete this thesis well.

Also, thanks to Mr. Iwan Kustiawan, S.Pd., M.T., Ph.D., Head of the Electrical Engineering Study Program, Indonesia University of Education. For his support, permission and recommendation to the author to compile this thesis.

Thank you also to All lecturers and teaching staff of DPTE FPTK UPI for all the knowledge and lessons given to the writer during the lecture period.

All friends of the Electrical Engineering Education class of 2019, especially TE'19 and Elkom'19, have gone through many ups and downs together during our studies. I wish everyone to succeed in their paths.

And all those who have accompanied during the study and provided support during the writing of the thesis that the writer cannot mention one by one.

Bandung, August 2023

Afdal Rezki

ABSTRACT

The facial recognition attendance system plays a crucial role in enhancing security through its biometric capabilities. Particularly, in the context of a pandemic or an endemic situation, the adoption of facial recognition technology offers a contactless solution to minimize the risk of transmission. This research aims to develop a mobile-based facial attendance system using artificial intelligence. Numerous previous studies have demonstrated high accuracy levels of mobile-based facial recognition systems supported by artificial intelligence. By integrating this technology with Flutter programming and applying Machine Learning and Neural Network methods, a fast and accurate facial recognition system is created. Flutter provides user interface widgets developed by Google with high-quality coding standards. With this system, developers can easily customize without the need to write code from scratch. Within Flutter, various technologies are highly supportive of Artificial Intelligence-based project development. Libraries are available to facilitate application creation, streamlining the coding process. This mobile-based application enables usage anytime and anywhere. The Iterative Waterfall Model is employed as the development methodology. The implemented facial attendance application achieves a system accuracy rate of 92%, with a dataset loading time of around 653 milliseconds. This application demonstrates efficient facial recognition under adequate lighting conditions, even when faces are obstructed by glasses. Overall, this research presents a well-functioning facial attendance system by harnessing artificial intelligence to enhance security and contactless interactions that can be applied to the academic system.

Keywords: Face recognition; Artificial intelligence; Machine learning; Mobile application

ABSTRAK

Sistem aplikasi kehadiran wajah memiliki peran penting dalam meningkatkan keamanan melalui kemampuan biometriknya. Terutama, dalam konteks pandemi atau endemi, adopsi teknologi pengenalan wajah menawarkan solusi tanpa kontak untuk meminimalkan risiko penularan. Penelitian ini bertujuan untuk mengembangkan sistem kehadiran wajah berbasis mobile menggunakan kecerdasan buatan. Banyaknya penelitian terdahulu telah menunjukkan tingkat akurasi yang tinggi dari sistem pengenalan wajah berbasis mobile yang didukung oleh kecerdasan buatan. Dengan mengintegrasikan teknologi ini dengan pemrograman Flutter dan menerapkan metode Machine Learning dan Neural Network, sistem pengenalan wajah yang cepat dan akurat tercipta. Flutter menyediakan user interface widgets yang dikembangkan oleh Google dengan kualitas coding yang tinggi. Dengan sistem ini developer dapat melakukan kustomisasi dengan mudah, tanpa perlu menulis coding dari nol. Di dalam flutter memiliki berbagai teknologi yang sangat mendukung untuk pengembangan sebuah projek berbasis Artificial Intelligence. Library untuk memudahkan pembuatan aplikasi juga sudah tersedia sehingga memudahkan proses coding. Aplikasi berbasis mobile ini memungkinkan penggunaan kapanpun dan dimanapun. Metode Iterative Waterfall Model digunakan sebagai metodologi pengembangan. Aplikasi kehadiran wajah yang diimplementasikan mencapai tingkat akurasi sistem sebesar 92%, dengan waktu pemuatan dataset sekitar 653 milidetik. Aplikasi ini menunjukkan pengenalan wajah yang efisien dalam kondisi pencahayaan yang memadai, walaupun wajah terhalang oleh kacamata. Secara keseluruhan, penelitian ini menyajikan sistem kehadiran wajah yang baik dengan memanfaatkan kecerdasan buatan untuk meningkatkan keamanan dan interaksi tanpa kontak yang dapat diterapkan pada sistem akademik.

Kata Kunci: Pengenalan wajah; Kecerdasan buatan; Machine learning; Aplikasi mobile

LIST OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

REFERENCES

Adjabi, I., Ouahabi, A., Benzaoui, A., & Taleb-Ahmed, A. (2020). Past, Present, and Future of Face Recognition: A Review. *Electronics*, *9*(8), 1188. https://doi.org/10.3390/electronics9081188

Eroglu, G. (2023). *Machine Learning-Based Dyslexia Detection Using Google Ml Kit: A Pilot Study*. 1–19. https://doi.org/https://dx.doi.org/10.2139/ssrn.4494658

Fachmi, Z., Sudarma, M., & Jasa, L. (2019). Sistem Monitoring Kehadiran Perkuliahan Menggunakan Face Detection Dengan Algoritma Viola Jones. *Majalah Ilmiah Teknologi Elektro*, *18*(1), 119. https://doi.org/10.24843/mite.2019.v18i01.p18

Fagarasan, C., Popa, O., Pisla, A., & Cristea, C. (2021). Agile, waterfall and iterative approach in information technology projects. *IOP Conference Series: Materials Science and Engineering*, *1169*(1), 012025. https://doi.org/10.1088/1757-899x/1169/1/012025

Kang, Y., Cai, Z., Tan, C. W., Huang, Q., & Liu, H. (2020). Natural language processing (NLP) in management research: A literature review. *Journal of Management Analytics*, *7*(2), 139–172. https://doi.org/10.1080/23270012.2020.1756939

Kortli, Y., Jridi, M., Al Falou, A., & Atri, M. (2020). Face recognition systems: A survey. *Sensors (Switzerland)*, *20*(2). https://doi.org/10.3390/s20020342

Kumar, A., Kaur, A., & Kumar, M. (2019). Face detection techniques: a review. *Artificial Intelligence Review*, *52*(2), 927–948. https://doi.org/10.1007/s10462-018-9650-2

Li, W., Yen, C., Lin, Y., Tung, S., & Huang, S. (2018). JustIoT Internet of Things based on the Firebase real-time database. *2018 IEEE International Conference on Smart Manufacturing, Industrial & Logistics Engineering (SMILE)*, 43–47. https://doi.org/10.1109/SMILE.2018.8353979

Liu, W., Wang, Z., Liu, X., Zeng, N., Liu, Y., & Alsaadi, F. E. (2017). A survey of deep neural network architectures and their applications. Neurocomputing, 234(October 2016), 11–26. https://doi.org/10.1016/j.neucom.2016.12.038

Nachmani, O., Saun, T., Huynh, M., Forrest, C. R., & McRae, M. (2022). "Facekit"—Toward an Automated Facial Analysis App Using a Machine Learning–Derived Facial Recognition Algorithm. Plastic Surgery, 229255032110738. https://doi.org/10.1177/22925503211073843

Ohyver, M., Moniaga, J. V., Sungkawa, I., Subagyo, B. E., & Chandra, I. A. (2019). The Comparison Firebase Realtime Database and MySQL Database Performance using Wilcoxon Signed-Rank Test. Procedia Computer Science, 157, 396–405. https://doi.org/10.1016/j.procs.2019.08.23

Radityatama, R. G. (2017). *Rancang Bangun Aplikasi Mobile Android Sistem Kehadiran Mahasiswa Melalui Pencocokan Wajah Dengan Menggunakan Library Android Face Recognition With Deep Learning Studi*.

Rahouma, K. H., & Mahfouz, A. Z. (2021). *Applying Mobile Intelligent API Vision Kit and Normalized Features for Face Recognition Using Live Cameras* (Issue May 2021, pp. 413–429). Springer International Publishing. https://doi.org/10.1007/978-3-030-76346-6_38

Rahouma, K. H., & Zarif, A. (2021). Design and Implementation of a Face Recognition System Based on API mobile vision and Normalized Features of Still Images. *Procedia Computer Science*, *194*, 32–44. https://doi.org/10.1016/j.procs.2021.10.057

Siau, K., & Wang, W. (2020). Artificial intelligence (AI) Ethics: Ethics of AI and ethical AI. *Journal of Database Management*, *31*(2), 74–87. https://doi.org/10.4018/JDM.2020040105

Sun, J., Fu, Y., Li, S., He, J., Xu, C., & Tan, L. (2018). Sequential human activity recognition based on deep convolutional network and extreme learning machine using wearable sensors. *Journal of Sensors*, *2018*(1). https://doi.org/10.1155/2018/8580959

Suresh Kumar, S., Dashtipour, K., Abbasi, Q. H., Imran, M. A., & Ahmad, W. (2021). A Review on Wearable and Contactless Sensing for COVID-19 With Policy Challenges. *Frontiers in Communications and Networks*, *2*(May), 1–10. https://doi.org/10.3389/frcmn.2021.636293

Wang, W., & Siau, K. (2019). Artificial intelligence, machine learning, automation, robotics, future of work and future of humanity: A review and research agenda. *Journal of Database Management*, *30*(1), 61–79. https://doi.org/10.4018/JDM.2019010104

Yang, H., & Wang, X. A. (2016). Cascade classifier for face detection. *Journal of Algorithms and Computational Technology*, *10*(3), 187–197. https://doi.org/10.1177/1748301816649073