

**FACE RECOGNITION ATTENDANCE SYSTEM USING CNN**

**UNDERGRADUATE THESIS REPORT**

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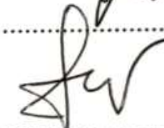

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## STATEMENT

I hereby declare that in this thesis there is no work, either in whole or in part, that has been submitted for an academic degree at a university, and to the best of my knowledge there is also no work or opinion that has been written or published by another person, except cited in writing in this manuscript and mentioned in the citation list/bibliography

Malang, 7 July 2022



Brian Sayudha.

## ABSTRAK

**Sayudha, Brian.** “Face Recognition Attendance System Using CNN”.  
**Pembimbing: (1) Dr. Eng. Rosa Andrie Asmara, ST., MT. (2) Mustika Mentari, S.Kom., M.Kom.**  
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Pada proses pencatatan kehadiran pada suatu acara umumnya masih menggunakan metode tradisional dengan menggunakan kertas sebagai media untuk melakukan pencatatan kehadiran di setiap acara. Dengan metode tradisional tersebut tentunya masih banyak kekurangan yang ada dari segi keamanan, pengelolaan, bahkan dengan metode tradisional penyelenggara acara tidak tahu kapan peserta melakukan presensi. Di samping itu, dari segi keamanan sistem presensi secara tradisional masih cukup kurang. Hal ini dikarenakan banyaknya kecurangan peserta dengan melakukan titip absen, seperti contoh tanda tangan yang masih bisa ditiru, ataupun centang kehadiran masih bisa diakali karena peserta dapat mengubahnya dengan mudah. Tentu hal ini dapat menghambat kesuksesan suatu acara yang memiliki beberapa aturan tertentu mengenai presensi.

Oleh karena itu, perlu adanya sistem presensi yang dapat dilakukan secara efisien, aman dan mudah untuk dikelola. Dengan adanya presensi yang dilakukan secara daring atau dengan menggunakan ponsel tentunya dapat memudahkan penyelenggara acara dalam mengelola jejak kehadiran peserta. Presensi yang dilakukan secara daring dapat mengurangi adanya penggunaan kertas yang cukup signifikan, dan menambah keamanan sistem absensi. Keamanan dapat ditambahkan dengan autentikasi biometrik yang akan menggunakan wajah sebagai media pengenalan peserta yang dapat mengurangi adanya kecurangan seperti ‘titip absen’ yang sering dilakukan di Indonesia saat ini.

Dengan demikian, penggunaan pengenalan wajah tentunya diperlukan adanya metode yang paling terbaru dan tercepat, sehingga memudahkan penyelenggara acara maupun peserta dalam melakukan absensi pada acara tertentu. Dari hal ini, penelitian diadakan dengan memilih metode CNN (*Convolutional Neural Network*) sebagai dasar pengenalan wajah dalam sistem presensi. Metode CNN merupakan jaringan saraf tiruan yang lebih sering digunakan dalam analisis citra visual. Metode ini digunakan sebagai metode pengenalan wajah karena dapat membedakan citra visual satu dengan yang lainnya dengan berbagai aspek yang diberikan dan memberikan hasil yang cukup akurat meskipun diberi informasi atau data latihan yang cukup sedikit.

Selanjutnya dengan penelitian pengenalan wajah menggunakan metode CNN menghasilkan akurasi tertinggi dengan persentase 100% dan terendah 20%. Dengan melakukan percobaan di 15 pose yang berbeda dan penggunaan aksesoris yang bermacam-macam di setiap volunteer dan memiliki total akurasi dengan persentase 67% untuk *advanced* dan 47% untuk *basic*. Dari hal ini dapat disimpulkan bahwa metode CNN cukup akurat apabila diberi data latihan sebanyak 1 dengan total percobaan 15 pose disetiap volunteer.

**Kata Kunci:** Sistem absensi, ponsel, biometric, pengenalan wajah, CNN

## ***ABSTRACT***

***Sayudha, Brian. "Face Recognition Attendance System Using CNN". Supervisors: (1) Dr. Eng. Rosa Andrie Asmara, ST., MT. (2) Mustika Mentari, S.Kom., M.Kom.***

***Thesis, Informatics Engineering Study Program, Information Technology Departement, State Polytechnic of Malang, 2022.***

In the process of recording attendance at an event, event organizer generally still uses the traditional method of using paper as a medium to record attendance at each event. With this traditional method, there are still many shortcomings in terms of security, and management, even with the traditional method the event organizers do not know when participants attend. In terms of security, the traditional attendance system is still quite lacking. Because many participants cheated by 'titip absen'. For example, copied signatures, or attendance checks can still be tricked because participants can change them easily. Of course, this can hinder the success of an event with certain attendance rules.

Therefore, it is necessary to have an attendance system that can be carried out efficiently, safely, and easily to be managed. With attendance made online or by using a smartphone, it can make it easier for event organizers to manage the traces of participants' attendance. Online attendance can significantly reduce the use of paper and increase the security of the attendance system. Security can be added with biometric authentication which will use the face as a participant identification medium which can reduce fraud such as 'taking in absentia' which is often done in Indonesia today.

Thus, face recognition certainly requires the newest and fastest method, making it easier for event organizers and participants to attend certain events. From this, the research was conducted by choosing the CNN (Convolutional Neural Network) method as the basis for facial recognition in the attendance system. CNN method is an artificial neural network that is more often used in visual image analysis. This method is used as a face recognition method because it can distinguish visual images from one another with various aspects given and gives fairly accurate results even though they are given quite a bit of information or training data.

Furthermore, face recognition research using the CNN method produces the highest accuracy with a percentage of 100% and the lowest is 20%. By experimenting with 15 different poses and using various accessories for each volunteer. And has a total accuracy of 67% for advanced and 47% for basic. From this, it can be concluded that the CNN method is quite accurate when given 1 training data with a total of 15 poses for each volunteer.

***Keywords:*** Attendance system, Smartphone, biometrics, face recognition, CNN

## FOREWORD

Praise and gratitude we pray to the presence of Allah SWT/God Almighty for all His grace and guidance, the author was able to complete this undergraduate thesis with the title “FACE RECOGNITION ATTENDANCE SYSTEM USING CNN”. This undergraduate thesis is written as a requirement to complete the Diploma IV, Informatics Engineering study program, Department of Information Technology, Politeknik Negeri Malang.

We realize that without the support and cooperation of various parties, the undergraduate thesis proposal final report will not be able to run well. For that, we would like to express our gratitude to:

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The author realizes that in the preparation of this undergraduate thesis final report, there are still many shortcomings and weaknesses that the author has, both in the systematics of writing and the use of language. For this reason, the author expects suggestions and criticisms from various parties that are constructive to improve this report. Hopefully, this report is useful for readers in general and writers in particular. Finally, the authors say thank you very much.

Malang, 7 Juli 2022

Author

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## CHAPTER I. INTRODUCTION

### 1.1. Background

In this modern era, of course, we are no strangers to technology that has developed very quickly at this time, the number of tools or a system that makes human work easier has also begun to emerge and is growing all over the world. For example, Indonesia is a country with a population of approximately 272 million people (Direktorat Jendral Kependudukan dan Pencatatan Sipil, 2021) with a device ownership rate of 76% for smartphones (Yosepha Pusparisa, 2020) and a percentage of internet usage rate 98.2% for smartphone (Wahyunanda Kusuma Pertiwi, 2021), but with a large number of existing devices, Indonesia is still outdated for the technological development, such as China which has developed much artificial intelligence (AI), where they can identify through facial recognition in public areas, but in Indonesia, they still use manual identification which can cause errors that are not realized by humans themselves. To reduce errors and increase effectiveness at work, of course, we need to take advantage of technology and implement it fundamentally in the field of an attendance system for students or public events using facial recognition technology, so the event or school attendance can be carried out efficiently and safely without additional fraud such as entrusting absent to another person or absent at an unspecified place and time.

In Indonesia, the attendance system is still quite underdeveloped, because most attendance systems in Indonesia still use a piece of paper and then sign there, gradually this method causes many problems, such as the existence of cheating "titip absen", even someone's delay in taking an absence is still cannot be detected by this method. To reduce all the shortcomings in the manual attendance system, the company surveyed to see which method was more profitable. The results prove that 48% of companies choose online attendance because it can be managed easily and accurately and then reduce the costs incurred in doing attendance (such as reducing paper for attendance) (Teknologi Talenta, 2020).

Face detection is a key procedure for other face-related technologies including face alignment, facial recognition, facial animation, facial attribute analysis, and human-computer interaction. The accuracy of the face detection system directly impacts this technology, which is why the success of face detection

is very important. In a general sense, face detection aims to determine if there are faces in the image or not, and recognize those faces detected in images (S. Zhang et al., 2019).

The face recognition technology as an identification tool certainly still has considerable weaknesses in terms of face authentication, traditional face recognition cannot effectively recognize a person's face in certain positions. To be able to maximize this, it is necessary to refine the existing facial recognition approach by relying on all the feature points on a person's face, so that verification can be done very accurately (Deng et al., 2019).

On the journal entitled “Penerapan Facial Landmark Point untuk Klasifikasi Jenis Kelamin berdasarkan Citra Wajah”, The face of each individual contains several different information. Examples are expression, gender, age, and also race, Therefore, in biometrics technology or biological data recognition technology, faces can be used as identification (Ulla Delfana Rosiani et al., 2020). Based on research entitled “Comparison of Geometric Features and Color Features for Face Recognition”, performance analysis with Geometric Features and Color Features combined will make the results more accurate and the mean accuracy between three models resulted: GNB with an average accuracy of 74.67 %, KNN K=5 w with an average accuracy of 72.1%, and SVM one to one with an average accuracy of 74.83%. And the good condition of the dataset must be set to gain optimum accuracy (Rahmad et al., 2021).

Based on research entitled “Haar Cascade and Convolutional Neural Network Face Detection in Client-Side for Cloud Computing Face Recognition”, In six types of test data (Normal Face, Expression Face, Face with Mask, Face with some Obstacles, Face with Glasses, and More than one Face) using Haar Cascade, an average accuracy of 81.12% was obtained, and compared to using CNN, an accuracy of 86.53% was obtained. Haar Cascade can detect multi-user faces (more than one) is superior by detecting simultaneously without interference which faces is more dominant (Andrie Asmara et al., 2021).

Based on the previous research entitled “RetinaFace: Single-stage Dense Face Localization in the Wild” resulted in the conclusion that the RetinaFace method has outperformed the most advanced state-of-art methods for face detection

today. With stable face detection in various poses, when RetinaFace is combined with existing state-of-art methods for face detection, it will certainly increase the accuracy of face detection (Deng et al., 2019).

One of the areas of focus in the computer vision community right now is recognition of micro-expressions, which has gained a great attention from academics in recent years. Tracking point facial features have been studied for facial expression identification, particularly macro-expressions, and have shown impressive results in some research. Implementing the tracking points function has the benefit of consuming less time because it can occasionally be used for expression (Asmara et al., 2019).

From this explanation, the method that will be used in this research is CNN to recognize faces optimally. The system will be developed in mobile application because it has been proven above that quite a lot of Indonesians access the internet. The attendance using smartphones and mobile device is designed for highly efficient face localization and recognition that can give high speed real-time recognition (Ulla Delfana Rosiani et al., 2020). This system will mainly develop for offline events (required for a participant to come to event place) such as graduation, music festival, and offline seminars, and support online events such as video conference seminar (Deng et al., 2018).

The attendance system will follow plan that organizers choose, and it is hoped that this research and development can produce good facial recognition accuracy and good attendance system.

## **1.2 Research Problem**

1. How to reduce “titip absen” shortcomings in attendance system?
2. How to recognize faces with various poses and various image condition using the CNN?
3. How is the accuracy of face recognition with various poses and various image condition using CNN?
4. How to implement face recognition system in attendance system?
5. How to implement automatic time and place detection and addition in attendance system?

6. How to make an automatic digital reports of attendance system?

### **1.3 Research Scope**

1. Use Python 3.x Programming Language
2. Using CNN Method
3. Clear lighting conditions
4. Using Mobile Platform
5. Cloud serverless
6. Online Location Feature

### **1.4 Objectives**

The purpose of doing a thesis with the title "FACE RECOGNITION ATTENDANCE SYSTEM USING CNN", are as follows:

- Building a facial recognition model by implementing the CNN method
- Knowing the accuracy and effectiveness of facial recognition system using CNN
- Creating attendance application with advanced face detection method

### **1.5. Benefit**

The research carried out is expected to have the benefit of being a prototype in the development of existing facial recognition technology with most advanced method that available in face detection method and can be used for the development of existing technology in Indonesia, especially the Politeknik Negeri Malang.

### **1.6. Writing System**

The systematics of writing this thesis report is structured to provide an overview of the research conducted. The systematics of writing this thesis are as follows:

#### **BAB I. INTRODUCTION**

This chapter describes the background in the research, formulates the core problems faced in this research, determines the objectives and limitations of this research and the systematics of writing.

#### **BAB II. LITERATURE STUDY**

This chapter describes the previous research that was used as a reference for this research and discusses various basic concepts and theories related to the topic of the research and development carried out.

### BAB III. RESEARCH METHODOLOGY

This chapter describes the methods used in research and development such as methods of target market analysis, data collection, system description and development method.

### BAB IV. SYSTEM ANALYSIS AND DESIGN

This chapter describes the general description of this research and development along with a description of the flow of the program. In addition, this chapter describes an overview of the database system and UI that will be used.

### BAB V. IMPLEMENTATION AND TESTING

This chapter describes the application of the system that has been designed by the author. This chapter contains the results of the implementation to the database, the program and the results of the tests carried out.

### BAB VI. RESULTS AND DISCUSSION

This chapter contains the sequence in the system testing process and a discussion of the system test results.

### BAB VII. CONCLUSIONS AND SUGGESTIONS

This chapter contains conclusions and suggestions from undergraduate thesis research and development.