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Implementation of Face Recognition-Based Personal Information Management System using Hikvision AI Cameras for UNUSA Community

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Personal Information Management (PIM) at the University of Nahdlatul Ulama Surabaya (UNUSA) continues to face challenges, particularly in managing attendance within the eSorogan system and the UNUSA Academic Information System (SIM). This study proposes and implements a face recognition-based PIM system designed to automate the identification and recording of members of the UNUSA academic community. The system integrates AI-powered cameras with a web-based dashboard, referred to as the Lobby PIM Dashboard, which displays real-time information related to recognized individuals. The workflow begins with image capture and face detection by the AI camera, followed by data transmission to the server via an API for identification and information retrieval. The system generates detection logs and attendance records, which are stored and presented through the dashboard interface. The results demonstrate that the proposed system can support more efficient attendance management and provide accessible academic information for lecturers and students. Overall, this implementation contributes to improving administrative processes and enhancing the effectiveness of academic services at UNUSA.

I. INTRODUCTION

Personal Information Management or PIM refers to the practice and study of activities to create, store, use, and share information as required by life roles or responsibilities [1]. PIM can assist individuals in managing information relevant to their tasks and roles, such as work schedules, personal data, or academic information, thereby increasing productivity and efficiency. In addition, the element of sharing appropriate information with relevant parties is also included in PIM. This ensures that authorized people have access to the required data at the right time, which helps with better decision-making [2], [3], [4].

The implementation of PIM is highly dependent on how an agency or organization implements it. Universitas Nahdlatul Ulama Surabaya (UNUSA) is one of the universities that also implements PIM. The application of PIM at UNUSA is currently used as the management of university administrative data. However, the application of PIM at UNUSA can be less effective due to the many systems that are scattered.

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For example, the eSorogan online learning system and the Academic Management Information System (SIM) can be used as one system for learning needs. The implementation of PIM that has many different sources at UNUSA will increase the complexity of the PIM system and make it difficult to implement a perfect PIM system because the more complex a system is, the more unique the collection is [5].

The academic process that occurs at UNUSA, especially in the attendance section, is carried out using the eSorogan application, where the eSorogan application is a fraction of the Academic SIM which is the centre of academic activities at UNUSA. The initial purpose of creating this system was to focus the attendance process into a separate application, namely eSorogan. In its use, the eSorogan application will be used by lecturers to open classes and students will take attendance after the class is opened. However, in some conditions there are problems such as slow access to display problems that often make it difficult for lecturers to access, so that the existence of this application can hamper the academic process at UNUSA.

From these problems, the application of PIM with AI camera technology will result in the visualization of the PIM dashboard. This PIM dashboard will later become a means to integrate existing systems at UNUSA, for example the UNUSA Academic SIM and eSorogan. By taking data from the previous system as training data, such as facial images, and personal information (name, identification number, gender, major, and faculty). So that based on the data used the camera will detect certain individuals through facial images registered on the camera, then produce personal information that exists in the previous system and will become one system that integrates several existing systems at UNUSA.

II. RELATED WORKS

Yani et. al. [6] research looks specifically at how final year students manage their personal information, especially in relation to their final project or thesis. The journal highlights real problems such as information overload that students face.

Farley et. al. [7] proposes a real-time parking lot availability detection system using ordinary CCTV cameras and deep learning models. The system is designed to be efficient and lightweight so that it can be run on low-powered devices such as Raspberry Pi.

Dragonas et. al. [8] highlights the importance of real-time data visualization through the development of dynamic and customizable dashboards for survey results analysis. The goal is to simplify the process of monitoring and interpreting live survey data, so that decision makers can act more quickly and appropriately.

Stadler et. al. [9] This research highlights how the use of data visualization dashboards can improve efficiency and convenience in analyzing healthcare data. By leveraging interactive visualization technology, these dashboards help medical professionals and hospital managers interpret complex data quickly and accurately-whether for trend analysis, clinical performance monitoring, or data-driven decision-making.

III. METHODS

This section describes the experimental design, tools, data collection methods, and types of controls. If research is carried out in nature, the author describes the research area, location, and also explains the work done. The general rule to keep in mind is that this section should be detailed and clear so that the reader has the basic knowledge and techniques to develop. The methods sections should tell the reader clearly how the results were obtained. They should be specific. They should also make adequate reference to accepted methods and identify differences.

A. Research Method

Several things have been carried out in this study. The system flow overview will be explained in the system design, along with other elements such as equipment needed for system development. In this study, interviews were also conducted with several lecturers at UNUSA. The questions asked are related to the attendance system that has been implemented at UNUSA. From the development of this system, it is planned to be integrated with the employee or student attendance system at UNUSA. Therefore, this

interview aims to find out if there are any problems frequently experienced by lecturers during the attendance process.

B. Interviews Result

From the interviews conducted, a total of 10 lecturers were interviewed, with some of the selected lecturers taken from each faculty in order to obtain responses from lecturer representatives from the faculties at UNUSA. After the interviews were conducted, the results showed that eight out of ten lecturers experienced difficulties using the attendance system, because the attendance was still web-based, which often caused page reloads during the manual attendance process. Then, six out of ten lecturers indicated problems related to students who had marked their attendance but were not actually present in class, as students completed attendance on their own, making it prone to cheating. From these issues, it is evident that the current attendance system can still be improved. An example of an interview conducted was with Mrs. Dike Bayu Magfira, S.T., M.MT, one of the lecturers of the Information Systems study program. The recorded results of the interview with her are shown in Table 1 as follows.

Table 1 Interview results with one of the lecturers

Number	List of Questions	Problems That Have Been Experienced
1	How is student attendance usually taken in the class you teach? Are there any common problems that often occur?	"If attendance using E-Sorogan is high, first the button provided is not very effective, when the process of marking student attendance often loads again, if possible, there could be a button placed at the end to save only so it is not done one by one."
2	Have you ever experienced difficulties in verifying the attendance of students who are physically present but might have someone else sign in for them?	"I often encounter students who frequently have someone else mark their attendance for them. When it comes to offline classes that require connecting to the campus Wi-Fi, those students are not actually in the classroom, yet their attendance is marked as present."
3	In your opinion, does the attendance process take a significant amount of time during class sessions?	"The difficulty lies in the student attendance process, which often reloads after completing the attendance for one student, making it more effective if there is a save button after taking student attendance."
4	Are there cases where student attendance data is difficult to track or reconcile later on?	"For students who have someone else mark their attendance, the attendance of those students cannot be tracked or verified again."
5	In your opinion, does the attendance of students in class currently reflect their honest and active participation?	"Applies only to students who attend and are present in class, not to students who have someone else mark their attendance for them."

C. System Design

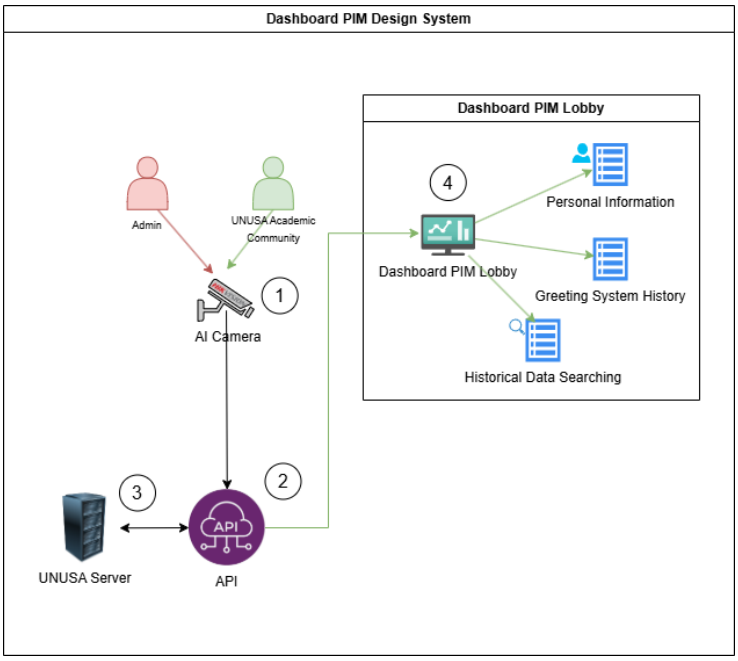

Figure 1. System design

This research will discuss the system to be developed, PIM Lobby Dashboard. The workflow starts from an AI camera that will detect one of the people included in the UNUSA academic community, either students or lecturers, and all these processes continue to produce a Dashboard. In Figure 1 making this system requires several tools such as, Dome Face Capture Camera as CCTV, Node-RED, and Xibo.

D. Dome Face Capture Camera

This Dome Face Capture Camera from Hikvision will be placed in the UNUSA Lobby area which will function as CCTV while detecting people who pass through the Lobby area and recording people who pass through the lobby area. The data from this recording will be stored and forwarded to the dashboard to display the information obtained, namely information from people passing through the lobby area.

E. Node-RED

Node-RED will be used as the main logic flow organizer that will connect the two face recognition cameras with the PIM Dashboard. Because almost all systems communicate using APIs, Node-RED will be able to easily connect all systems, both in the PIM Lobby Dashboard and the PIM Room Booking Dashboard [10], [11].

F. Xibo

Xibo is a digital signage that will be used to display information on a screen. A screen will be placed in the lobby area to display information, as well as a greeting system will be displayed on the screen from the previous Hikvision CCTV camera that displays information on people passing through the lobby area [12].

IV. RESULTS AND DISCUSSIONS

In this section, the process of implementing the process and developing the PIM dashboard will be carried out. The process of making this PIM dashboard will be divided into two because there are two systems to be made, the first is the PIM lobby dashboard and the second is the PIM room booking dashboard.

A. Greeting System Flow

The experiment was conducted by creating a system flow on Node-RED as shown in Figure 2 to retrieve data generated by CCTV cameras. The data generated by the camera is in the form of JSON which each

process flow on Node-RED will break down the data and retrieve the data used such as the name of the person, which then at the end of the flow will be displayed on the screen displayed by Xibo.

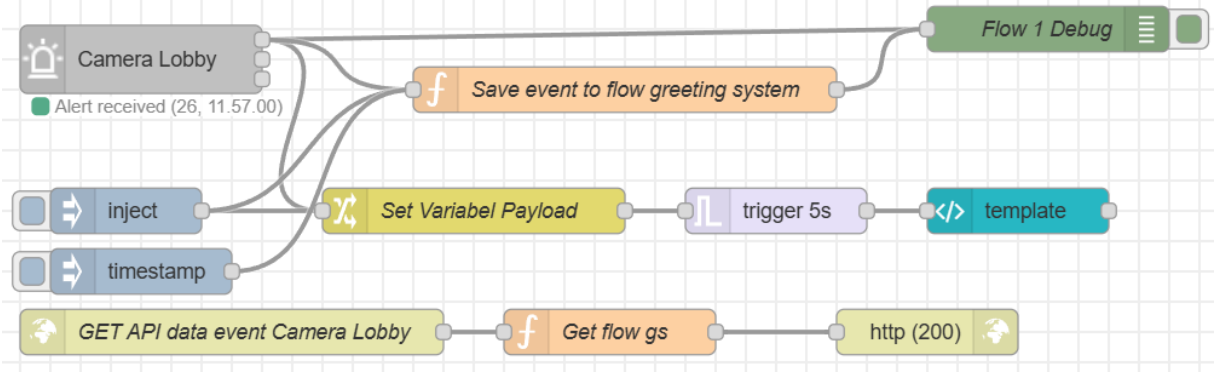

Figure 2. Greeting system flow

B. Xibo Design

After the process of making the greeting system, the next process is to implement the system into a PIM dashboard. The creation of the PIM Lobby dashboard will be used to display information related to UNUSA, such as the agenda of ongoing activities, UNUSA's video profile, prayer schedule for the Surabaya area, the agenda of upcoming activities, and the greeting system. The creation of this PIM dashboard was made with the help of the Xibo application as shown in Figure 3.

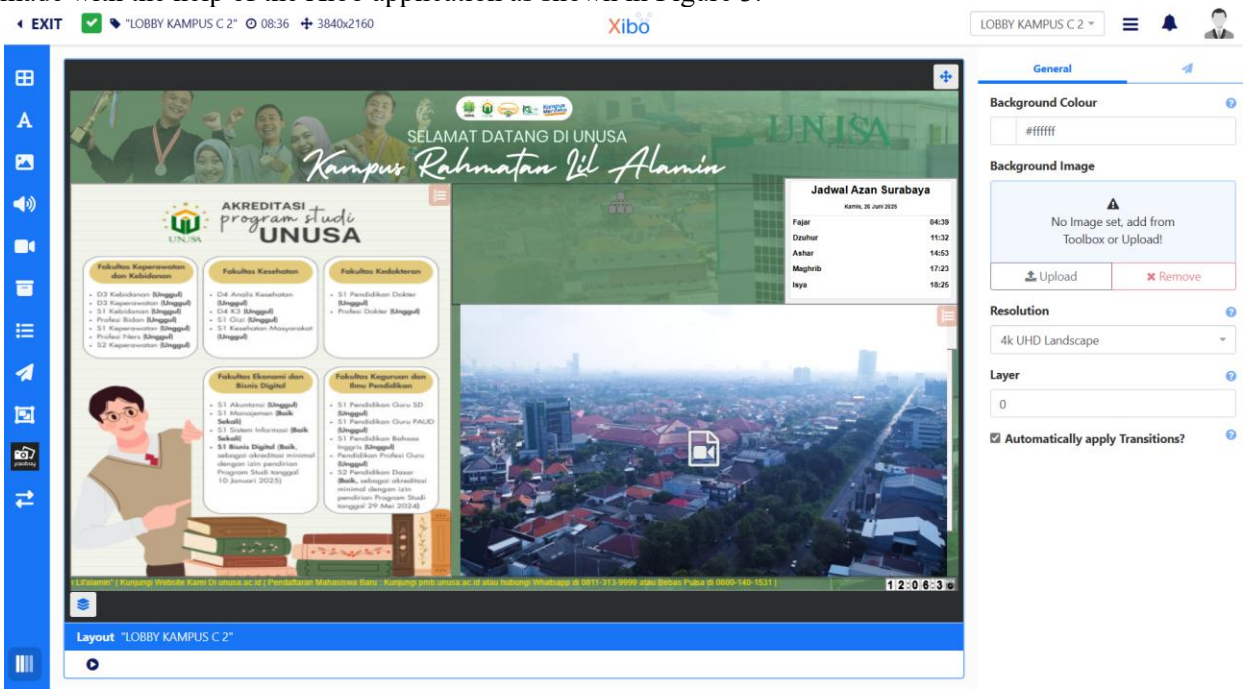

Figure 3. Xibo dashboard design

C. PIM Lobby Dashboard Result

The demonstration of the PIM lobby dashboard displayed on a TV screen in the lobby area of Campus C at UNUSA. This demonstration process is also used to see whether the system that has been made works well or there are certain defects during the demonstration process, when people pass through the lobby area then their information will be displayed on the screen as shown in Figure 4.

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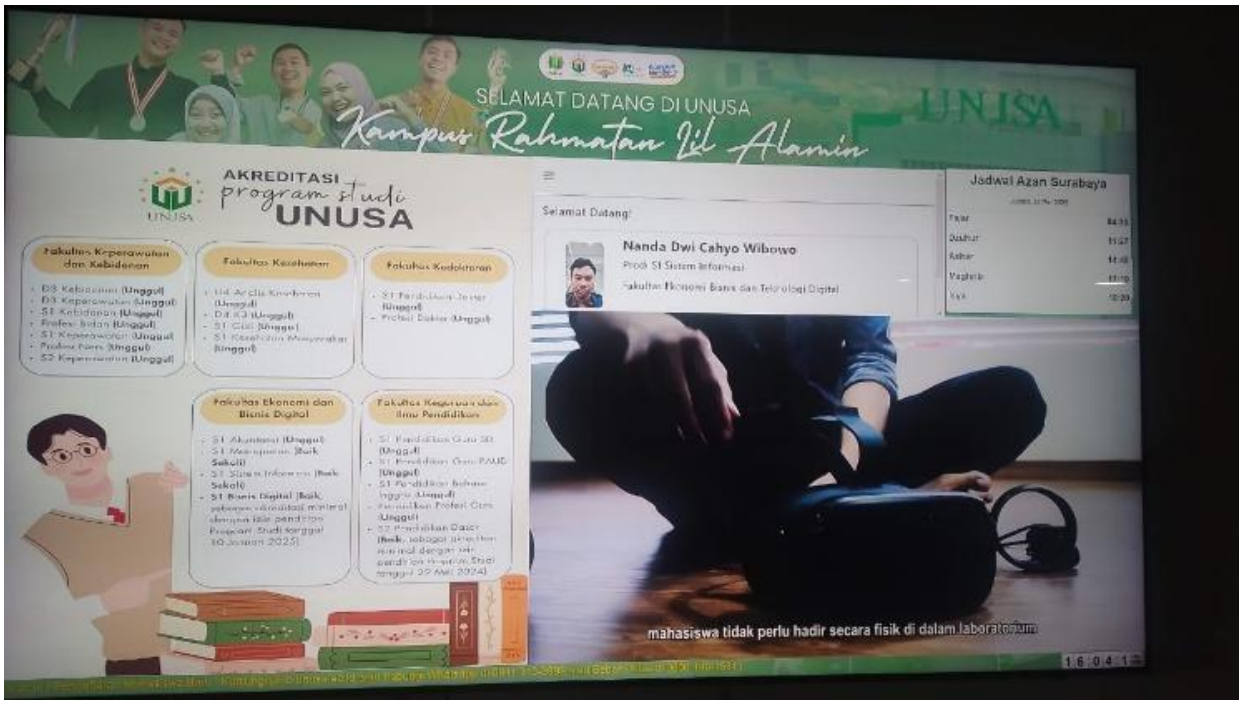

Figure 4. Dashboard lobby result

D. Face Recognition Evaluation

At this stage, two scenarios will be checked. The first scenario is by walking normally like people who are entering the campus lobby area as usual without noticing the camera. The second scenario is to walk in the lobby area but with a stop position right at the center point of the lobby with the best area that can be captured by the camera. Other attributes were also added during the testing process such as the use of glasses and masks [13], [14]. The addition of these attributes is done to test whether it will affect the detection time that can be done by the camera.

1) Normal Scenario

Table 2. Normal Scenario Result

Participant	Attributes	Result	Time	Information	Description
Rizqi Putri Nourma Budiarti, S.T., M. T	No attributes	Success	3 sec	Actual	-
	Eyeglasses	Success	3 sec	Actual	-
Niken Savitri Primasari, S.E., M.M.	Eyeglasses	Success	1 sec	Not actual	Camera mistakenly detected
	Eyeglasses	Success	2 sec	Actual	-
	Mask	Failed	-	-	Face not detected
Mulya Nafa	No attributes	Success	3 sec	Actual	-
	No attributes	Success	1 sec	Actual	-
	Eyeglasses	Success	2 sec	Actual	-
	Eyeglasses	Success	1 sec	Actual	-
	Mask	Failed	-	-	Face not detected
	Mask	Failed	-	-	Face not detected
Abdur Rochman	No attributes	Success	2 sec	Actual	-
	No attributes	Success	2 sec	Actual	-
	Mask	Failed	-	-	Face not detected
	Mask	Failed	-	-	Face not detected
Anisa Putri	No attributes	Failed	-	-	Face not detected
	No attributes	Success	1 sec	Actual	-
	Mask	Failed	-	-	Face not detected
	Mask	Success	2 sec	Not actual	Camera mistakenly detected

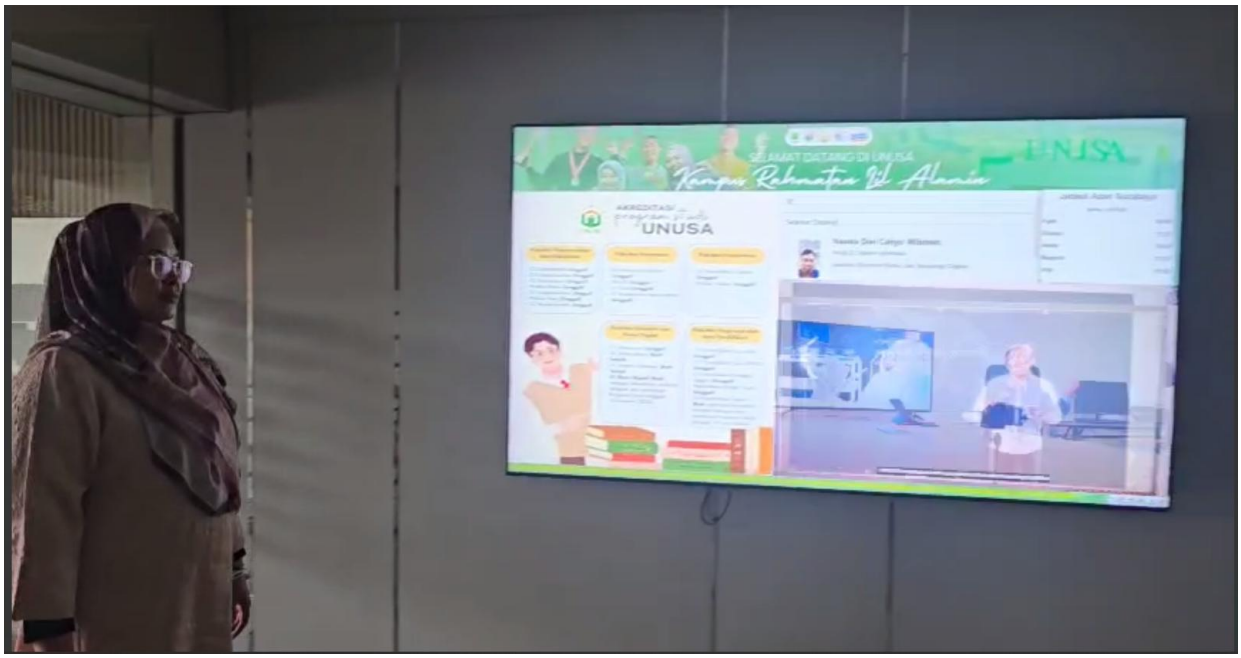

Figure 5. False detection

From the test results of the scenario described in Table 2 which was carried out under natural conditions when people passed through the lobby area of Campus C UNUSA. It is concluded that in natural conditions the camera has difficulty in certain genders, especially women. Because all UNUSA lecturers and students use the hijab, so the face is not too clearly visible which has an impact on the camera which is difficult to recognize certain individuals [15]. Another problem is found in the camera network during the detection process; in the participant Mrs. Niken Savitri there are inconsistent results [16], [17]. On the first try the detection error showed another person with the individual "Nanda Dwi Cahyo Wibowo" like it shown on Figure 5.

In another experiment, different results were shown. The problem in this experiment is that several participants, especially women, showed delays when passing through the lobby area, causing the greeting system not to display any results. In this experiment, participants will try to stand long enough in the lobby area to see if the camera can recognize their faces or if it simply just takes a long time. The length of this recognition process may be due to a poor internet connection, or it could be that the camera is not yet able to recognize the participant's face, because for participants, especially women, more of their facial area is covered compared to male participants. The results show that the camera indeed struggles to recognize participants even after trying for quite a while; examples of the experiment documentation can be seen in Figure 6.

But on the other hand, the male gender face can be easily recognized by the camera. In both genders, the use of attributes such as glasses does not have a big impact on the detection results. The camera is still able to recognize people who use attributes such as glasses. In the worst case, the use of mask attributes, both male and female genders have the same problem [18]. The use of the mask attribute significantly reduces the detection results of the camera, so that at the natural speed of someone passing through the lobby area the camera is still unable to detect certain individuals.

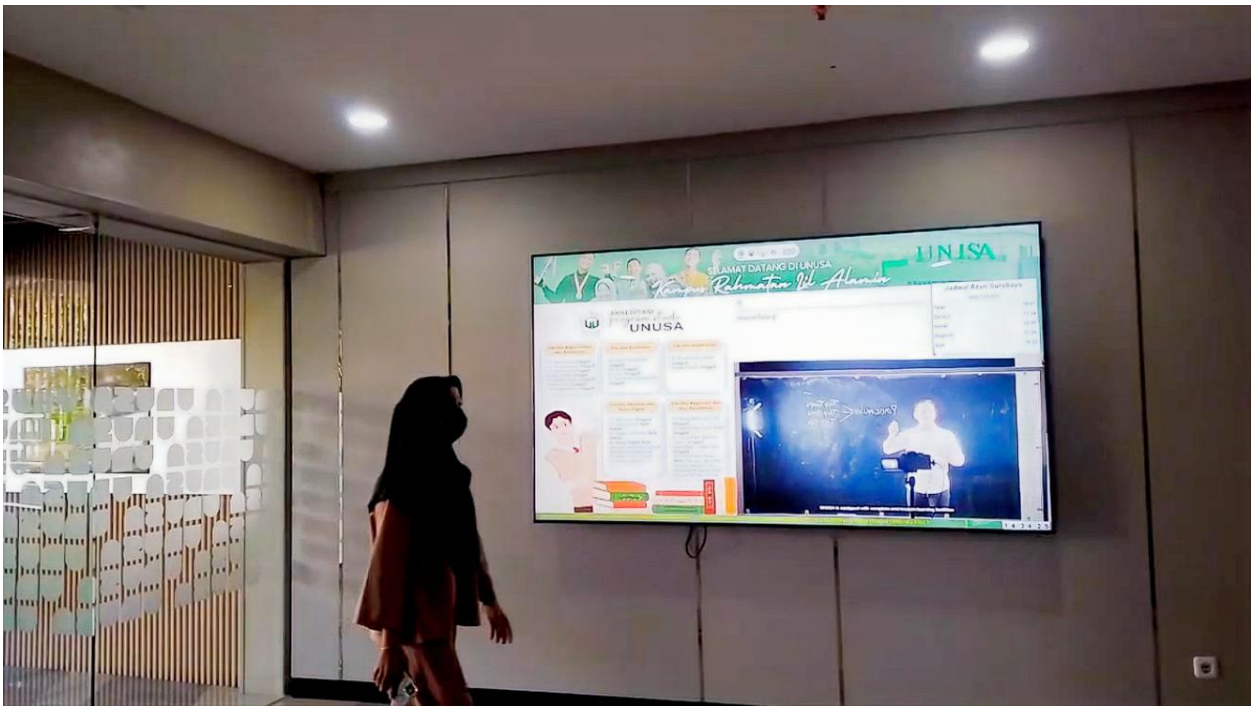

Figure 6. Participant not recognized

2) Looking Camera Scenario

Table 3 Looking Camera Scenario

Participant	Attributes	Result	Time	Information	Description
Rizqi Putri Nourma Budiarti, S.T., M. T	No attributes	Success	2 sec	Actual	-
	Eyeglasses	Success	2 sec	Actual	-
Niken Savitri Primasari, S.E., M.M.	Eyeglasses	Success	2 sec	Actual	-
	Eyeglasses	Success	2 sec	Actual	-
	Mask	Failed	-	-	Face not detected
	Mask	Failed	-	-	Face not detected
Mulya Nafa	No attributes	Success	2 sec	Actual	-
	No attributes	Success	2 sec	Actual	-
	Eyeglasses	Success	2 sec	Actual	-
	Eyeglasses	Success	1 sec	Actual	-
	Mask	Failed	-	-	Face not detected
	Mask	Failed	-	-	Face not detected
Abdur Rochman	No attributes	Success	2 sec	Actual	-
	No attributes	Success	2 sec	Actual	-
	Mask	Success	5 sec	Actual	-
	Mask	Success	4 sec	Actual	-
Anisa Putri	No attributes	Success	2 sec	Actual	-
	No attributes	Success	1 sec	Actual	-
	Mask	Success	2 sec	Not actual	Camera mistakenly detected
	Mask	Success	20 sec	Actual	After change face picture

The second trial results are with the camera viewing scenario described in Table 3. It is concluded that the results obtained have little change from the first scenario that has been done. The male gender has an increased change in camera detection results from the first result of failing to be detected, which is around four to five seconds in a stationary position and looking at the camera. While in the female gender the

results obtained are still in the same problem, namely the possibility of false detection or not detected at all. So that from this point, trials will be carried out to change the face model in the camera [19]. The photo of the face to be changed will have brighter light conditions, so that the camera can more easily detect every detail of the face that will be learned as a model again for face recognition. At the time of the next trial, lighting was added to the lobby area so that the camera did not experience back light conditions that caused the camera to not focus on certain individual faces because it was blocked by light from the outside lobby area [20], [21]. From the results of facial changes made, the results are better. The camera originally did not detect faces, especially in the female gender and added a mask. The results show that there is a slight change that occurs, the camera begins to detect the face of a hijab-wearing woman wearing a mask while staying in place and looking at the camera for a duration of 20 seconds. So, from this trial it can be concluded that lighting plays a very important role in the success of facial recognition even though it is still in a long duration.

E. History Data

The result of both PIM Dashboard systems is the history data obtained from the facial recognition process carried out by the camera, either in the lobby area or the front area of the classroom. Figure 7. shows the results of face recognition on the greeting system.

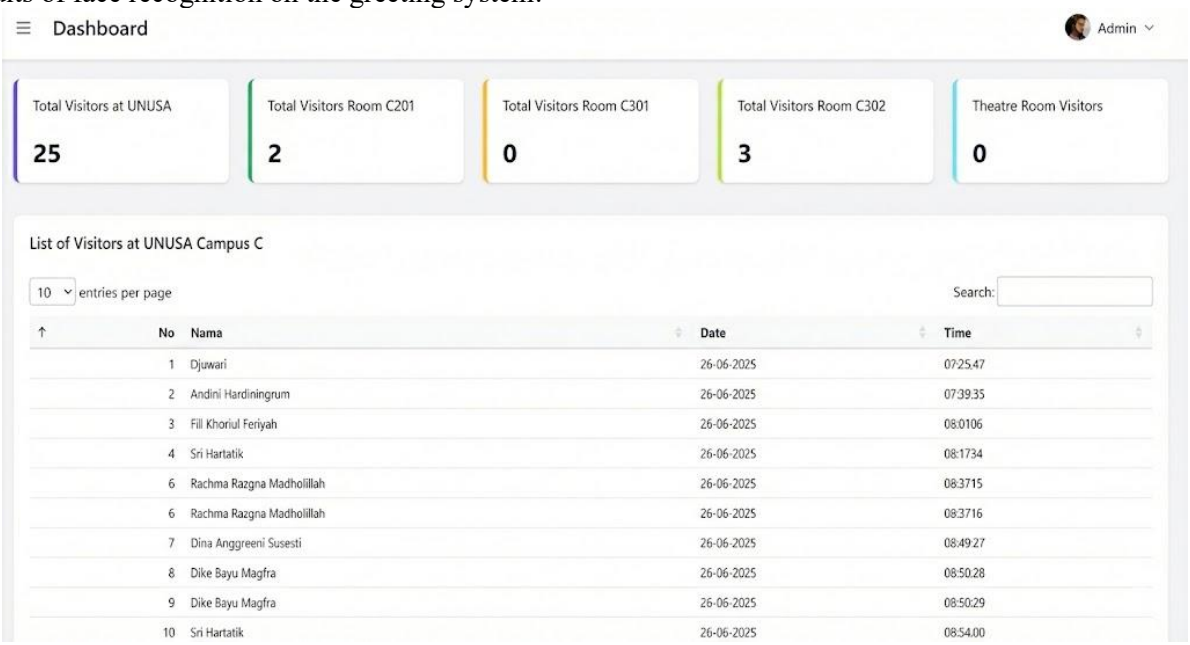

Figure 7. History data greeting system

V. CONCLUSIONS AND RECOMMENDATIONS

Based on the implementation of the results of making each PIM dashboard system that has been carried out, the PIM dashboard system that has been made, namely the PIM lobby dashboard can be used to monitor people who visit Campus C UNUSA. The data obtained from the monitoring results also produce an API that can be used by other systems. The data from this monitoring can be used as data material to integrate existing systems at UNUSA such as the attendance system.

A recommendation that can be given from this study to future studies or studies with similar topics is to improve the accuracy of face detection. Because the camera used is a CCTV camera, it is prone to interference from light and the environment. If this problem can be overcome, the face detection process will be more accurate in capturing information about a person within the camera's capture area.

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