NEAR EAST UNIVERSITY

INSTITUTE OF GRADUATE STUDIES

DEPARTMENT OF SOFTWARE INGENEERING

SMART ATTENDANCE SYSTEM BY FACE RECOGNITION

M.Sc. THESIS

Franck Junior Ngoumkam Onana

Nicosia

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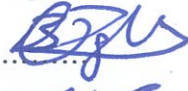
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Approval

We certify that we have read the thesis submitted by **Franck Junior Ngoumkam Onana "SMART ATTENDANCE SYSTEME BY FACE RECOGNITION"** and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Computer Sciences.

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Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Franck Junior Ngoumkam Onana

03/07/2023

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• All the Cyprus family for the moments of joy we spent together. I wish you with all my heart happiness and success in your family and professional life.

 • Our thanks, to Almighty God, for allowing us and granting us the will, the health, the patience and the courage to carry out this work. In the name of Jesus Christ his only son and the merciful who watches over us night and day.

Franck Junior Ngoumkam Onana

ABSTRACT

Smart Attendance System by Facial Recognition

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The project that holds our attention is the creation of an application for taking attendance by facial recognition in order to facilitate the work of teachers with regard to taking the presence of students in universities when entering and leaving out of class just by presenting their faces in front of a camera placed at the entrance of the class and to generate a Csv, Txt or Excel file registration form which will serve as the attendance list. This domain covers the domain of facial recognition which is a domain of artificial intelligence, when creating our application we will focus on use cases like enrolling a new student in the system, taking a picture of the registered student, training photos by the system, management of the attendance sheet, all this by a main user who will be responsible for creating other users like him. Users can only integrate the system (SASBFR) by an identifier consisting of a username and a password. To achieve our goals, we have opted to work with one of the most powerful, popular and easiest algorithms for the handling of computer vision which is the LBPH (Local Binary Pattern Histogram). In this case, its combination with the HOG (histogram of oriented gradients) and the SVM (support vector machine) used for classification and regression analyzes gives extraordinary results in facial recognition and detection.

Nowadays machine learning algorithms have revolutionized the way of using computers and thinking about the world in a different way. Today computers think like humans, can predict the cost of IPOs, prevent cancer, or recognize someone just by their face.

This project replaces the old traditional method of taking attendance which was done by noting the names of the pupils present in class on A4 paper or by fingerprints. This would not only be useful for universities but also for companies and organizations that would like to improve their security in this sector.

SOYUT

Yüz Tanıma ile Akıllı Seyirci Sistemi

Franck Junior Ngoumkam Onana

Danışman: Doç. Prof. Dr. Kamil Dimililer

YÜKSEK LİSANS YAZILIM MÜHENDİSLİĞİ BÖLÜMÜ

Haziran 2023, 69 Sayfa

İlgimizi çeken proje, üniversitelerde öğrencilerin derse girerken ve çıkarken sadece yüzlerini göstererek yoklamalarının alınması konusunda öğretmenlerin işini kolaylaştırmak için yüz tanıma ile yoklama alma uygulaması oluşturulmasıdır. sınıf girişine konulan bir kamera ile yoklama listesi görevi görecek Csv, Txt veya Excel dosyası kayıt formu oluşturmaktır. Bu alan yapay zekanın bir alanı olan yüz tanıma alanını kapsamaktadır, uygulamamızı oluştururken sisteme yeni bir öğrenci kaydetme, kayıtlı öğrencinin fotoğrafını çekme, sistem tarafından eğitim fotoğrafları, yönetim gibi kullanım durumlarına odaklanacağız. tüm bunlar, kendisi gibi diğer kullanıcıları oluşturmaktan sorumlu olacak bir ana kullanıcı tarafından yapılır. Kullanıcılar sisteme (SASBFR) yalnızca bir kullanıcı adı ve paroladan oluşan bir tanımlayıcı ile entegre olabilir. Hedeflerimize ulaşmak için, LBPH (Yerel İkili Desen Histogramı) olan bilgisayarla görmenin işlenmesi için en güçlü, popüler ve en kolay algoritmalardan biri ile çalışmayı seçtik. Bu durumda, sınıflandırma ve regresyon analizleri için kullanılan HOG (yönlendirilmiş gradyan histogramı) ve SVM (destek vektör makinesi) ile kombinasyonu, yüz tanıma ve algılamada olağanüstü sonuçlar verir.

Günümüzde makine öğrenimi algoritmaları, bilgisayarları kullanma ve dünyayı farklı bir şekilde düşünme biçiminde devrim yarattı. Bugün bilgisayarlar insanlar gibi düşünüyor, halka arzların maliyetini tahmin edebiliyor, kanseri önleyebiliyor veya birini sadece yüzünden tanıyabiliyor.

Bu proje, sınıfta bulunan öğrencilerin adlarının A4 kağıdına veya parmak izlerine kaydedilmesiyle yapılan yoklama almanın eski geleneksel yönteminin yerini alıyor. Bu sadece üniversiteler için değil, aynı zamanda bu sektörde güvenliğini artırmak isteyen şirket ve kuruluşlar için de yararlı olacaktır.

Anahtar kelimeler: yüz tanıma, yapay zeka, sasbfr, devam sistemi, eğitim fotoğrafı.

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LIST OF ABREVIATIONS

SASBFR : Smart Attendance System by Face Recognition

GUI : Graphical User Interface

SGBD : database management system

HOG : Histograms of Oriented Gradients

LBPH : local binary pattern histogram

CNN : Convolution Neural Network

SVM : Support vector machine

FR : Facial Recognition

AI : Artificial Intelligence

PIP : Python installer package

CV : Computer vision

CHAPTER I

GENERAL INTRODUCTION

1.1 Introduction

Since the arrival of scientific and technical progress and the invention of large machines, the world has experienced an unprecedented revolution in all sectors. The application area of machine learning algorithms keeps reaching out to all levels of our lives. With its fundamental matrix which is artificial intelligence (AI), today the computer has become a static human who performs tasks that in the past were almost impossible. With very advanced processing forces and performances.

1.2 Statement of the problem

Today the computer merges with artificial intelligence to bring wonders to the world that the human being far from that which the human could not conceive of itself. Today we are addressing a theme that is very unpredictable by humans. To counteract the loss of time in the classrooms to roll call the students and also to bring the students back to more discipline as it would also be easy for the school after a large number of absenteeism to notify the parents on the behavior of their children. In this ideology we will deal with the theme: "the design and implementation of an intelligent application of presence by facial recognition" (SASBFR) case of a "university". During our research, it was clear that it would be appropriate to design a face recognition application by facial recognition to serve as an aid to the teacher for taking attendance in class. "facial recognition is a technology that was born in the 70s before being further developed in the 90s, in 1999 a company in the north of France set up a Morpho-doorman which is a kind of door equipped with a camera and made it possible to recognize certain faces" (Gapin, Années 90, les débuts de la reconnaissance faciale, 2019).

1.3 Purpose of the study

The objective of this project is to specify the software expectations of our new system for managing attendance by Facial Recognition; it must be complete as a feature provided by the attendance system. In addition, this project aims to change the old traditional working methods which were done by manually taking student names on paper or fingerprint by this new modern method which is an automated and secure form.

It helps universities and can also be useful for organizations to keep student files for indefinite periods of time, to research a particular student in a very specific time and time range at just midnight, to know all the students who have taken a lesson with precise information on the day, time and also the year. This method will also help in the tasks of increasing the performance of students in schools because it will lead them to more presence in class (B Sekeroglu, 2019)This system is a tremendous improvement compared to this old method which was losing too much time and loss of data also caused perhaps by fires in places where student files were deposited, by large quantities of documents, therefore the search becomes impossible. Facial recognition is becoming more and more important in our society. It has made very remarkable progress in the area of security. It is a very effective tool that can help law enforcement officials (Police, Gendarmerie) to recognize criminals. This is the reason why Christian Estrosi, mayor of Nice, wishes to use this technology. Nice is one of the cities in France with the most video surveillance cameras per inhabitant (1 for 145 inhabitants). (Gapin, Années 90, les débuts de la reconnaissance faciale, 2019) And software companies are leveraging technology to help users gain access to technology. This technology can be further developed for use in other avenues such as ATMs, accessing confidential files or other sensitive documents.

1.4 Research questions/Hypotheses

1. How to use facial recognition to mark the presence of students in a university?
2. How to get the system to take student photos?
3. How to train data (photos) with facial recognition algorithms?
4. How the LBPH algorithms work to represent the features of a face?

5. How the Euclidean distance calculation works to calculate the closeness between images?

6. How to train the classifier to have good results?

7. How to predict output face with Dlib. Dlib uses HOG (Histogram of Oriented Gradients) and SVM (Support Vector Machine) methods for detection?

1.5 Significance of the Study

Artificial intelligence is set of theories and techniques used to produce machines capable of simulating human intelligence (Copelan, 2023)today one of the most demanding sectors in the computer field, facial recognition which is a sub-field of artificial intelligence has occupied space due to its many successes in several interventions (A Kirsal Ever Y. A., 2019)such as help in identifying bandits (Vonintsoa, 2022) for police officers, can also be used at "airports and border control. With biometric passports, travelers can skip long lines for manual verification. In addition to

reducing waiting time, facial recognition improves security in these high-traffic areas. Always thanks to the authenticity of the facial imprint" (Vonintsoa, 2022) help in recognizing identity thieves and many more. This technology is in full growth its improvement would give more fields of action in the much more confidential fields therefore the documents are very sensitive. The SASBFR is in its beta version; it is an association of the web, facial recognition algorithms and also a database.

This project plays a multiple role with a user-friendly and easy-to-use interface, such operations can be performed:
• registration of students in a database with everything
• related to student information
• student photo award and photo training
• taking attendance of student entries and exits
• consultation of attendance sheets

With all its features, any organization will use it without any problem for its attendance.

1.6 Limitations of the study

It is very important to note that there is no perfect science and since many constraints arise for face recognition. This is the case for many facial recognition algorithms. Taking an image is often greatly influenced by the position of the camera. And also other factors also influence such as make-up, aging, position of the hair, plastic surgery. (Vonintsoa, 2022).

Setting up a product or a feature for an application always goes through a lot of obstacles and for the design of our facial recognition application we also had problems obtaining the necessary information that could guide us. During the literature review we found that many authors who have dealt with this subject have also been examined but the information on face recognition has always been a challenge. In addition, the difficulty in selecting the most appropriate website for our study.

During facial recognition the lighting conditions have a very significant impact on the output results, a dark area or an area that can be lit will have a different result from the lit one (Khelif, 2014). Another aspect that influences when taking by facial recognition is the movement of the head, the rotation of the head is also an impacting aspect for a good result.

Assistance in the development of the facial recognition application for taking attendance can help reduce the time very often wasted by teachers, but there are many limits for this application as well, the inability to identify blurred faces, the inability to take faces in dark areas.

One of the limitations of this project is face spoofing. which is a very important aspect that we will touch in version 2 of the evolution of our project case this will prevent students absent from class to be helped by their classmates just by showing the image or a video of their photo on the camera and then they (absent) will become present yet they did not come to school.

1.7 Definition of terms

Artificial intelligence (AI): is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. It can also be defined as the science whose goal is to make a machine do tasks that man accomplishes using his intelligence. (Paste, 2000)

Facial recognition (FR): The International Observatory on the Societal Impacts of AI and Digital (OBVIA) defines facial recognition as "a technology combining biometric techniques, artificial intelligence, 3D mapping and machine learning to compare and analyze a person's face in order to identify it".

Training photo: training a photo is a process by which the machine learning algorithm decomposes the photo into a binary sequence and retrieves all the characteristics of the photo in order to recognize a person during facial recognition.

Computer vision (CV): "Computer vision is an interdisciplinary field that deals with how computers can be designed to gain high-level understanding from digital images or video. From an engineering perspective, it seeks to automate tasks that the human visual system can perform "Computer vision is about the automatic extraction, analysis, and understanding of useful information from a single image or a sequence of images» (contributors, Outline of computer vision, 2023).

Machine learning: machine learning invented in 1959 by Arthur Samuel, is the ability to give a machine to learn itself without programming it explicitly. It's a very powerful automation tool (Ogidan, Dimililer, & Ever, 2018).

CHAPTER II

LITERATURE REVIEW

2.1 Theoretical Framework

Alan Turing's 1950 test is a legend in the world of artificial intelligence. according to him he wondered whether the machine could think, (COPELAND, 1912-1954) the difficulty and the loss of time for teachers when taking attendance in class leads us to extend our reflection on this subject of artificial intelligence and in particular in the field of facial recognition. Universities and many other structures still proceed today in a traditional way (manual attendance on A4 paper) or fingerprint which a very risky method with:

- ❖ Data loss
- ❖ The risk of fire
- ❖ The loss of more than 20min for a course of one hour of time
- ❖ The difficulty in finding a student's registration form in an already very high stock.

The research question is how to help its universities, companies or organizations to proceed automatically (presence taking by facial intelligence) and to considerably reduce the time and the risks related to student data.

2.2 Related Research

Artificial intelligence is subdivided into 2 main subfields which are machine learning "Machine learning is an evolving branch of computational algorithms that are designed to emulate human intelligence by learning from the surrounding environment" (EI Naga, 2015) and deep learning. "Deep learning is a branch of machine learning that tries to model high-level abstractions of data using multiple layers of neurons consisting of complex structures or non-liner transformations" (Hao, 2016).
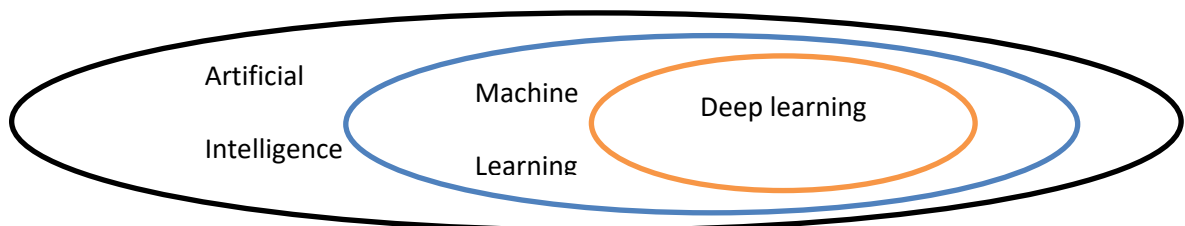
Figure. 1 Artificial intelligence
facial recognition.

9 dates marked the history of facial recognition from 1964 to the present day we will list some of them.

In 1964 a team of American researchers composed of Woodrow Bledsoe, Helen Chan and Charles bison (Thierry, 2020) seeks to recognize human faces and imagines a semi-automatic method to study computer programming.

In 1991 Alex Pentland and Matthew Turk from the Massachusetts institute of technology set up the first successful facial recognition technology: Eigen faces (Thierry, 2020).

In 2011 deep learning was born, it is an automatic learning method based on artificial neural networks. The more images there are, the better its algorithm learns (Thierry, 2020).

In 2014 the giant social network Facebook created its first facial recognition algorithm, the Deepface which according to them has an efficiency of 97%. (Thierry, 2020).

Chinese police announced in 2018 that they had arrested a man at a pop start Jacky Cheung concert in Nanchang on suspicion of an "economic crime" his face was spotted in a crowd of more than 50,000 people (Thierry, 2020).

In 2019 the coronavirus pandemic invaded the whole world the dead from all corners of the earth globe. This disease kills women, men and children; it is a disease which is contaminated by nasal voice. For this fact, many international organizations, such as the organization responsible for world health, WHO, are setting up a first barrier to this pandemic by wearing face masks. Many researchers and computer scientists have created face detection applications without a mask in order to control citizens who want to enter public spaces (Kayali, 2021).

Woodrow, Helen, Charles semi-automatic	Eigen faces	Artificial neural networks	Deepface Facebook	Facial recognition	Facemask detection
1964	1991	2011	2014	2018	2019
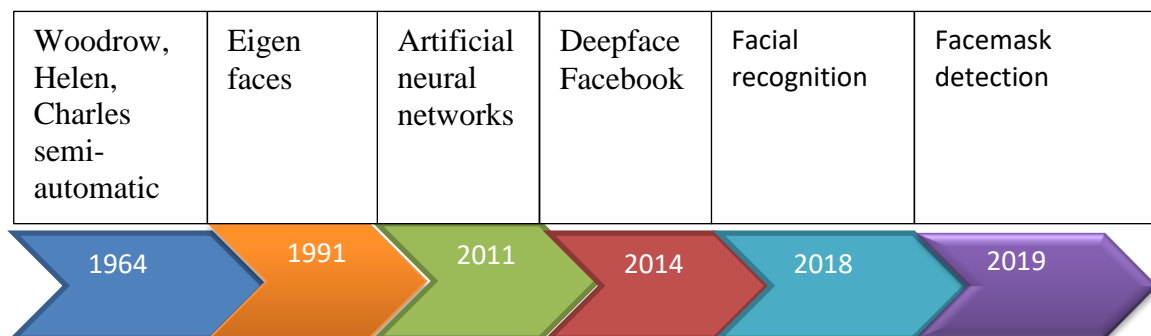
Figure. 2 History of facial recognition

To answer this research question, we used an observational approach and also a case study approach from our near east university. An observation also noted in many

other universities the case of Cyprus West University where i was also a student. i could also talk about the case of ISEM IBCG university of Cameroon where i was also a student. This approach allowed us to understand that we had to set up a system for taking attendance by facial recognition. The results of this new system show a positive influence on the new method of taking attendance. Indeed this would be of paramount importance for data security and also for the reduction of attendance times. Our research contributes to the improvement of the attendance system in universities just by presenting the face on a camera posed at the entrance of the classroom, and automatically the system will generate an attendance sheet which will also have to be stored in a database. This approach raises a new automated and computerized method for attendance.

This application for the moment is still in its version 1 and so far it has been tested just in a family of 6 people with a result accuracy of 98%. We hope in the future days to experiment it on a larger group of people, on the scale of a classroom of 100 people or a company of 200 employees. And also improve it in the detection of false faces or the spoofing of images by other students to help their classmates absent from class.

CHAPTER III

RESEARCH METHODOLOGY

3.1 Introduction

Research design is a line or plan outlining the methods, procedures or steps that should be followed for data collection and analysis, research sample size, participants and also ethical consideration.

The realization of any project always begins with an idea resulting from an expressed need and its realization happens by the description of the different elements that will come into play for its implementation. On those, in this chapter we will give the motivations for the choice of the project, the specifications describing all the functionalities of the system, the existing study and in the end the software architecture adopted.

With regard to the design of the SASBFR app, our approach was first of all observational, in all the universities of Cyprus, attendance in class is done by reading the name or not filling in an attendance sheet. we can cite examples of universities such as Cyprus west university where I was a student, near east university where I am currently at the end of my training, Cyprus international university where my little sister with whom I live is a student, eastern Mediterranean university where my little brother with whom I live was a student and also many others such as Bahar Academy or CEMEC Academy training centers. we also proceeded by telephone interrogation with several of our friends who study in other countries of the world it is the case of France, Belgium, Canada, Cameroon and the results prove to be the same ones. This facial recognition technology is currently used in 2% of companies in the world, but with regard to taking attendance in class, it has not yet been popularized. The biggest form of data collection has been on Google scholar and also a survey i had to do creating a post on pi network's new Fireside Forum social network and many thousands of commenters say they haven't seen this tools or not having enough information about.

The same question was asked but in the opposite direction, namely: would you like us to create an intelligence application for taking attendance by facial recognition in schools and universities? The responses were very very positive.

3.2 Data Collection Procedures

Training a facial recognition model requires a large number of images. We proceeded with a photo session of all the inhabitants of the house, a series of 150 photos per individual were collected with ideas for each. the first photo bears the index 1.1 which means photo of the student with identification number 1, the second photo bears

the index 1.2 which means student with identifier 1 and photo 2 and so on until the photo with index 1.150 and the second student wears photo 2.1 which means student with identifier 2 and photo number 1 and so on. The figure below shows the storage folder for the collected photos.
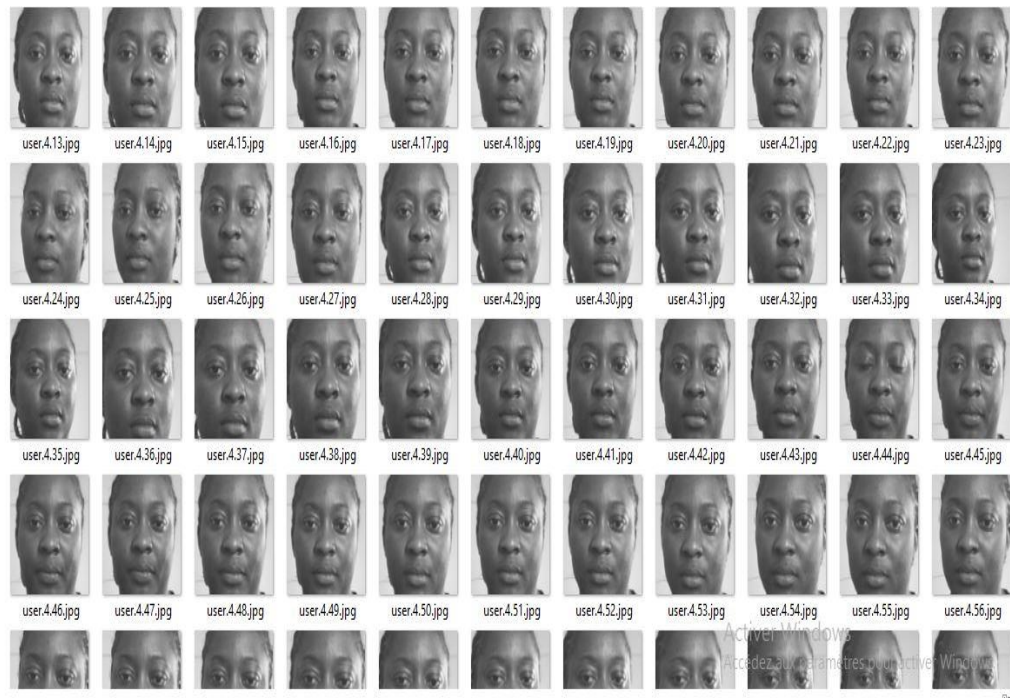
Figure. 3 Dataset images

The collected images are then sent to the system for training. The system uses the LBPH algorithm to train the model the process is as follows after extracting, cropping, resizing and converting to gray scale, the facial recognition algorithm is responsible for finding the characteristics that best describe the images of entrance. By using LBP combined with histograms, we can represent face images with a simple data vector. The bottom figure is an example of the result after training the images stored in the dataset, the student's face is recognized and the student's information is also mentioned there.
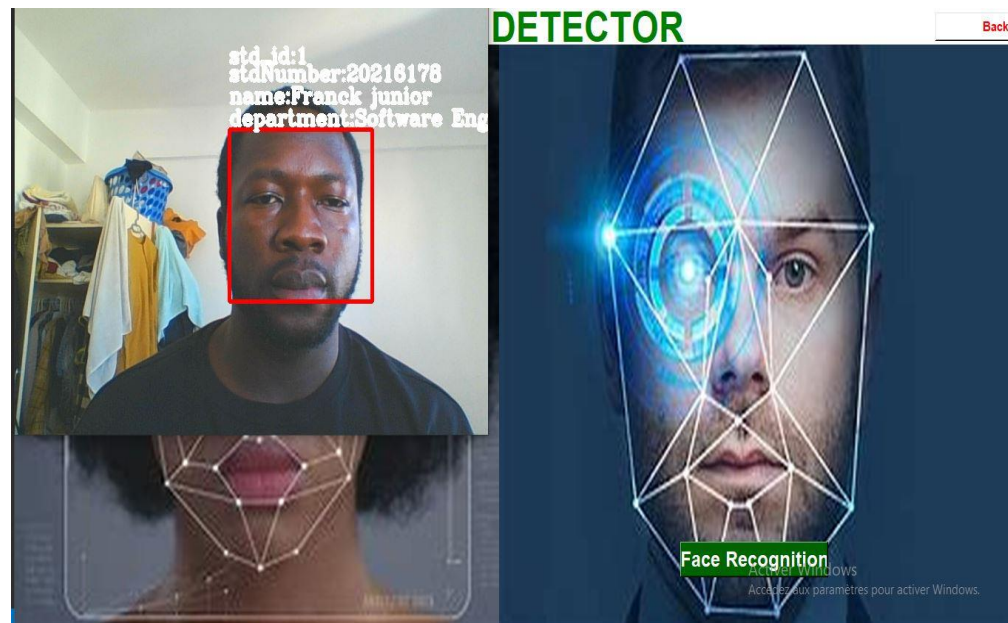
Figure. 4 Face Recognition

3.3 Choice of the subject

The environment in which we live imposes constraints on us during our various acts. having observed my supervisor and I, it was first of all a question of doing in artificial intelligence but in the case of the recognition of people without masks when they enter public areas in order to make our modest contribution to this pandemic of the century which is the corona virus or COVID-19, given its disappearance even today it is partial, we decided to make an application for taking attendance by facial recognition, this choice of subject was not a random way. The observation is simple, the teachers, to speak only of the case of schools and universities, take on average 10 min before class and 10 min after class to make the call and know the pupils or students present in class. And another motivation for the choice of the subject is also the desire to revolutionize the way of taking attendance.

3.4 Project specifications

The specification is a contractual document describing what is expected of the project manager by the client. It is therefore a document describing as precisely as possible, with a simple vocabulary, the needs that the project manager must meet.

3.4.1 Functional requirement

The SABFR (Smart Attendance System By Facial Recognition) application aims to revolutionize the method of taking attendance cases to remain Alcaic by the use of

papers and writing by hand, even if other methods have emerged such as recognition by fingerprint (Lamia Rzouga., 2012) must be able to perform the following operations:

Record the information and take a series of 150 photos through a camera of a new student and save it in the database so that they can be recognized at any time. The application will contain a dashboard with 8 pages.

The management of the dashboard will be done by the teacher. The SABFR application must bring together the teacher (administrator) and the student.

The role of the administrator:

- ➢ Authenticate on the system with a username and password
- ➢ Manage students by:
- ➢ Add the information of a new student such as his Last name, his first name, his date of birth, his department, his semester, capture photos of the student etc...
- ➢ Delete a student. The teacher (administrator) has the ability to delete a student directly from the database.
- ➢ The administrator has the possibility to modify the profile of a student
- ➢ Admin has the ability to import and export an attendance list and edit it as well.
- ➢ The administrator can update the photos of a student
- ➢ Train the photos of the new student so that the computer can recognize him when he wants to take his presence
- ➢ View details of all students
- ➢ Research students by perhaps their names, genders, departments, etc.
- ➢ View photos of all students
- ➢ Consult the developer of the application, ask for help in managing the application

As soon as he enters the system, the teacher must register all the students registered in his course. He will also have the possibility at any time to delete or modify a student.

The teacher will have to take sample photos of each student and send to the training algorithm to train the system to be able to recognize the student each time he comes to mark his presence in class.

The ASBFR is an application whose purpose is to replace the old technique of taking attendance which is done by calling the names of students and their recordings on A4 format paper, SABFR is a digital and automatic model with a very high security in terms of storing information.

Able through a camera to take the face of a student on his arrival to mark his presence with his time of arrival, his day, the year and also the teacher will be able to import it by different formats must- he desires.

3.4.2 Non-functional requirement

The non-functional needs describe the difficulties related to the realization and the proper functioning of the system, we can speak here of the environment, the implementation of the system, the constraints of requirements in terms of performance, its maintenance, its reliability.

The ergonomics of the interfaces: the application must be compatible on different operating systems such as WINDOWS, MAC and LINUX to be accessible by a large number of users.

Security: access to the system first passes through authentication using a user name and a password and the passwords must be encrypted in the database.

Audit: field verification is important to avoid having empty fields and incorrect characters.

Reliability and ease of managing the application: the system must be simple and easy to handle in order to allow interaction between the user and the machine.

3.5 Identification of actors

There are two types of actors in a computer system internal actors and external actors to the system. By definition, a system actor is a person, software or hardware that interacts with the system in order to perform one or more tasks concerning the use cases. For the SABFR case we have listed them in the table below and full details will come in the sequel to our duty.

Table. 1 table of actors

Actors	Role
Teachers or administrators	An admin has the role of filling in the details of a student in the system, taking the sample photo (150 photos) of the new student and training this photo by the LBPH algorithm, the admin has the responsibility of managing the attendance admin can be the head of department, teacher or a head of registrar
Students	Students have the only task of presenting their faces in front of the camera when entering and leaving class.

3.6 Context Diagram

The context diagram shows the actors interacting with the "SASBFR" system. An admin manages the list of all students, and imports or exports a csv attendance file
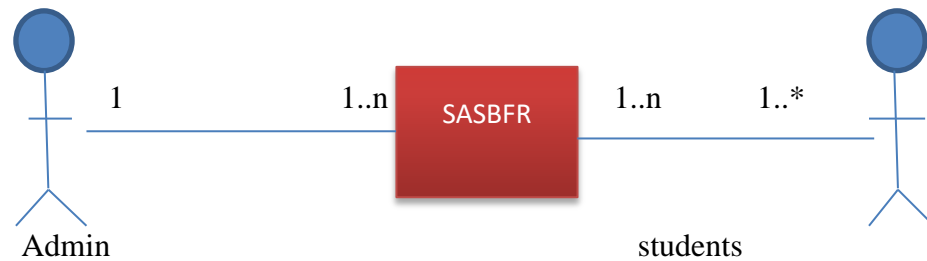

Figure. 5 Context diagram

3.7 Development method

Application development requires several steps and the creation process may differ from person to person.

The first step is to develop the strategy,

Planning and analysis,

Conception and development

Application testing and deployment

Performance monitoring

The strategy allows you to carefully examine the objectives, capabilities and business model of your new application. And in the case of the SASBFR, our objective is to model class attendance by facial recognition in order to replace the old method which had remained traditional on paper until now.

Planning and analysis helps list your thoughts, strategies, and general method for the process. Our thought was to facilitate the work of the teacher and for other companies which will be able to use this application and it is in this part that the functional and non-functional requirements which we quoted in the Specifications part come into play.

The design, the model of a product brand is often very much put forward more than the product in question just because it is the model that sells the product so it will be a question of designing a user-friendly, fluid, intuitive and attractive interface. This is why

in the case of the design of note SASBFR we chose GUI of Tkinter which makes it possible to design interfaces on very professional python.

The development of an application is one of the most important parts if not the most important. For an application it very often involves 2 types of developers namely the backend and the frontend here the group decides on the design languages, the database servers and also the type of hosting desired.

The front end designs the physical part of the application while **the backend** designs the invisible part but which makes it possible to make an application dynamic and also for its evolution. In our case we used as programming language python, MySQL for database management, GUI of Tkinter for the user interface we will enumerate all its technologies in the continuation of the treatment of our subject.

Application Testing is a very important step in a software product, it is when the management team observes if the software is ready for the users it is also to make sure that the application has no bug, the security of the application, and also the stability of the application. In our SASBFR case, we used a classifier and trained our model with LBPH algorithms. We tested our model on a large number of people with 150 photo samples each.

Deployment is the release of the software product and on different systems or platforms.

3.8 Comparative analysis

The comparative study is used to compare two products, two fields or to compare the advantages and disadvantages of two products. In the case of the SASBFR, our system makes it possible to considerably reduce the time for taking attendance in the classrooms, this same system plays several roles since it can also be used to register students in the university database. . This system is very different from the traditional methods used so far by 95% of schools and universities in the world.

The SASBFR like any other system has:

- A Login interface with fields to fill in email and password
- A registration page for admins with fields like last name, first name, phone, backup question password and theme and terms of use to accept
- A lost or forgotten password recovery page
- A very easy to use interface with 8 elements (student details, train data, images, facial recognition, presence, developer, help, and exit) with buttons to return to the initial page.
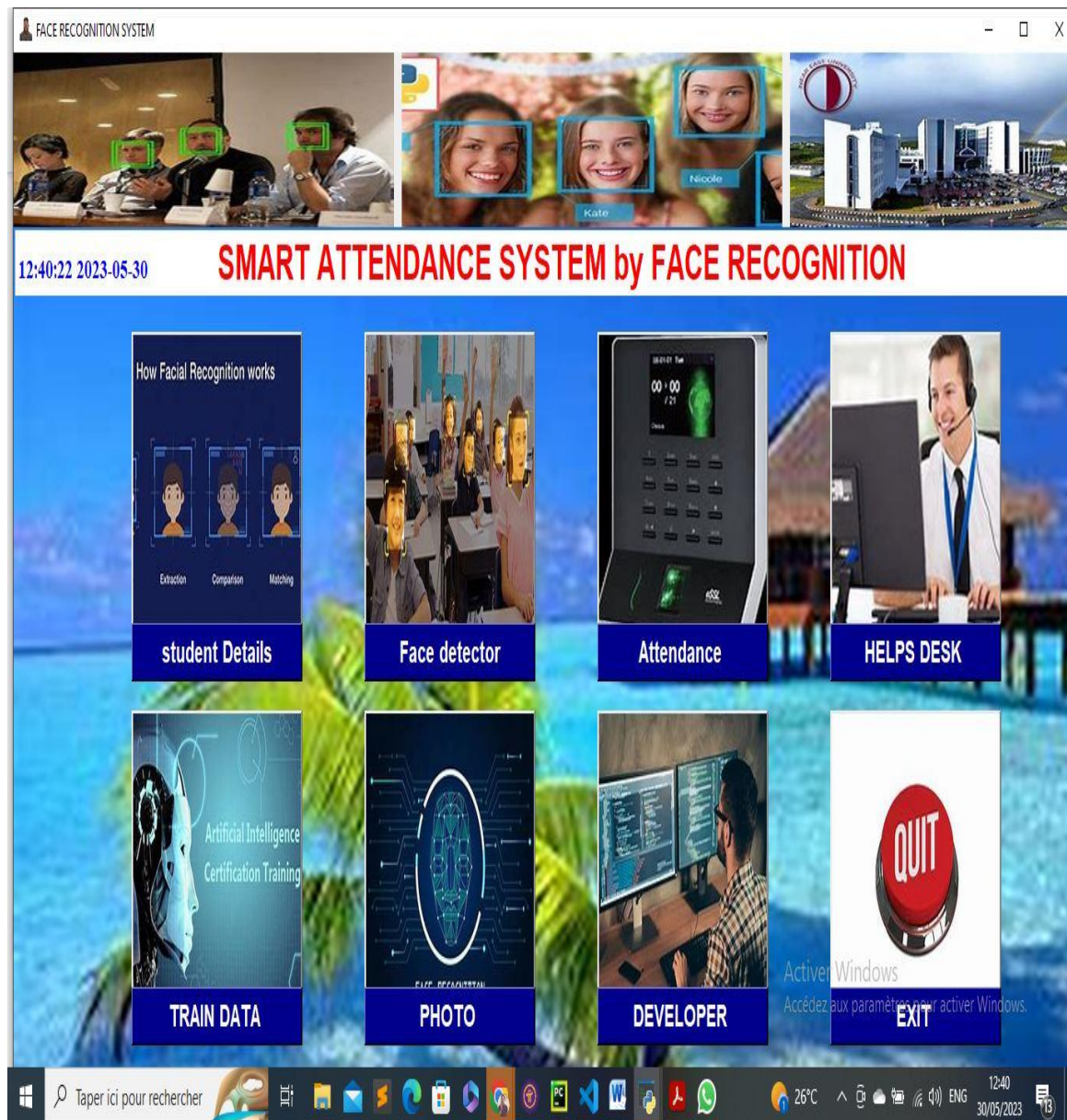
The photo below shows what this system looks like

Figure. 6 Face Recognition Attendance System Interface

3.9 Overall software architecture

The teacher or the administrator can react with the system from a computer and access the interface, then the teacher fills in the information from the first day of the registration of the student in the course and makes also take a series of 150 photos to the student, his information is saved and sent to store in a database, after registration of the student the teacher must do a training of the photos of the student from a classifier.
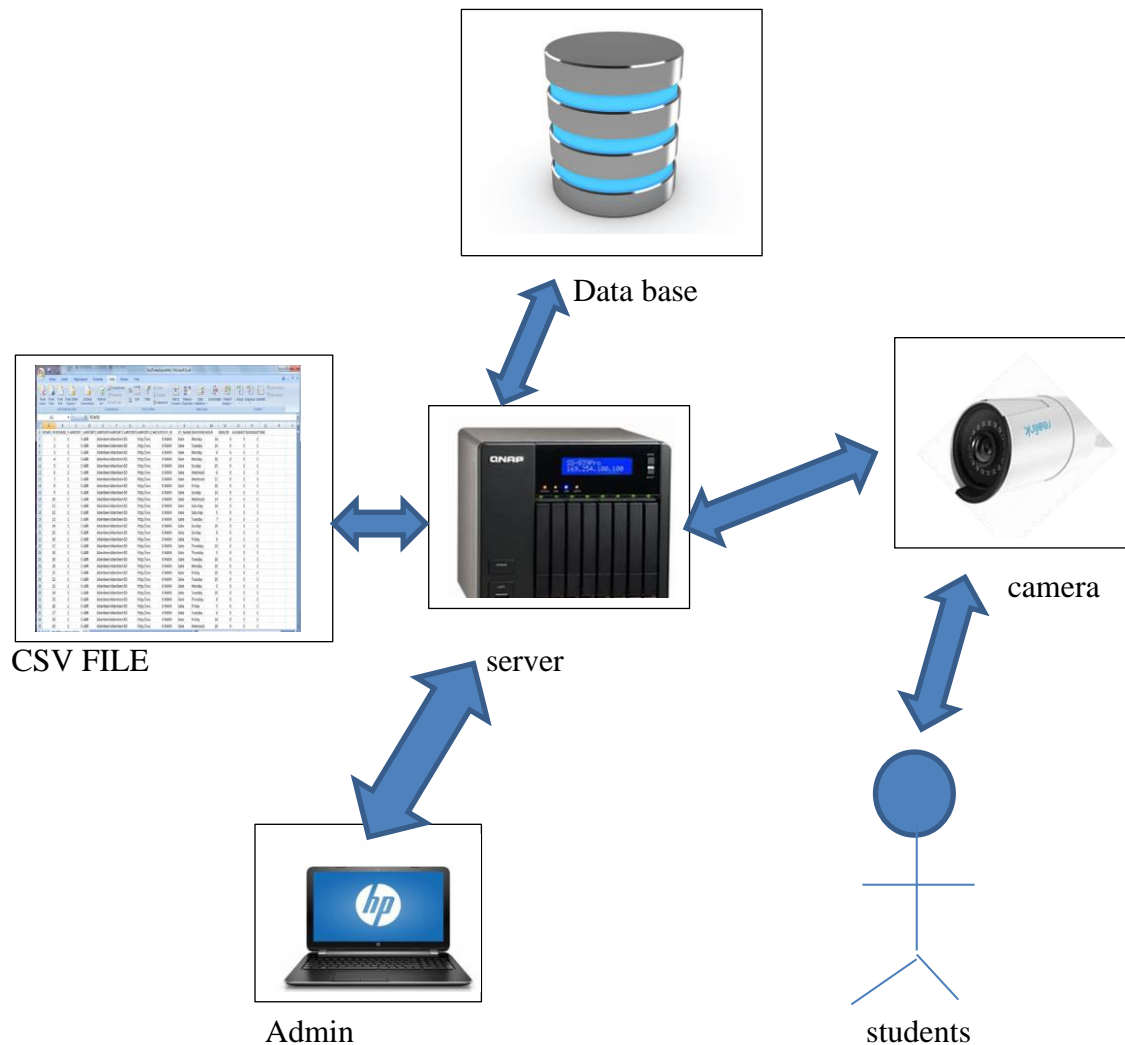
Figure. 7 Overall Software Architecture

3.10 The SASBFR backlog product

The Product Backlog is an emergent and ordered list of what is needed to improve the product. This is the only source of work undertaken by the team. Items in the Product Backlog that can be done by the team within a sprint are considered ready for selection during a sprint planning event.

The SASBFR backlog product is listed in the table below. It includes the following fields:

ID: this is the unique number for each user's history

User Stories: these are the sentences that describe the functionalities desired by the user.

Priority : This is the priority of the development of each user story. Here is list that establishes a study in order to distribute the stories by priority according to the following conditions:

• The complexity

• Priority:

This task can be:

- High: operation must be done.

- Medium: operation should be done as much as possible

- Low: operation could be done as long as it has no impact on other tasks

The table below presents the SASBFR product backlog.

Table. 2 SASBFR Product backlog

Id	User stories	priority
1	As an administrator, I can consult the status of the students at any time (presence, absence)	High
2	As an administrator, I can know in real time the current name of students present or absent	high
3	As an administrator I can delete a student	high
4	As an administrator I can modify a student's information	high
5	As an administrator I can modify the photos of a student	high
6	As an administrator I can mark the presence of a student	high
7	As an administrator I can I can train student photos using LBPH algorithms	high
8	As a user I can take an attendance photo	middle

3.11 Overall use case diagram

In order to describe the behavior of the different elements of the system, we have chosen the UML for the case modeling; it is a unified graphical modeling language in the form of pictograms. In our SASBFR application, the Uml describes the different actions that the administrator and the student must take on the system. The figure below shows the different actions that Admin and student are able to perform.
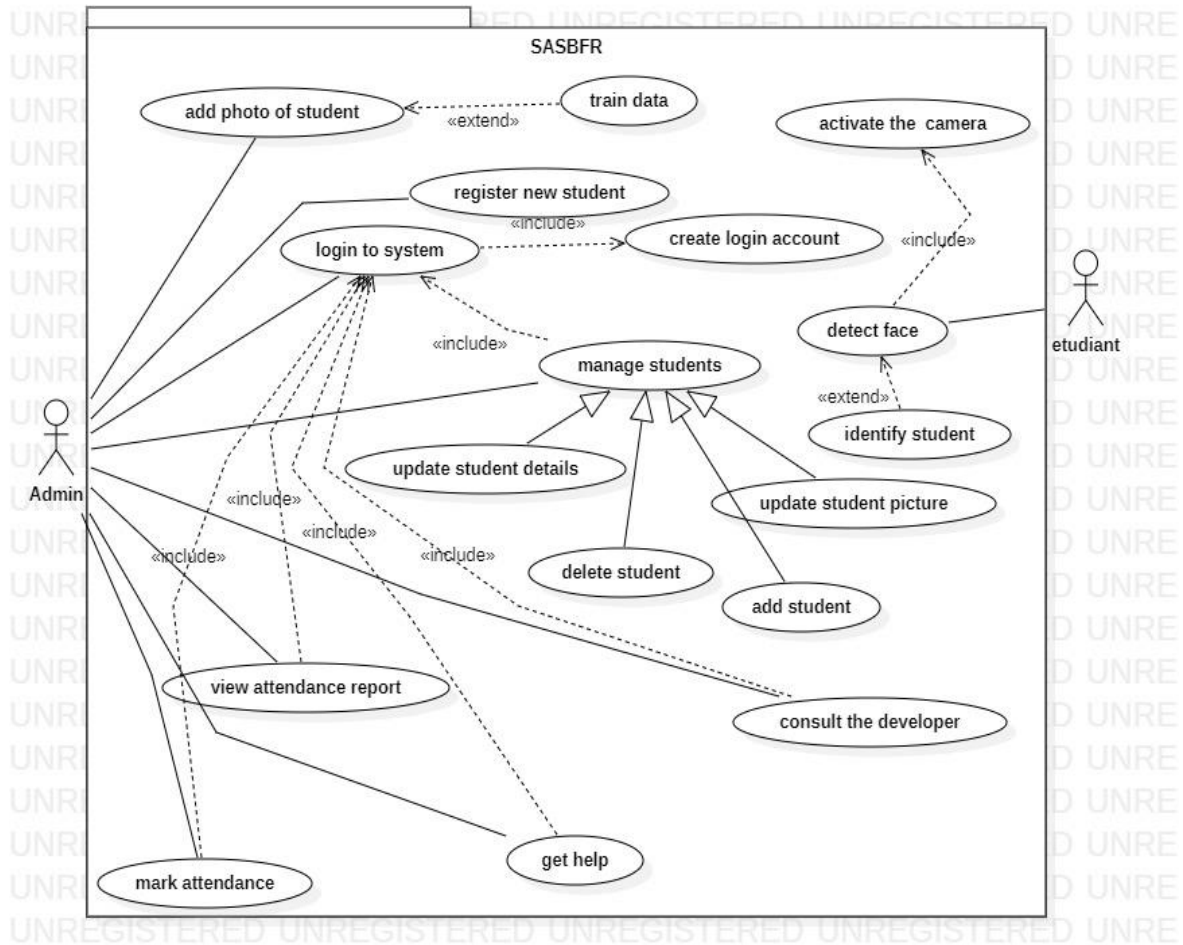

Figure. 8 Overall Use Case Diagram

CHAPTER IV

FINDINGS AND DISCUSSION

4. Introduction of the chapter

The design of a computer project requires a certain amount of knowledge with regard to the tools to be used for its realization, artificial intelligence being very new for us (me) it was a question for us of first doing the recognition and the learning tools for the realization of our SASBFR application. We are going to present the different stages of our learning and the encountered.difficulties

4.1 planning session

Several meetings between my supervisor and me to discuss the tools to use, we decided as tools:

- OpenCV: opencv or computer vision is a library used by python to design artificial intelligence applications it allows real-time image capture and processing, it is a product of the company Intel.
- Dlib: by its author David king, Dlib is a toolkit for creating real-world machine learning and data analysis applications.
- Numpy: numpy is a machine learning library for manipulating matrices and multidimensional arrays.
- Euclidean the Euclidean calculation makes it possible to calculate the closest distance between two histograms and this makes it possible to find the face image closest to the target image
- Python is the most popular programming language that allows web development, artificial intelligence, data analysis etc...
- MySQL database management
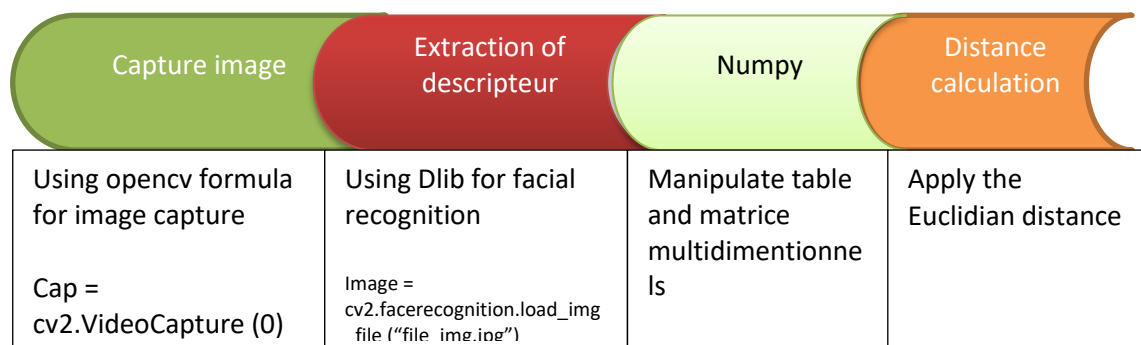- GUI Tkinter which helps for user interface

Capture image	Extraction of descripteur	Numpy	Distance calculation
Using opencv formula for image capture

Cap = cv2.VideoCapture (0) | Using Dlib for facial recognition

Image = cv2.facerecognition.load_img file ("file_img.jpg") | Manipulate table and matrice multidimentionne ls | Apply the Euclidian distance |

Figure. 9 work planning

4.2 Developer backlog

The developer's backlog is a tool that helps in the distribution of tasks in order to quickly achieve the objective. We will try to list them in the table below.

Table. 3 Developer backlog

Id	User stories	Complexities
1	As a developer I must know the use of Opencv to capture images	high
2	As a developer I must know the use of Dlib face recognition to extract face descriptors	high
3	As a developer I must know the use of Numpy for matrices	high
4	As a developer I must know the calculation of the Euclidean distance	high
5	As a developer I must know the use of the python language	high
6	As a developer I must know the use of MySQL for database management	high
7	As a developer I must know the use of Tkinter tools to design the user interface	high

4.3 Definition and installation of the various programming tools

The phase of getting started with a software or programming language has never been easy, that being said, given that we used python as a programming language, it was only wise to use PIP for the installation of the different libraries to help us to make our program work.

Pip is a package installer for Python that lets you install and manage software packages and libraries.

To install pip on a machine, just run the command **pip install pip** in the command prompt (cmd).

Now that pip is installed on our machine we can install other libraries such as:

Dlib: Dlib is a general-purpose, cross-platform software library written in the C++ programming language. Its design is heavily influenced by ideas from contract design and component-based software engineering. It includes machine learning algorithms and tools that help us create complex software. Used in academia and industry for areas of embedded devices, robotics (contributors, Dlib, 2021).

Its installation is very simple on LINUX as on OS, just types the **command pip install** dlib in the command prompt (cmd).

After installing we can install dependencies like **Cmake** and **Numpy** with the command **pip install numpy.**

Figure 10 logo of Dlib

4.4 Camera learning with opencv

OpenCV is an open source computer vision library with C++, python, java and android interface it supports operating systems such as MacOs, windows, android and Linus. It is used for real-time computer vision applications. In order to take a picture, the camera must be activated and this is the role of opencv.
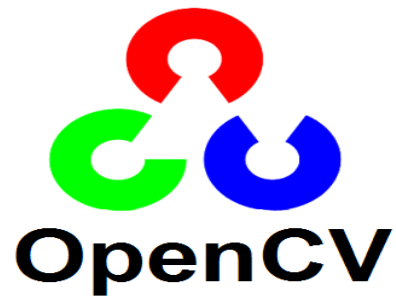
Figure 11 logo opencv

4.5 Image descriptor extraction with LBPH

LBPH is a facial recognition algorithm that uses local binary patterns (LBP) to extract features from an image.
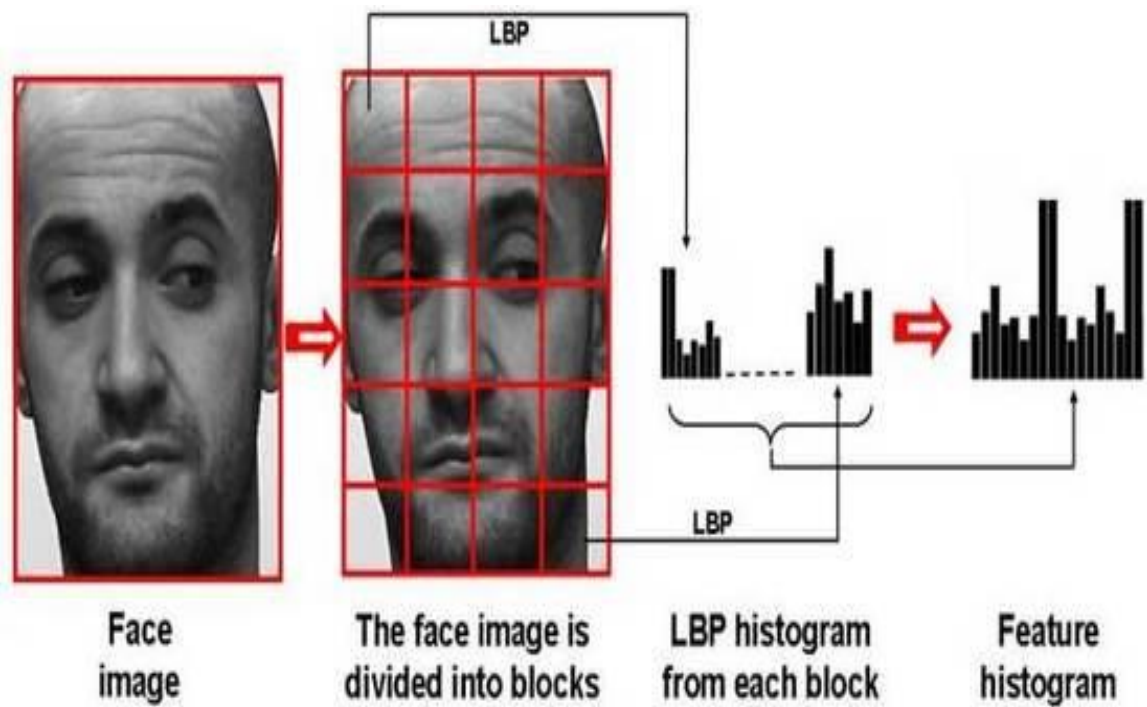

Face image | The face image is divided into blocks | LBP histogram from each block | Feature histogram

Figure. 12 LBPH operation

Application of the LBP operation: The first step in calculating the LBPH is to create an intermediate image that better describes the original image, highlighting the facial features. To do this, the algorithm uses a sliding window concept, based on the radius and neighbor parameters.

The LBPH (Local Binary Pattern Histogram) algorithm is a simple approach that labels the pixels of an image by thresholding the neighborhood of each pixel; (A KURNIAWAN, 2023) LBPH is a facial recognition algorithm that can represent local features in images. It is robust against monotonous gray scale transformations and is provided by the OpenCV library. LBPH is used to recognize a person's face both from the front and from the side. LBPH is a combination of the Local Binary Patterns (LBP) and Histograms of Oriented Gradients (HOG) descriptors. The LBP operator is used to extract and label pixels from an image. The LBPH algorithm is limited if conditions, such as expression diversification, disorientation, and a change in lighting performance occur. After extracting, cropping, resizing and converting back to gray scale, the facial recognition algorithm is responsible for finding the features that best describe the image. This takes place in two essential steps:

"Verification or authentication of a facial image: this operation consists in essentially comparing the input facial image with the facial image linked to the user who requests authentication. This is basically a 1x1 comparison" (Prado, Face Recognition: Understanding LBPH Algorithm, 2017).

"Facial Identification or Recognition: This technique essentially compares the facial image of the entered user with all the facial images in a dataset with the aim of finding the user who matches that face. This is essentially a 1xN comparison" (Prado, Face Recognition: Understanding LBPH Algorithm, 2017).
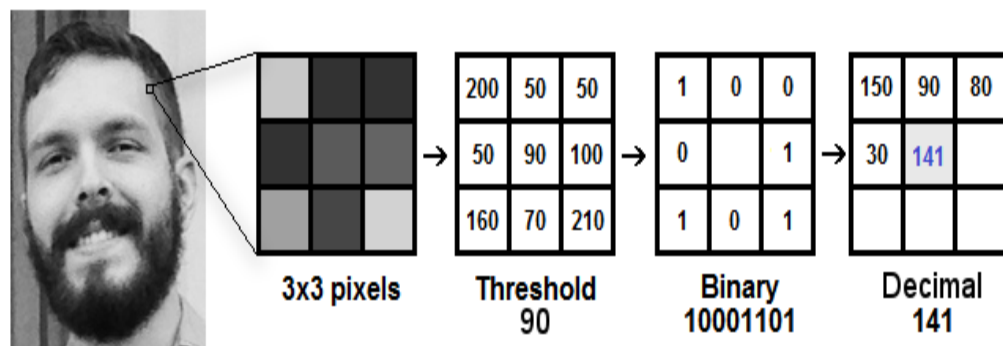

Figure. 13 Application of the LBP on an image

Euclidian Distance: it is possible to use several methods to compare the histograms by calculating the distances between two histograms (the absolute value, the Euclidean distance and the chi square).

For our case we used the calculation by the Euclidean distance to find the closest points between the different images, so here the output algorithm is the Id of the image closest to the histogram, the algorithm must also return the distance calculation which must be used as confidence and as soon as the confidence is low it gives a good result because the distance is very close between the histograms. And then we will automatically use the threshold and the confidence to see if the algorithm correctly recognizes the image, if the confidence is lower than the threshold, then the algorithm correctly recognizes the image. (A Kumar, 2023) The Euclidean calculation to find the image that comes closest to the target image is:

$$\mathbf{AB} = \sqrt{(xB - xA)2 + (yB - yA)2}$$

With 2 points A and B of the respective coordinate plane $A(x_A, y_A)$ and $B(x_B, yB)$, points already incorporated in the python programming language.

Euclidean distance (V1, V2)

V1 and V2 are vectors of the plane containing the descriptors of the target image.

4.6 Design

In order to describe how the SASBFR application interacts with students and administrators we will materialize this with the sequence diagram. A sequence diagram is a type of interaction diagram describing what order objects work together.

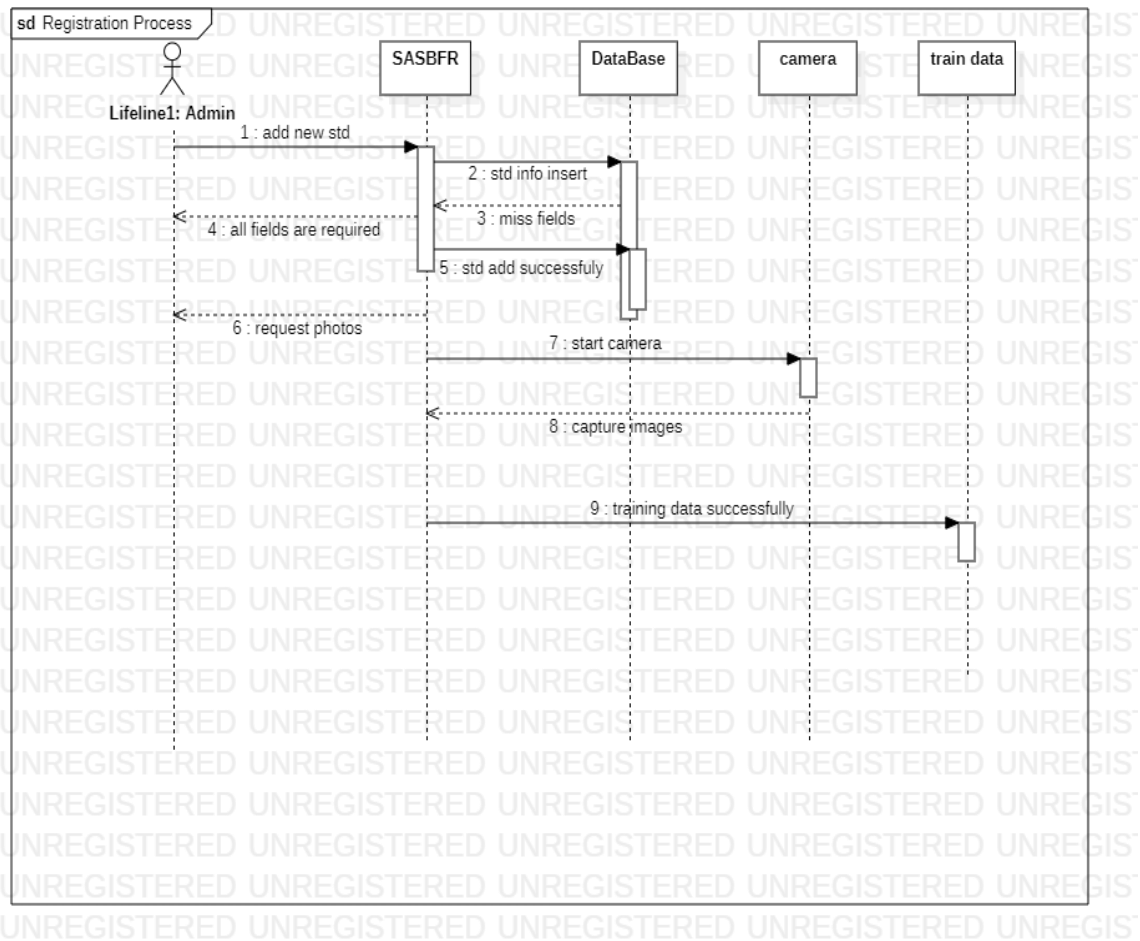Student check-in process sequence diagram

Figure. 14 sequence diagram: register a student

To register a student, the administrator/teacher must enter all the information of the student gender: name, student number, department, chosen course, year of registration, etc... . The system checked if the fields are well filled and that there is not also repetition of the winding number and validates otherwise sends a message to warn the administrator of an error when filling in the fields. After having recorded the information in the database, the administrator puts the student whose information has just been recorded in the system in front of a camera where 150 photos will be taken in a few seconds depending on the brightness of the place where the camera is positioned, after taking the photo the administrator returns to the training page and causes the system to recognize his photos and in return receive a message of success and the same process will be done for all the other students.

CHAPTER V

SASBFR SYSTEM DESIGN

5. Introduction

The previous chapter detailed the work done with regard to the recognition and learning of the design tools, being done we will proceed by the design of the separate elements.

5.1 Technologies, Platform and Tools used

For the realization of this application we used a number of professional application design tools. This in order to achieve an application that meets the standard.

5.2.1 Technologies

For the realization of this project we used a large number of technologies and not the least. Because the reliability of an application is also often evaluated according to the technologies used. We are going to quote some of them.

Python 3.11: python is a popular high-level programming language used for a wide variety of applications. In this project we used python as programing language. The python language was first conceived in the 1980s and its implementation began in December 1989 by Guido Van Rossum in the Netherlands as a successor to ABC able to handle exceptions and interface with the Amoeba operating system (contributors, History of Python, 2023). Python has already known several versions version 2 was released in October 2000 and in 2009 version 3 was released with more functionality and currently we are at version 3.11 of python, it is simply the most used programming language in big companies in the world.

Opencv 4.7: OpenCV is a library of programming functions primarily for real-time computer vision. Originally developed by Intel.

Dlib: Dlib is a general-purpose, cross-platform software library written in the C++ programming language.

Face recognition: the facial recognition system is an intelligent technique for identifying the face of a person taken by a photo or a video, it is used to recognize an individual whose photos have already been registered in the database. Such a system is typically used to authenticate users through identity verification services and works by

identifying and measuring facial features from a given image. (contributors, Facial recognition system).

LBPH: facial recognition algorithm based on the binary local model which allows to locate a face and to give a good result.

Numpy : library for working with arrays

Haarcascade: haar's haarcascade is an algorithm for detecting faces in an image or in a video in real time, it was proposed by Paul Viola and Michael Jones in their articles "Rapid object detection using a boosted cascade of simple features" released in 2011.

Tkinter GUI: for user interface

PIL: as the acronym indicates: "python image library" is an open source library built for python it helps to manipulate, save and open images from several formats.

Pyttsx3: is a python library that converts text to speech on output

MySQL: phpmyadmin for database design

5.2.2 Platform

Windows, **Linux**, **MacOs** which are operating systems helping the proper functioning of computer programs or software products.

5.2.3 Tools

The tools here representing the different editors or code compilers used for our project

Visual studio code: professional code editor built by Microsoft

Pycham anaconda: integrated development environment used in python

5.3 Specification of software requirements

These are the different tasks that must be carried out by the actors of the system. We have two types of users for the system

1 Administrator/teacher

2 students

The following functions can be performed by the administrator:

- Login to the system
- Create a new users
- register a new student
- Add 150 student photos to training database
- Update a student
- Delete a student
- Search for a student by name, department, nationality, gender, etc.
- Mark students attendance
- View a report of all students
- change his password if he forgets it
- Consult the photo database
- Solicit developer help

The following function can be performed by the student

• Mark his presence at the entrance and exit of the class

5.4 Design

The design of the application goes through a number of elements while respecting the software life cycle which is all the stages of software development from the beginning to the end of life through its maintenance.

For the design of the different diagrams we used the StarUml software, According to Wikipedia, StarUML is a software engineering tool for system modeling using the Unified Modeling Language, as well as Systems Modeling Language, and classical modeling notations. It is published by MKLabs and is available on Windows, Linux and MacOS.

Figure. 15 Uml software

5.4.1 Class diagram

The class diagram is a type of static diagram of UML which presents the classes and the interface of the system as well as their different relations. In our SASBFR case we have three classes that communicate with each other.
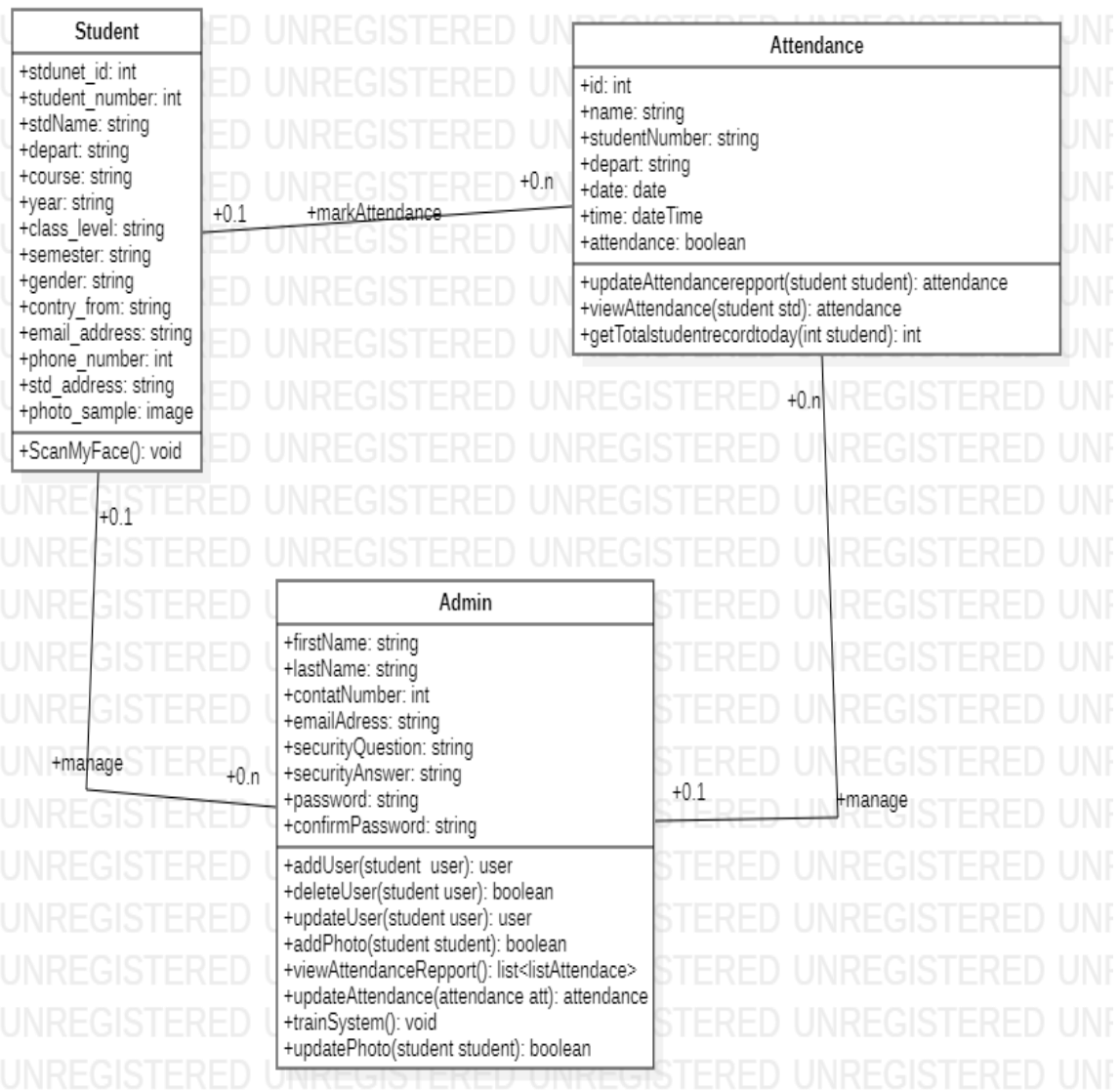
Figure. 16 class diagram SASBFR

To access the SASBFR you must be an administrator and access the system by your username and password,

5.4.2 Use case for login system

This use case shows the actions that are taken by system users to gain access to the system. This concerns the security of the system case all people will not have the right to access the system.
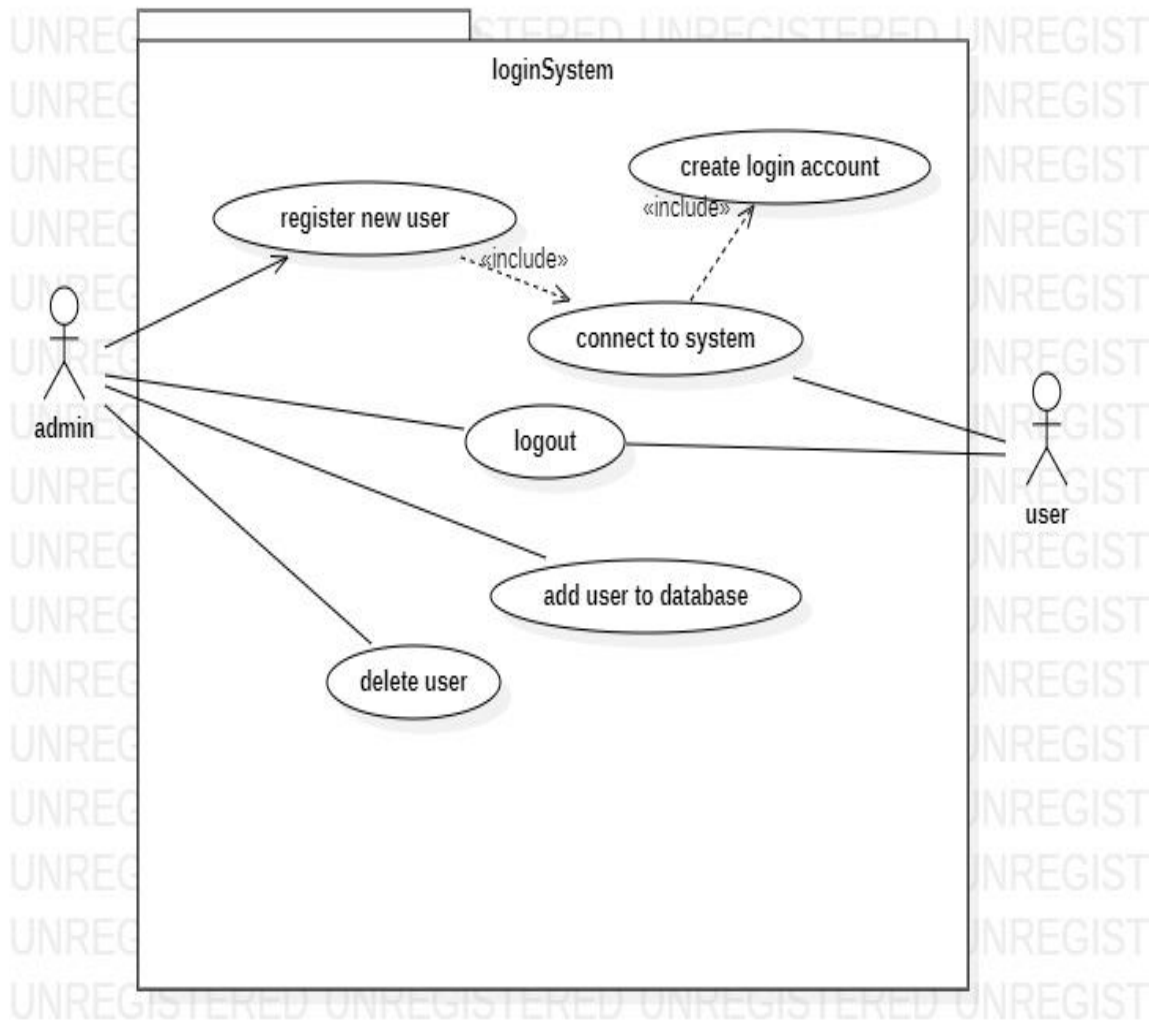
Figure. 17 User case for login system

5.4.3 Connection sequence diagram

According to Wikipedia, the sequence diagram makes it possible to show the interactions of objects within the framework of a scenario of a diagram of the cases of use. For the sake of simplification, the main actor is represented on the left of the diagram, and the possible secondary actors on the right of the system. The goal is to describe how the interactions between actors or objects take place. The vertical dimension of the diagram represents time, making it possible to visualize the sequence… (Wikipedia, 2021).

To be able to add other users, the main user must first create an account and then he will have the privilege of managing the system.
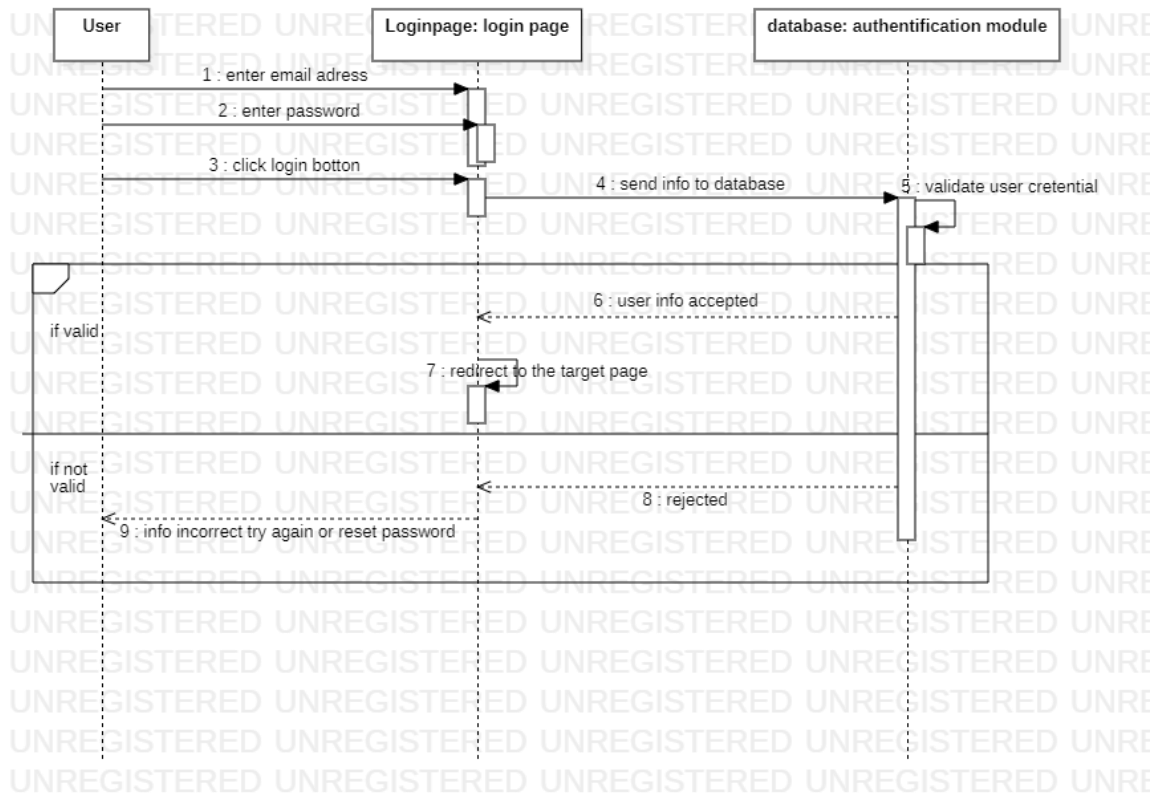
Figure. 18 Login Process Sequence Diagram

5.4.4 Mark attendance

The presence is taken by the appearance of the student's face in front of the camera which is triggered and now the facial recognition system will analyze the face received by the camera and go to its stock of 'images to watch thanks to the lbp's algorithm searches for the image that matches the input image. If the algorithm finds the image corresponding to the student, the student information should appear and the system will automatically update the attendance sheet. The sequence diagram below describes the different steps.

5.4.5 Sequence diagram of marking attendance

This diagram shows the different actions that must be carried out to mark the presence of the student through his registration in the database and the training of his photos by the algorithm.
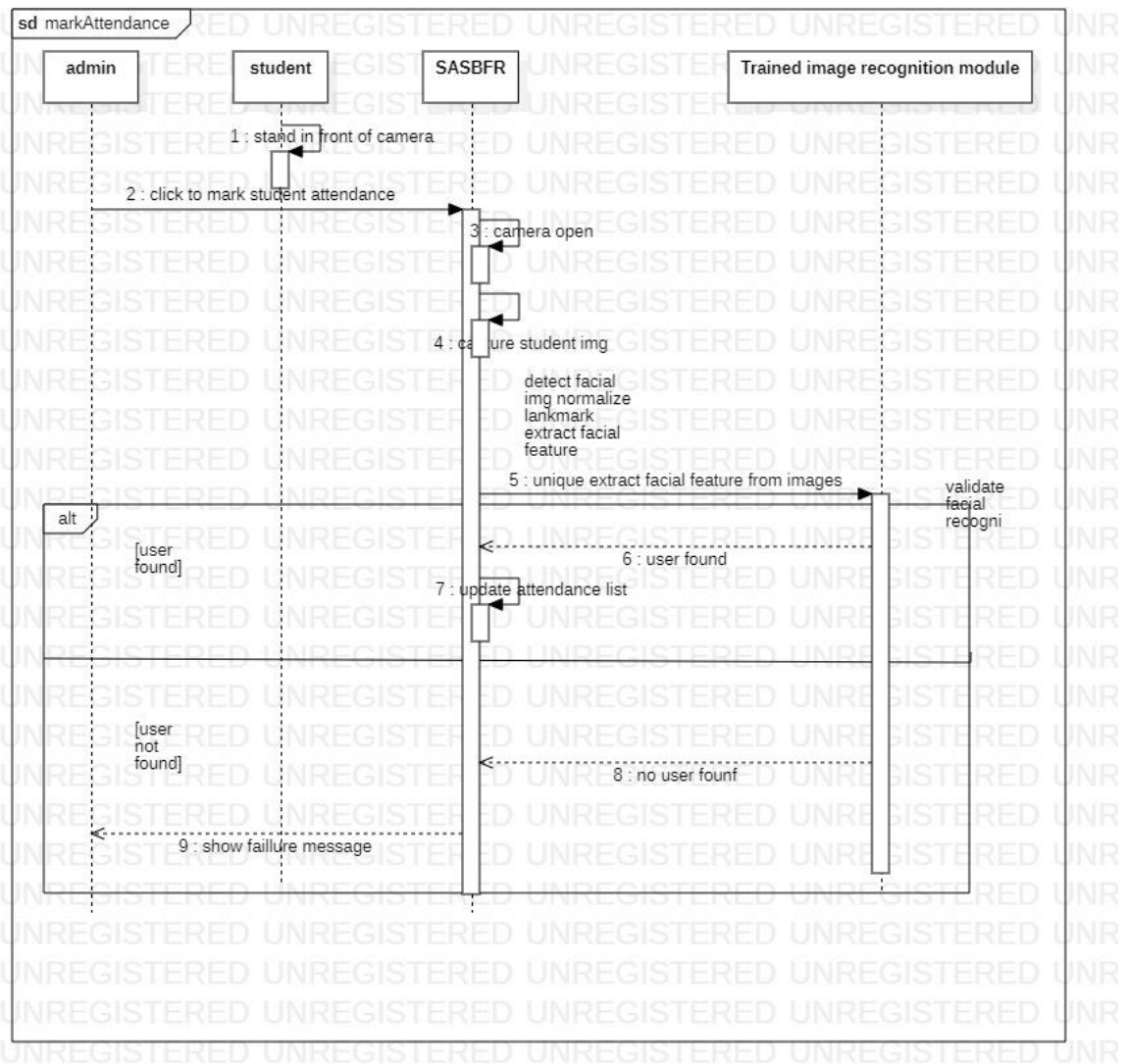
Figure. 19 Mark attendance

5.4.6 Activity diagram

IBM documentation help defines the activity diagram as one that provides a view of the behavior of a system by describing the sequence of actions of a process (corporation, 2021).

5.4.7 Admin activity diagram

Here is the description of the different action sequences that the administrator must carry out on the system to mark the presence of a student.
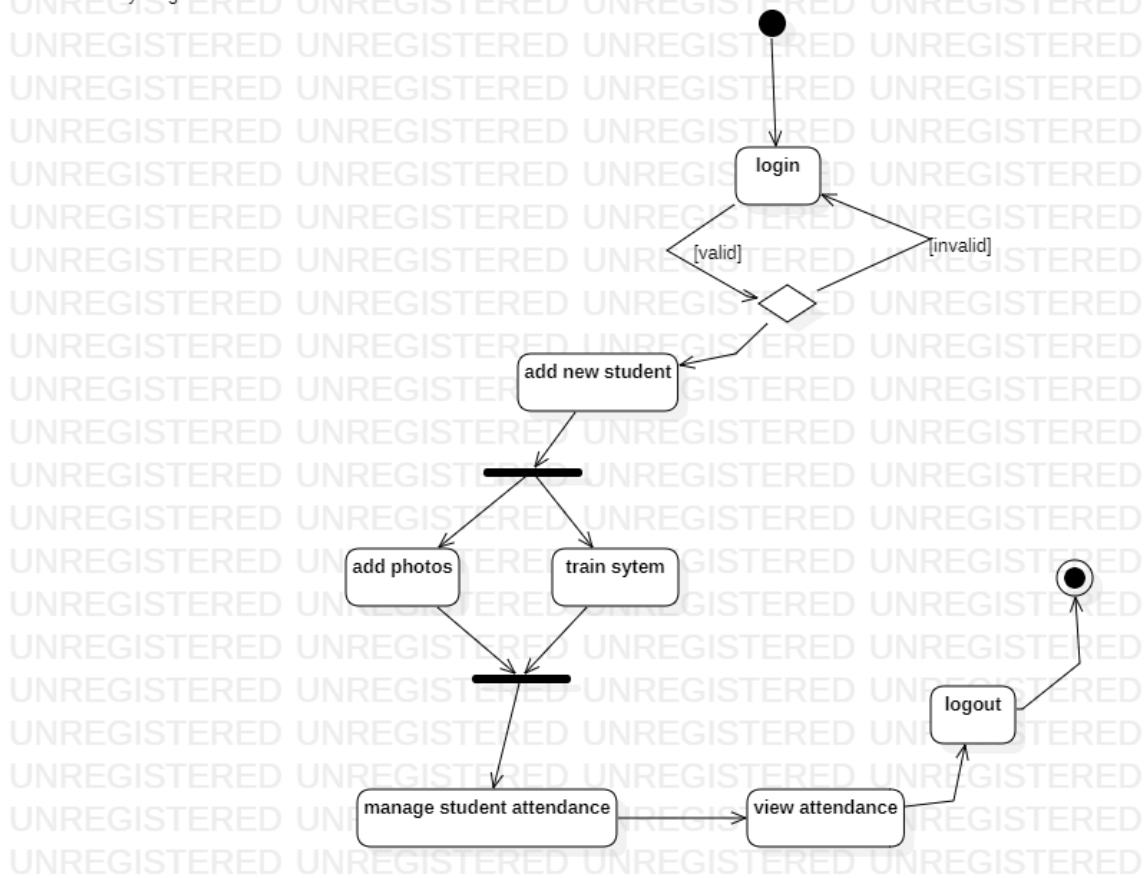
Figure. 20 Admin activity diagram

5.4.8 Attendance tracking system activity diagram

The activity diagram below describes the different action sequences that occur during the attendance of a student.
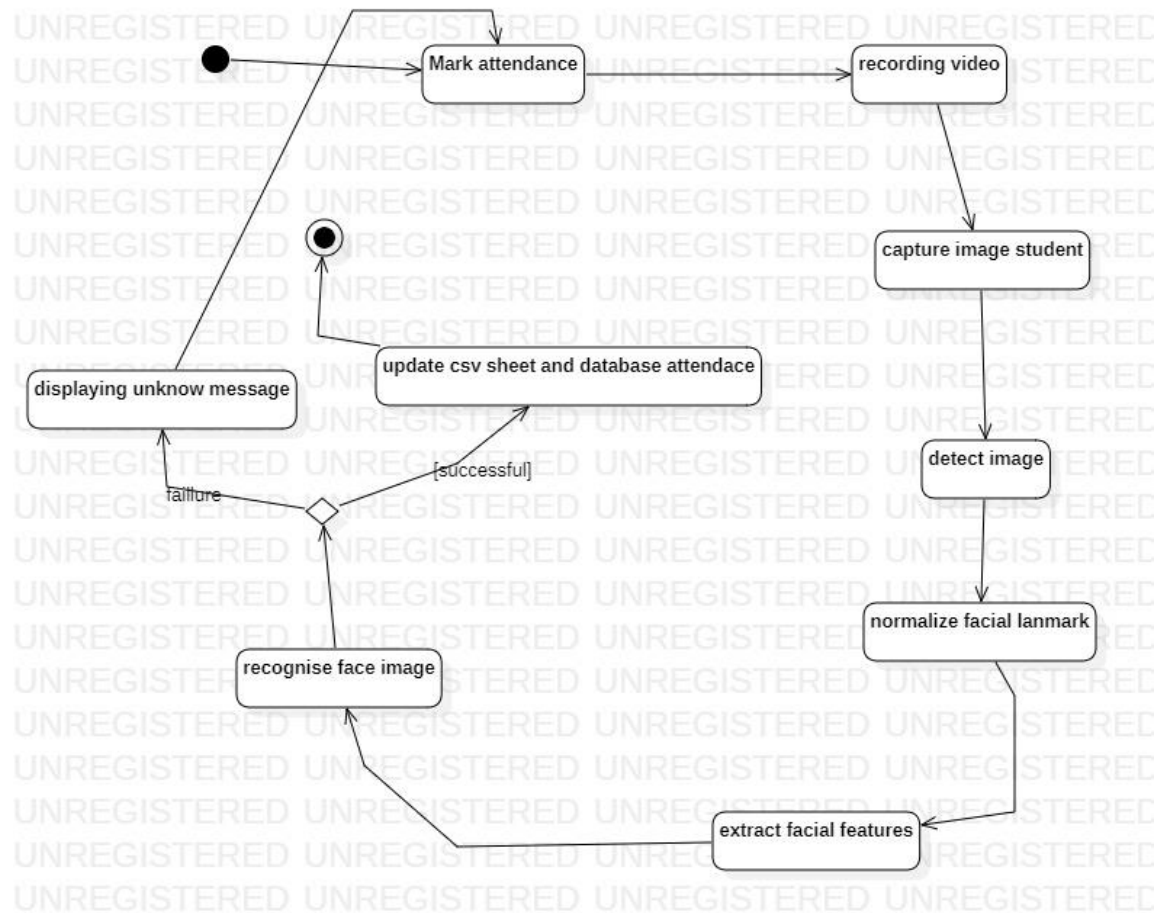
Figure. 21 Attendance tracking activity diagram

5.5 Data Dictionary

According to Wikipedia: "A data dictionary is a collection of metadata or reference data needed to design a relational database. It is of particular strategic importance because it is the common vocabulary of the organization. It describes such important data as customers" (Wikipédia, 2023).

User login

Table. 4 login Data dictionary

N°	FieldName	Data type	required	unique	PK/FK	Ref.Table
1	userFname	string	true	false	-	-
2	userLname	string	true	false	-	-

3	usercontact	string	true	false	-	-
4	useremail	string	true	true	PK	-
5	usersecurityQuestion	string	true	false	-	-
6	usersecurityAnswer	string	true	false	-	-

User Attendance

Table. 5 Data dictionary Attendace

N°	Fieldname	Data type	required	unique	PK/FK	Ref.Table
1	attId	int	true	true	PK	-
2	attstdnumber	string	false	false	-	-
3	name	string	false	false	-	-
4	depart	string	false	false	-	-
5	time	time	false	false	-	-
6	date	date	false	false	-	-
7	Attendance-status	string	false	false	-	

Student
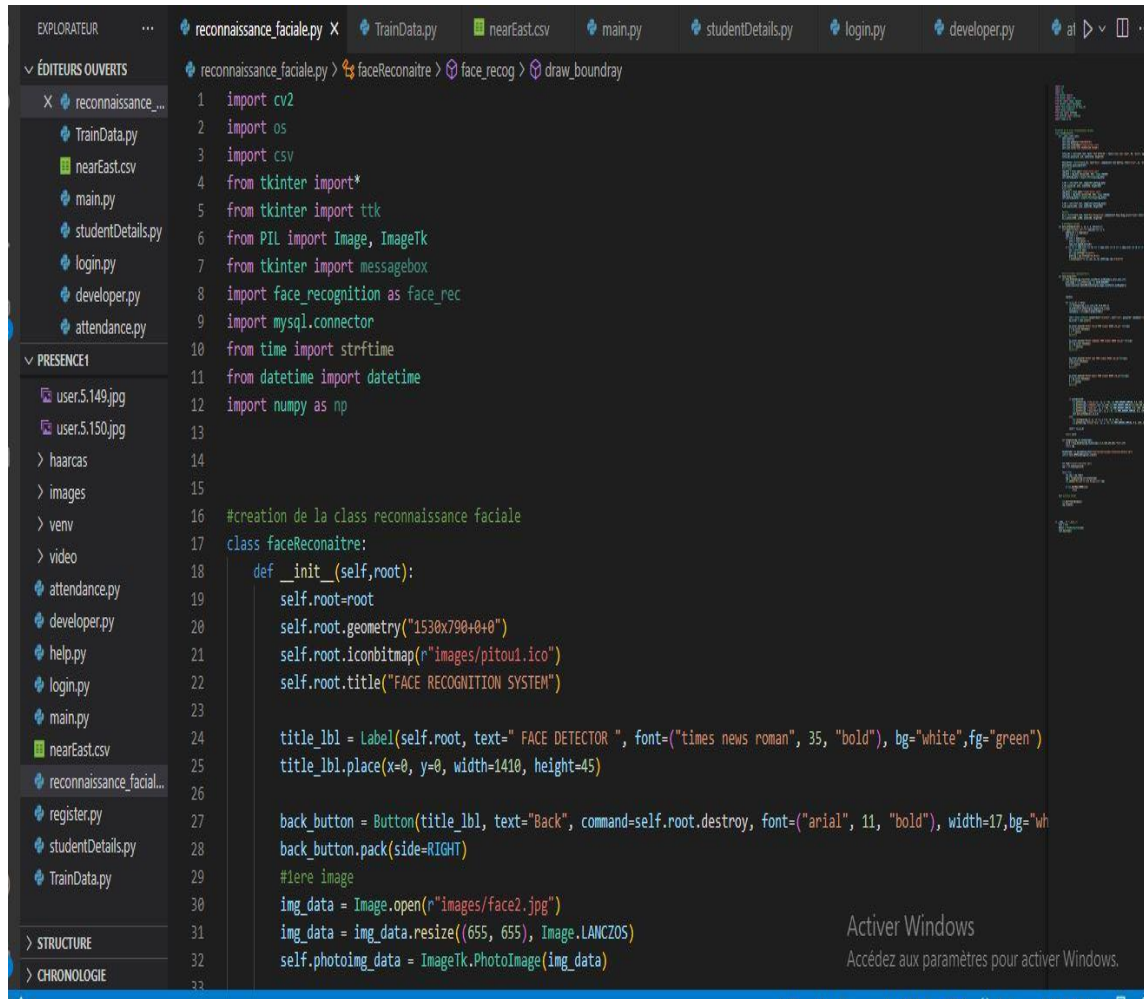
Table. 6 Student Data Dictionary

N°	Fieldname	Data type	required	unique	PK/FK	Ref .Table
1	depart	string	true	false	-	-
2	course	string	True	False	-	-
3	year	string	True	False	-	-
4	Std_id	string	True	True	pK	-
5	Stdnumber	string	True	False	-	-
6	Name	string	True	False	-	-
7	Level	string	true	false	-	-
8	Gender	String	True	False	-	-
9	Country	String	True	False	-	-
10	Email	String	True	False	-	-
11	Phone	String	True	False	-	-
12	Std_address	String	True	False	-	-
13	Photo sample	string	true	false	-	

Our data dictionary describes the tables with the attributes and their different types as well as the priorities that some have of others.

5.6 Implementation

As the life cycle of software wants it, after its design, it was necessary to move on to its implementation, which is the coding aspect. here is where programming tools like python , Tkinter, dlib, opencv, Numpy, Cmake, Hog, haarcascade, Sql, and all the rest have help.. . Our model was based on an agile model.

Figure. 22 face recognition coding1

Figure. 23 face recognition coding

Some line of face recognition code.

Figure. 24 training dataset coding

Some line of training data code
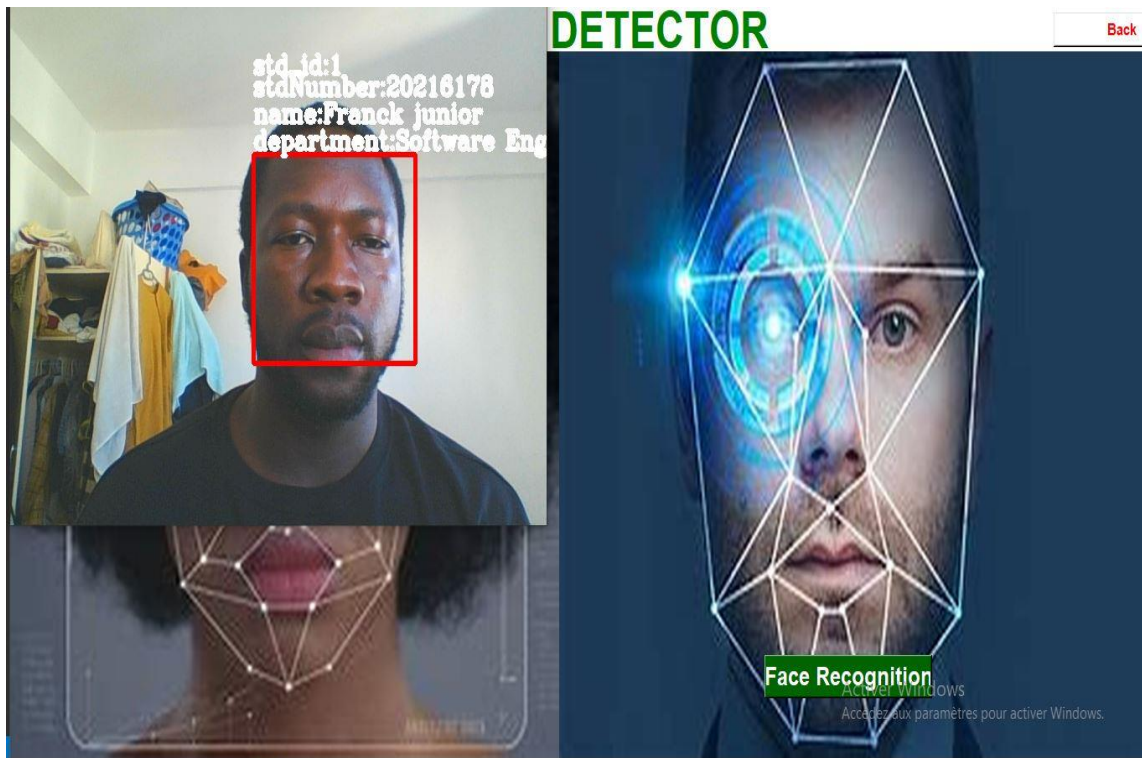
Figure. 25 face recognition with student information

After the detection of faces by the system, a csv file attendance sheet is updated with information such as the student's registration number, student number, name, department, time and date of taking attendance and then his status of attendance in class.

Figure. 26 Facial recognition another student

Figure. 27 photo detection and csv file attendance

The csv file can be modified according to the needs of the teacher and exported for his personal purposes. The figure 23 shows how it walks.

Figure. 28 attendance sheet

CHAPTER VI

DISCUSSION

6. Introduction

This section shows the discussion of the results carried out in this study compared to the past study. The theme that has been the subject of our research is that of the design of a facial recognition system in order to help to establish presence in classrooms.

6.1 Performance of LBPH algorithms for facial recognition

At the end of this study, we have the firm assurance of noting with great pleasure that the LBPH algorithms of artificial intelligence combined with those of the SVM make the machine almost on the same footing as the human. The precision of its algorithms makes it possible to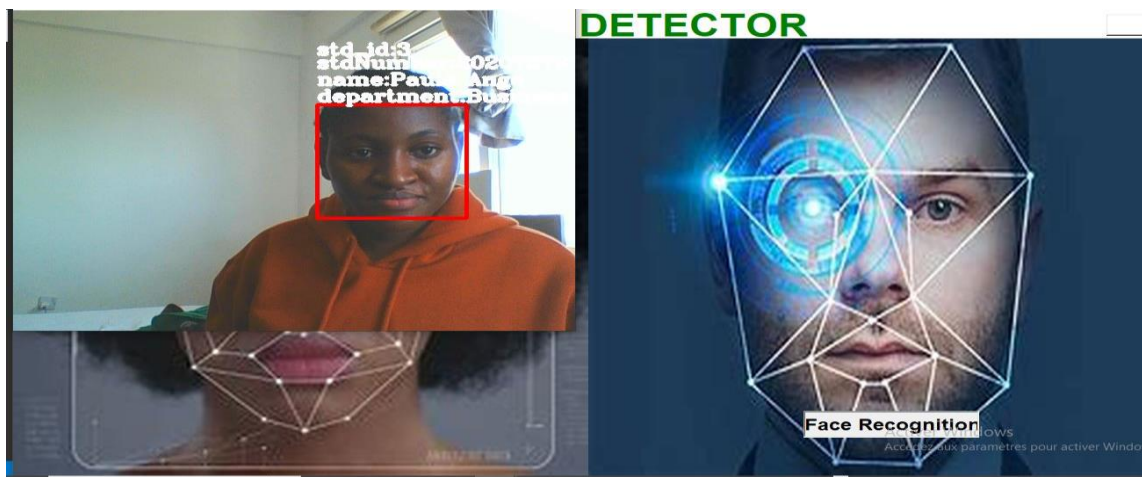 take attendance by facial recognition. In addition the combination with the HOG algorithms brings an almost surgical precision to the result. When these three algorithms (LBP, HOG, and SVM) are pooled, the result is very satisfactory. "To solve the illumination problem of the conventional face recognition system using Haarcascade algorithm, LBPH is merged into the system with the HOG linear SVM object detector, in this paper" (Hwang, 2019).

Other large, globally recognized structures have already used facial recognition to create applications for their structures, such as Apple with its Face ID technology. « Face ID is a facial recognition system designed and developed by Apple Inc. for the iPhone and iPad Pro. The system allows biometric authentication for unlocking a device, making payments, accessing sensitive data, providing detailed facial expression tracking for Animoji, as well as six degrees of freedom (6DOF) head-tracking, eye-tracking, and other features. Initially released in November 2017 with the iPhone X, it has since been updated and introduced to several new iPhone models, and all iPad Pro models» (contributors, Face ID, 2023). The current version of this system is at its version 1 and the results of this version are already satisfactory.

6.2 Haarcascade classifier for facial recognition

Face recognition is everywhere around us, in front of banks, shopping malls, airports, smartphones and many others. But how did we use haarcascade to classify our faces for

our SASBFR system? In his article instituted "rapid object detection using a boosted cascade of simple features" in 2001, Paul Viola and Michael Jones explain the operation of the haar algorithm thus, the haar algorithm works on 4 stages:

- Calculation of haar characteristics
- Creation of integral images
- Using Adaboost
- Cascading Classifier implementation

For Viola and Jones the idea is to use a sort of filter which they apply to the images and thanks to haar cascade this will allow the characteristics of the image to be extracted. This technique is almost identical to that of convolutional neural networks (CNN), its filters being called feature haar. The image below describes what haar cascade looks like.
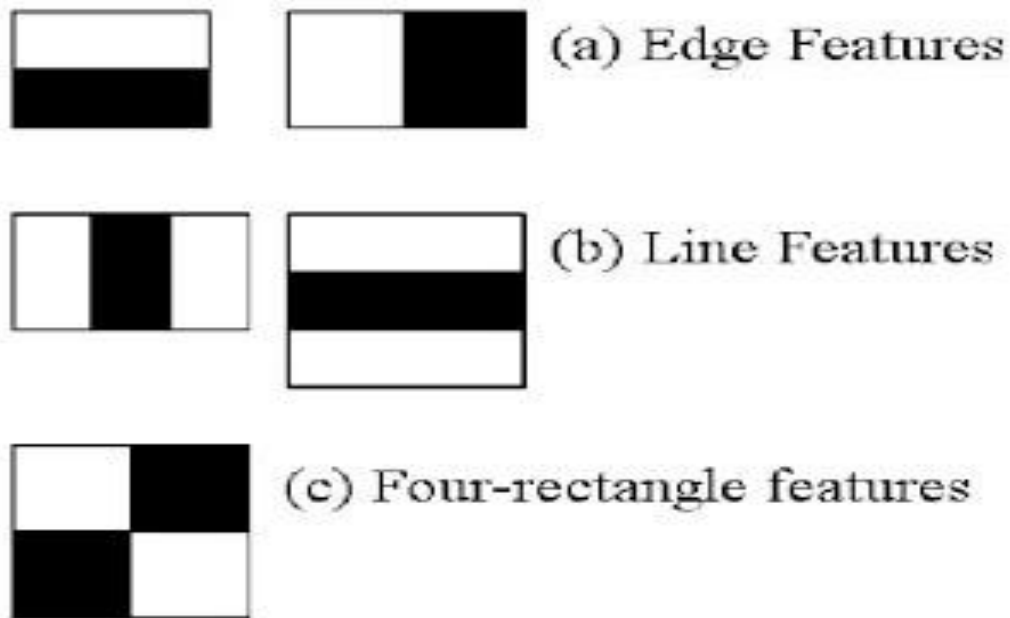
Figure. 29 Haar features

Figure.30 Cascade haar applied to the face

Valentino Alto in his article explains how haar cascade works as follows:

"The idea is to pass these filters over the image, inspecting one part (or window) at a time. Then, for each window, all pixel intensities, respectively, of white and black parts are summed. Finally, the value obtained by subtracting these two sums is the value of the extracted feature. Ideally, a high value of a feature means it is relevant. Namely, if we consider the Edge characteristic (a)" (Alto, 2019).

6.3 Accuracy of facial system recognition for attendance

the present study gives us satisfaction because the accuracy of the result is just brilliant we have a result of 97% for facial recognition with regard to the sample of 6 people on which we have done our test, the algorithm at each times recognized the face and marked the exact information of the person. The observation that we made during our research is that when the system receives more data (images) the result becomes more precise than when it has little. Therefore the facial recognition technology brings more accurate results when it captures more images. during our research and design work we started by giving our training algorithm 100 images of each student, after having introduced 2 students so for a total of 200 images in our dataset, the result was good but there were some small flaws, we decided to give our training model 150 images for each student and with a total of 5 people so 750 images we saw an exponential improvement the result was very better so we can draw a conclusion that when the amount of data (images) is large, the algorithm gives more accurate results.

The result of our research shows that facial recognition tasks will be more important not only for universities but also for organizations in the future. It emerges from this research that machines are static brains that work exactly like the human brain. due to its convolutional neural networks, (Saad Albawi, 2017) the machine

receives information in our case from process images due to the LBPH algorithm which uses Euclidean calculation and focuses on the nearest neighbor to recognize a face in real time from hundreds photos of different people and uniquely identify that person. the SASBFR facial recognition system is designed with professional technologies here we are talking about python which is the 100% programming software and the Tkinter GUI (graphical user interface) used for this work, the version is the most recent, therefore 3.11. We used opencv 4.7.0.7 which is a library for programming real-time functions by computer vision in general; we have built an intelligent system for taking attendance by facial recognition. This system includes three main features, namely
• the registration of students in the database via its very well designed user interface. But before the user does this work, it is recommended to proceed by identification (in order to secure the system) (G. S. IIgi, 2022) then it is a question of entering a username and password previously registered in the system
• Taking 150 photos for each student
• Its training in the recognition of pupils by the recognition of their faces.

CHAPTER VII

CONCLUSION

7. Conclusion and Recommendations

The purpose of this research was to create an application for taking attendance by facial recognition to record and mark the presence of students when entering and leaving class. Python served as our programming language, LBPH was our training algorithm and we also used the Haar cascade classifier to extract features from images. The app. for its evaluation and functionality, we have defined a series of 150 photos that must be taken during the student registration. After that we proceeded by training the images using the classification algorithm.

This step is carried out for all new students and now for facial recognition the LBHP algorithm allows itself to do the Euclidean calculation with finding the vectors on the closest faces and returning the face at more than 93% prediction in time real with the information of the student present in front of the camera. We tested this application in a family of 6 and it works well. This application could be improved in order to also send messages to the parents of each student in order to indicate the time of arrival and time of leaving the class etc... Facial recognition algorithms encounter problems. the aging of people can impact on facial recognition, plastic surgery also completely modify the characteristics of a person, the luminosity also impacted on the taking of facial recognition as well as other factors such as the make up on the face the wearing of mask. another problem faced by facial recognition and artificial intelligence is the privacy of people, many people around the world do not agree with this technology because for them it affects the privacy of people it is the case of china which has installed surveillance cameras in all cities in order to detect and recognize all inhabitants and their different movements. China offers some examples in this area. Several governments tend to follow their citizens with this technology; this is the case in china, in certain states of the United States of America, such as in the state of Virginia and Philadelphia. This is what leads some citizens of the world to think that when they walk it is as if they have followed them. Many people around the world think this is a real threat to people's freedoms and privacy.

7.1 Recommendations

the recommendations of the study is the set of possibilities that can bring an improvement to the future system by having other new functionalities such as the

sending of sms or email to the parents of students in order to give them the presence of their children in class and therefore will help them to better follow their children as well.

For the next researchers they will be able to work on the aspect of separating the attendance sheets by department and ensuring that each course has a unique sheet.

Future studies could lead to a probable very special guide for not only teachers but also parents; this tool could also help in behavior control by perhaps integrating visual behavior detection algorithms.

7.2 Recommendations According to Findings

The future system will also be able to readjust to do other tasks such as calculating the number of absenteeism and issuing a report after each end of the month. This will also give a guide for the student for his own conduct and also for the parents in order to review the way they manage their children. The attendance system implemented so far has some shortcomings that must be resolved in the near future. In the future it would be a question for us to consider a technique to circumvent the students who would like to use the images of the other absent students to mark their presence. Here we are talking about image spoofing.

7.3 Recommendations for Further Research

Future research will be able to exploit the agile method with its different approaches in order to find several elements that are in line with the goal of the present study and find more enormous issues in a perspective of improving the taking of presence by facial recognition. Many other algorithms as sophisticated as those of: LBPH, SVM, HOG, such as convolutional neural networks which are also very popular for this kind of work. But the last aspect that future researchers should manage is the spoofing of images in order to avoid fraud.

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APPENDIX A

Code snippet

Mark attendance

```python
def mark_attendance(self, i, sn, n, d, entry=None):
        with open("nearEast.csv","r+",newline="\n") as f:
            myDataList = f.readlines()
            name_list = []
            for line in myDataList:
                entry = line.split(".")
                name_list.append(entry[0])
            if ((i not in name_list) and (sn not in name_list) and (n not
in name_list) and (d not in name_list)):
                now = datetime.now()
                d1 = now.strftime("%d/%m/%Y")
                dtString = now.strftime("%H:%M:%S")
                f.writelines([f"\n
{i},{sn},{n},{d},{dtString},{d1},Present"])
```

Face recognition

```python
def face_recog(self):
        def
draw_boundray(img,classifier,scaleFactor,minNeighbors,color,text,clf):
            gray_image = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
            faces=classifier.detectMultiScale(gray_image,scaleFactor,minNe
ighbors)



            coord=[]

            for (x,y,w,h) in faces:
                cv2.rectangle(img,(x,y),(x+w,y+h),(0,0,255),3)
                id,predict=clf.predict(gray_image[y:y+h,x:x+w])
                confidence = int((100*(1-predict/300)))

                conn = mysql.connector.connect(host="localhost",
user="root", password="",database="reconnaissance_faciale")
                my_cursor = conn.cursor()
```

```python
                my_cursor.execute("SELECT std_id FROM student WHERE
std_id=" +str(id))
                i = my_cursor.fetchone()
                i = "".join(i)
                #print(i)

                my_cursor.execute("SELECT stdNumber FROM student WHERE
std_id=" +str(id))
                sn = my_cursor.fetchone()
                sn = "".join(sn)
                #print(sn)


                my_cursor.execute("SELECT name FROM student WHERE
std_id="+str(id))
                n=my_cursor.fetchone()
                n ="".join(n)
                #print(n)



                my_cursor.execute("SELECT depart FROM student WHERE
std_id="+str(id))
                d = my_cursor.fetchone()
                d = "".join(d)
                #print(d)




                if confidence>66:
                    cv2.putText(img, f"std_id:{i}", (x, y - 75),
cv2.FONT_HERSHEY_COMPLEX, 0.8, (255, 255, 255), 3)
                    cv2.putText(img,f"stdNumber:{sn}",(x,y-
55),cv2.FONT_HERSHEY_COMPLEX,0.8,(255,255,255),3)
                    cv2.putText(img, f"name:{n}", (x, y - 30),
cv2.FONT_HERSHEY_COMPLEX, 0.8, (255, 255, 255), 3)
                    cv2.putText(img, f"department:{d}", (x, y - 5),
cv2.FONT_HERSHEY_COMPLEX, 0.8, (255, 255, 255), 3)
                    self.mark_attendance(i,sn,n,d)
                else:
                    cv2.rectangle(img,(x, y), (x + w, y + h), (0, 0, 255),
3)
```

```python
                cv2.putText(img,"Unknown Face", (x, y - 5),
cv2.FONT_HERSHEY_COMPLEX, 0.8, (255, 255, 255), 3)

            coord = [x,y,w,h]

        return coord

    def recognize(img,clf,faceCascade):
        coord =
draw_boundray(img,faceCascade,1.3,5,(255,255,255),"Face",clf)
        return img

    faceCascade=
cv2.CascadeClassifier("haarcas/haarcascade_frontalface_default.xml")

    clf=cv2.face.LBPHFaceRecognizer_create()


    clf.read("classer/classifier.xml")
    cap = cv2.VideoCapture(0)

    while True:
        ret,img = cap.read()
        img = recognize(img,clf,faceCascade)
        cv2.imshow("Welcome to face Recognition",img)

        if cv2.waitKey(1000)==13:
                break
```