**Resume builder**

A report submitted for the course named Project - I (CS)

By

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**Abstract**

The project has created a working Automated Facial Recognition System for IIIT Manipur and its students. With the use of Open CV library through programming language, Microsoft Visual Studio, OpenCV consists of Voila and Jones machine learning algorithms for face detection and extraction. The system is programmed fully with Microsoft Visual Studio 2022.

The motivation behind this project was to help Students, to make it easier for them to record their attendance by not having to be dependent with Card systems, as Student cards are often lost and paid to replace. This means they cannot prove their identity and record attendance instantly. The card-system is also at fault often with inaccurate attendance recordings, as it can be tricked or fooled, when individuals are able to record attendance for others. In the event when card system is offline, paper-based system have to be used in this event. This makes more time consuming for students and makes it

harder for them to focus on the lecture/lab sessions.

The project’s main objective was to find out if the Facial recognition system is effective at recording attendance of students than Card-based system/paper based system that is currently in place. By implementing the Automated Facial Recognition Attendance System with the students, it would be more effective at recording attendance, as most factor being that it saves, the students, valuable time and makes it easier for them to record their attendance.

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**Declaration**

In this submission, I have expressed my idea in my own words, and I have adequately cited and referenced any ideas or words that were taken from another source. I also declare that I adhere to all principles of academic honesty and integrity and that I have not misrepresented or falsified any ideas, data, facts, or sources in this submission. If any violation of the above is made, I understand that the institute may take disciplinary action. Such a violation may also engender disciplinary action from the sources which are not properly cited or permission not taken when needed.

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This is to certify that the report entitled resume builder submitted by KONADA Gopalakrishna, has been carried out under my supervision and that this work has not been submitted elsewhere for a degree, diploma or a course.

Signature of Supervisor

(Dr N. Kishorjit Singh)

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**Acknowledgment**

I would like to express my sincere gratitude to several individuals for supporting me throughout my Project. First, I wish to express my sincere gratitude to my supervisor, Dr N. Kishorjit Singh, for his enthusiasm, patience, insightful comments, helpful information, practical advice and unceasing ideas that have helped me tremendously at all times in my project and writing of this thesis. His immense knowledge, profound experience and professional expertise has enabled me to complete this project successfully. Without his support and guidance, this project would not have been possible. I could not have imagined having a better supervisor in my study.

-konada Gopalakrishna

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| **1 Introduction** |

**Software Requirements Specifications**

**1.0 Introduction**

Resume is the first meeting between you and a prospective employer more often now than ever. So, how do you want to be remembered? Wrinkled and unorganized. Neat and structured. Long and boring. Precise and interesting. Companies do not have the time to interview every applicant that is interested in the job. If they did, there would not be a company to work for. They use an eliminating process. That's right - resumes.

When a job seeker wants to apply for a job online then generally, he*/*she needs to attach his*/*her resume with the email.

Online Resume Building System provides the users the popular resume formats & a better way to show their resumes to the employers. A job seeker does not need to attach a resume with every email, he*/*she just have to include the URL of his*/*her resume and the employer can view the resume online by clicking on the link and can download as well.

**1.1 Purpose**

Purpose of Online Resume Builder is to provide a way to the customers to design their resumes according to their requirements.

a) Creating resumes online. b) Customizing the look and details. c) Keeping track of the customers and their resumes.

**1.2 Scope**

Online Resume Builder can be used in accordance with the requirements of the customers. Customers can customize their resumes with their choice of themes & details. The services are hard to be defeated by the competitors as the system is providing the customers exactly what they want.

## 1.3 Overview

**Project is related to Online Resume Building :**

* This project maintains 3 types of users.
  + Administrator User
  + Users(Customers)
  + Viewers
* Facilities provided by this projects are as follows
  + Details of customers are recorded.
  + Update of data is easy.
  + Flow of information is fast and easy.
  + Customers can login to their accounts and view & update their data.
  + Notifications about resume vie*ws* & downloads.

**1.4 Goals of Proposed System**

1) **Planned approach towards working**: - The working of

the system will be well planned and organized. The data will be stored properly in data stores, which will help in retrieval of information as well as its storage.

**2) Accurac*y***: - The level of accuracy in the proposed system

will be higher. All operation would be done correctly and it ensures that whatever information is coming from the system is accurate.

**3) Reliability:** - The reliability of the proposed system will be

high due to the above stated reasons. The reason for the increased

reliabilit

**4) No redundancy:** - In the proposed system utmost care

would be that no information is repeated anywhere, in storage or otherwise. This would assure economic use of storage space and consistency in the data stored.

**5) Immediate Retrieval of Information:** - The main

objective of proposed system is to provide for a quick and efficient retrieval of information. Any type of information would be available whenever the user requires.

**6) Immediate storage of information:** - In manual system

there are many problems to store & update the large amount of information.

**7) Easy to operate:** - The system should be easy to operate

and should be such that it can be easily understood by a new user.

**1.5 Background**

Online Resume Builder is a system which allows the customers to design their resumes in accordance with their requirements.

System provides facilities like...

• Customizing the resumes according to the user

requirements. Editing the design.

• Choosing from latest professional designers.

• Viewed resume notification for the customers.

Various operations done in the system are as follows...

• Registering customers :

Access to vie*w*e*rs/*employers is allowed for public/shared

data only.

• Writing resumes.

* Editing in design.

• Keeping track of latest formats of resumes.

* Viewed resume notification.

**1.6 Project Requirements**

**1.7 Technologies Used** This project will be an Internet application to be developed in following tools and technologies.

### a) AJAX (Asynchronous JavaScript and XML) - It is used

to make Internet application smaller, faster and more

User-friendly

### b) CORELDRAW - It is a tool to create graphics for web

Application.

### c) CSS (Cascading Style Sheets) - It is used to create

stylish web pages.

### d)DHTML (Dynamic Hyper Text Markup Language) - It

is used to create dynamic web pages.

### e) DREAMWEAVER - It is a tool to develop web pages.

### 

### f) FLASHMAKER - It is a tool to develop dynamic graphics

for web application.

### g) HTML (Hyper Text Markup Language) - It is used to

describe web pages.

### h) HTML DOM(Hyper Text Markup Language Document Object Model) -

It is used to define a standard way for accessing and manipulating HTML

Documents.

### i) JAVASCRIPT - It is used improve the design, validate forms, detect browsers, create cookies, and much more.

### j) PHOTOSHOP - It is a tool to create graphics for web

Applications.

### k) SQL (Structured Query Language) - It is a standard language for accessing and manipulating databases.

### l) VBSCRIPT (Visual Basic Script) - It is a Microsoft

scripting language. It is used into HTML files to make web

pages more dynamic and interactive.

m) **XML (Extensible Markup Language)** - It is used to

transport and store data over the Internet.

**1.8 User Characteristics** Every user should be:

* Comfortable in working with computer.
* He must have knowledge of resume writing.
* He must also have basic knowledge of English language.

**1.9 Constraints**

* GUI is only in English.
* Login and password are used for identification of user.

**1.10 Definition of Problems** Problems with conventional system are as follows.

* **Lack of immediate retrievals:** -
  + The information is very difficult to retrieve and to find particular information.
  + This results in inconvenience and wastage of time.
* **Lack of immediate information storage**: -
  + The information generated by various transactions takes time

and efforts to be stored at right place.

* **Lack of prompt updating**: -
  + Various changes to information are difficult to make as paper work is involved.
* **Error prone manual calculation:** -
  + Manual calculations are error prone and take a lot of time this

may result in incorrect information.

* **Preparation of accurate and prompt reports: -**
* This becomes a difficult task as information is difficult to collect from various registers.

**2.0 Feasibility Study** Depending on the results of the initial investigation the survey is now expanded to a more detailed feasibility study. **"FEASIBILITY STUDY”** is a test of system proposal according to its workability, impact of the organization, ability to meet needs and effective use of the resources. It focuses on these major questions:

• What are the user's demonstrable needs and how does a

system meet them?

• *W*hat resources are available for given system?

• What are the likely impacts of the system on the

organization?

• Whether it is worth to solve the problem?

During feasibility analysis for this project, following primary areas of interest are to be considered. Investigation and generating ideas about a new system does this.

**Steps in feasibility analysis** Eight steps involved in the feasibility analysis are:

• Form a project team and appoint a project leader.

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• Prepare system flowcharts.

• Enumerate potential proposed system.

• Define and identify characteristics of proposed system.

• Determine and evaluate performance and cost

effectiveness of each proposed system.

• Weight system performance and cost data. . Select the best-proposed system.

• Prepare and report final project directive to management.

**2.1 Technical Feasibility** Technical feasibility is the study of resource availability that may affect the ability to achieve an acceptable system. This evaluation determines whether the technology needed for the proposed system is available or not.

• Can the work for the project be done with current

equipment existing software technology *& a*vailable

personal?

• Can the system be upgraded if developed?

• If new technology is needed then what can be developed?

This is concerned with specifying equipment and software that will successfully satisfy the user requirement. The technical needs of the system may include:

**Front-end and back-end selection** An important issue for the development of a project is the selection of suitable front-end and back-end. When *w*e decided to develop the project we went through an extensive study to determine the most suitable platform that suits the needs of the academy as well as helps in development of the project. The aspects of our study included the following factors.

**Front-end selection:**

• It must have a graphical user interface that assists users

that are not an advanced user of computer.

Scalability and extensibility.

• Flexibility.

• Robustness.

According to the organization requirement and the culture.

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• Must provide excellent reporting features with good

printing support.

• Platform independent.

• Easy to debug and maintain.

• Event driven programming facility.

• Front end must support some popular back end like Ms

Access.

According to the above stated features we selecte**d Web Browser a**s the front-end for developing our project.

**Back-end Selection:**

• Multiple user support.

• Efficient data handling.

• Provide inherent features for security.

• Efficient data retrieval and maintenance.

· Stored procedures.

· Popularity.

• Operating System compatible.

• Easy to install.

• Various drivers must be available.

• Easy to implant with the Front-end.

According to above stated features *w*e selected **MY SQL** as the backend.

The technical feasibility is frequently the most difficult area encountered at this stage. It is essential that the process of analysis and definition be conducted in parallel with an **assessm**ent to technical feasibility. It centers on the existing computer system (hardware, software etc.) and to what extent it can support the proposed system.

**2.2 Economical Feasibility** Economic justification is generally the “Bottom Line" consideration for most systems. Economic justification includes a broad range of concerns that includes cost benefit analysis. In this we weight the cost and the benefits associated with the candidate system and if it suits the basic purpose of the organization i.e. profit making, the project is making to the analysis and design phase.

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The financial and the economic questions during the preliminary investigation are verified to estimate the following:

• The cost to conduct a full system investigation.

• The cost of hardware and software for the class of

application being considered.

• The benefits in the form of reduced cost.

The proposed system will give the minute information, as a result the performance is improved which in turn may be

expected to provide increased profits.

• This feasibility checks whether the system can be

developed with the available funds. **Online Resume Builder** does not require enormous amount of money to be developed. This can be done economically if planned judicially, so it is economically feasible. The cost of project depends upon the number of man-hours required.

**2.3 Operational Feasibility** It is mainly related to human organizations and political aspects. The points to be considered are:

• What changes will be brought with the system?

• What organization structures are disturbed?

• What new skills will be required? Do the existing staff members have these skills? If not, can they be trained in

due course of time?

The system is operationally feasible as it very easy for the End users to operate it.

**2.4 Schedule Feasibility** Time evaluation is the most important consideration in the development of project. The time schedule required for the development of this project is very important since more development time effect machine time, cost and cause delay in the development of other systems. **Online Resume Builder** can be developed in the considerable amount of time.

**1.1 Project Background**

Being a student in IIIT Manipur for 3 and half years, it has been difficult to record attendance. It was mainly paper-based attendance system. Even the card-based system is still very slow at times, where it takes more than 4-5 seconds to record attendance.

It isn’t just myself, with this problem. Many students and friends, have the same problem. The Automated Facial Recognition Attendance System is a system that helps the students record their attendance without a card. It has a Facial Recognition feature which automatically detects and instantly records attendance of the detected students.

Automated Facial Recognition Attendance System allows students, not to worry about student cards, whether it is forgotten at home or lost, they can still come into university and have their attendance recorded in their respective classes. It also helps the university by reducing students sing-in other students, as the Automated Facial Recognition Attendance System is foolproof, because it only records attendance when the right person is in the right place to be signed it.

**1.2 Problem Statement/Motivation**

There are no applications at IIIT Manipur that centralizes this information. For example, when there are, more or less, 100 students in a single classroom, it will take a long time for each one to scan their student cards to record attendance as each one has to queue to touch their respective cards into the card reader. This is hard, as the queue moves very slow if the card-system is slow as well, leading to late class start. This could put mental stress into the students, leading to not being able to concentrate and learn important topics in class. It will be better if there was a system, where all students could come and shit down and they will be singed in automatically. This makes the class flow smoothly as the lecturers/staff can just carry on with the class and do not have to wait for the students to finish recoding their attendance for the class.

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**1.3 Project Aim and Objectives**

The aims of the Automated Facial Recognition Attendance System are helping the students by:

• Record attendance without the use of student cards, through their face • Record Multiple attendance at the same time

The belief is that the Automated Facial Recognition Attendance System would solve the difficulties for students who find it hard to record their attendance on daily basis.

The objectives of the project are:

• Critically review the Literature Review

• Select appropriate software development life cycle methodology • Analyze and determine the requirements for the Automated Facial Recognition Attendance System

• Produce designs for the Automated Facial Recognition Attendance System • Develop and Implement the Automated Facial Recognition Attendance System

• Test and Evaluate the Automated Facial Recognition Attendance System • Determine possible future improvements/suggestions for the Automated Facial Recognition Attendance System

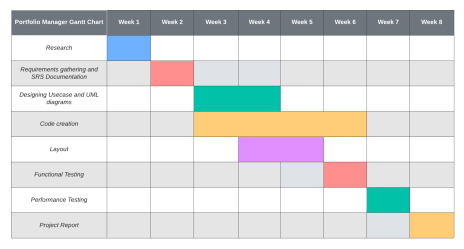
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**1.4 Overview of This Report**

The report structure is shown below:

|  |  |
| --- | --- |
| Section | Details |
| 1. Introduction | Project background, Problem  Statement, Project Aim & Objectives and Report Structure are discussed in this section. |
| 2. Analysis & Requirements | This chapter discusses requirements gathering techniques, functional and non-functional requirements. |
| 3. Design | This chapter contains Interface design and Database design. |

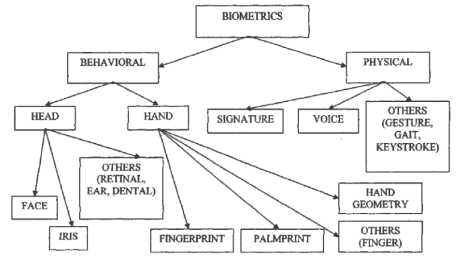
**1.5 Gantt chart**

****ATAS Gantt chart

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| **2 System Analysis** |

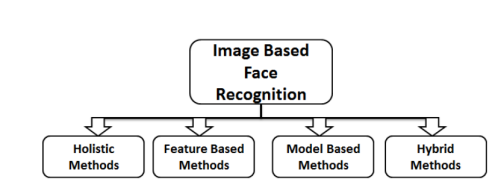
**2.1 Different types of attendance management system**

**Figure 1 - Types of Biometric Techniques**

**2.2 Face Recognition Steps & Techniques**

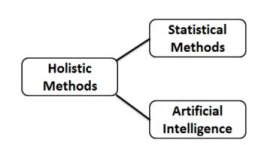
Usually, two steps are included in facial recognition. At first, detection occurs and then compared with the databases for verification. Face as a biometric feature was less reliable due to variations in illumination conditions, poses, and expressions. 3D facial recognition methods resolved the reliability issues like pose change and lighting. With the advancement of technology, different techniques improved the situation and face became a more secure biometric feature as compared to other characteristics e.g., fingerprint etc. Following image explains different facial recognition techniques:

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 **Figure 2 - Types of face recognition systems**

**2.2.1 Holistic Approach**

In this approach, the entire face is considered as a solitary feature for identification and acknowledgement. It analyzes the similarities of the entire face, overlooking individual highlights like eyes, mouth, nose etc. These schemes are portrayed into two sections as appeared in the figure.



**Figure 3 - Types of Holistic methods**

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**2.2.2 Feature Based Technique**

Inverse to the holistic approach, features based approach consider every individual element of the face: eyes, nose, mouth, mole, ears and match the similarities between the pictures. Another approach in face recognition encompasses, recognition with methods for hexagonal feature location. The approach takes a shot at the bases of edge location for face location and recognition utilizing the hexagonal facial. Heuristic parameters center around the nose segment of the collected pictures followed by grey scale changes and change of intensity. Another research work in which the face acknowledgement is finished by the assistance of edge data refined by the assistance of diminished sample size. The shading highlight in case of HSV shading space of the pictures of the facial segment is considered. The skin areas are recognized utilizing the shade and immersion characteristics. Skin highlight of the face is utilized as a part of piece approach, this examination system utilizes the procedures like piece approach and the RGB shading space. Gabor filter is used to extract the features.

**2.2.3 Technique based on Models**

Model-based feature acknowledgement is another approach. The 3D facial model can be procured utilizing both dynamic and inactive means. The extensively utilized active 3D picture procurement technique is infrared information, which ventures laser beam onto an object and records its appearance coming about best and exact 3D model’s recognition. Stereo Imaging is the procedure for the securing of the 3D show, in which at least two cameras at the same time are catching a scene from various points. Clear data is procured utilizing different data from various angles. 3D to 2D confronting acknowledgement that the technique is displayed, utilizing SRC and CCA for acknowledgement, outcome demonstrating a better performance with low computational cost. Another model "Partner Predict" (AP) was presented abolish to posture, light and impression variations. AP technique adequately dealt with the individual variations. A discriminative model was presented to reduce age heterogeneity issues in confront acknowledgement, utilizing scale-invariant feature transform (SIFT) and multi-scale neighborhood binary patterns for restricted descriptors and presented multi-features discriminant analysis (MFDA) algorithm to

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compare down the local descriptors, outcomes were facial acknowledgement development in the influence of ageing (Wong Y., 2011)

**2.3 Procedures**

This section describes the procedures and steps of the system. It consists of following processes.

➢ Obtaining the images

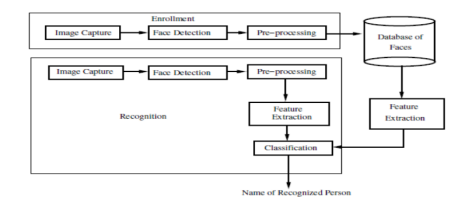
➢ Detection of face

➢ Turbulence removal/pre-processing

➢ Development of the databases

➢ Face recognition and analysis

➢ Attendance

**Figure 4 - System Architecture**

**2.3.1 Obtaining the images**

Images of the students are captured as soon as the students enter the classroom. The preferred size of the image is 640x480, to avoid resizing. Resizing affects the quality of the image and thus the performance of the system may be affected.

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**2.3.2 Detection of Faces**

Performance of the face recognition system is improved using appropriate and effective face detection algorithm. Feature invariant method, methods based on the geometry of faces and machine learning are a few methods used for exposure to faces. Voila and Jones’ method of face recognition has the highest detection rate. It is very efficient and fastest to date. The AdaBoost learning algorithm is mostly used as a classifier. This algorithm has been observed to perform well in different conditions of light.

**2.3.3 Pre-processing**

In this process, the image of the face undergoes Histogram equalization and the size is altered to 100x100. Histogram equalization is most practiced Histogram normalization procedure. This resizing procedure, increases the range of intensities of the images which improves the contrast of the image and thus image becomes clearer.

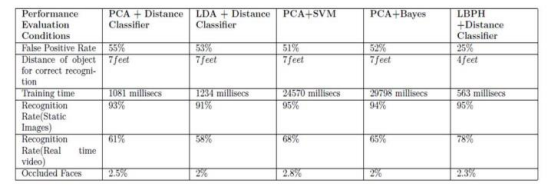
**2.3.4 Database Development**

When choosing a biometric-based system, enlistment of everyone in databases becomes necessary. The images are collected and then the required body feature is extracted, which in this specific case is a face. Preprocessing processes are applied to it and the images are stored in the databases.

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**2.4 Face Recognition & Analysis**

The execution of a Face Recognition system additionally depends upon the character extraction and their grouping to get the exact outcomes. Feature extraction is an accomplished utilizing feature-based strategy or all above-explained systems. In some comprehensive procedures, utilization of dimensionality diminishment is done before characterization. Analyzing the aftereffects of various holistic methodologies utilized for feature extraction.

**Figure 5 Comparison of different holistic algorithms**

Principal Component Analysis (PCA) was the first algorithm that was introduced to represent faces closely. In PCA the face pictures are expressed utilizing eigenfaces and their relating projections along each eigenface. Rather than utilizing all the dimensions of a picture, just important measurements are considered to represent the picture. Scientifically a picture utilizing PCA is expressed as: x= WY + μ in this equation, x represents face vector, W is feature vector, Y represents a vector of eigenfaces and μ symbolizes the average face vector. These projections (feature vectors) are then utilized as classification includes in face acknowledgement. Later Fisherazs Linear Discriminant Analysis (LDA) was proposed, in which the proportion of between-class dissipate, and inside-class scramble amplifies. PCA does not consider the

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discriminative data in the information though LDA stores the discriminative data in the information. LDA does not work effectively in poor conditions of light. Nearby Binary Pattern Histogram (LBPH) is as of late proposed algorithm for face highlight extraction. In this technique, LBP picture is portioned into local areas and the histogram of each is extricated and are connected to create a face descriptor. The precision of a system actualized utilizing PCA and LDA are influenced by the size of the database which isn't the situation in LBP. PCA is utilized for characters extraction and Support Vector Machine (SVM) is utilized for the classification. SVM is as of late proposed algorithm which is a compelling example grouping algorithm. For design acknowledgement SVM finds the ideal partition of nearest focus points in the training set. This partition should be possible straightly or non-linearly.

Face recognition consists of two procedures, extraction followed by classification. The previously mentioned highlight extractors joined with classifiers are thought about in different true situations, for example, lighting conditions, Unintentional facial component changes 16 (blocked faces), Expressions. Framework Performance is likewise assessed in terms of acknowledgement rate, remove, false positive rate, the time taken for preparing. False Positive Rates are ascertained by considering 60 ongoing picture outlines in the above table. It has been watched that LBP based calculation gives slightest false positive rate and great acknowledgement rate as it accurately separates between the obscure and known faces. LDA can make rectify segregation between the pictures just if the separation is given in the database (for instance pictures at various lighting conditions). Separation likewise plays as a basis in this framework show as the picture frames are caught when a man goes into the room and face region is resized. So, the face area captured at around 4feet and 7feet give better outcomes for LBPH and different algorithms separately. For a Training information of 150 pictures preparing time is ascertained.

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**2.5 Algorithms for Face Detection, Extraction and Matching 2.5.1 OpenCV Library**

OpenCV (Open-Source Computer Vision Library) is an open-source computer vision and machine learning software library. The library has more than 2500 optimized algorithms, the library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. (team, 2018) The OpenCV Library includes Viola and Jones, which from literature review, it is knows as one of the best algorithms for face detection and extraction algorithm. It also includes Eigen Object Detector which will be can be used to match the faces stored in the database against the face from camera.

**2.6 Programming Language & Database**

Programming language chosen to implement the algorithms is Python. This is used as an integrated software development environment, used to develop computer programs for Microsoft Windows, as well as web sites, web applications and web services. Reason for this choosing is that the component of Microsoft video Studio includes built-in tools include a forms designer for building GUI applications and Local Database built in. Local DB is created specifically for developers. It is very easy to install and requires no management, yet it offers the same T-SQL language, programming surface and client side providers as the regular SQL Server Express. In effect the developers that target SQL Server no longer have to install and manage a full instance of SQL Server Express on their laptops and other development machine. (Nixon, 2018)

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**2.7 Proposal analysis**

To determine the requirements, the initial project proposal was analyzed. This helped produced a series of Functional and Non-Functional requirements. The requirements were determined using FURPS – Functional, Usability, Reliability, Performance and Security. FURPS is a model for classifying software quality attributes. The requirements were partially implied in the proposal but since both Functional & Non-Functional requirements are necessary for the application to be successful, it was advised to look into it further. After the completion of the system, a questionnaire is handed out to a range of students who participated in creation of the system, to gather their feedback and update the system based on the suggestions. This will also help to know if the system is the right implemented solution to the problem identified.

**2.8 Research**

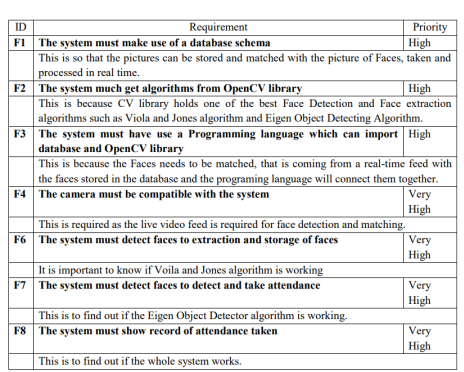
This is an important factor in finding techniques, to get a better understand of the system, research was carried out. The research was done by reading books, journals, articles and websites. This researched helped to know, the steps, techniques and algorithms that could be used to create the artefact.

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**2.9 Requirements Summary**

**2.9.1 Functional Requirements**

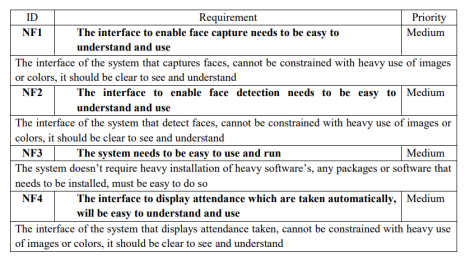
Looking at all the research results, the functional requirements for the were determined. These are the requirements that deal directly with the functionality of the application. The functionality requirements can be seen in Table 1: Functional Requirements.

**Table 1 Functional requirements**

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**2.9.2 Non-Functional Requirements**

The Non-Functional requirements do no directly deal with the functionality of the system. The Non-Functional requirements can be seen in Table 2: Non-Functional Requirements.

**Table 2 Non-Functional Requirements**

**2.10 Ethics**

Since the system deals with sensitive data of Coventry University students, there needs to be ethical considerations that had to be made. The initial ethical concern was that since it is not ethical to capture live pictures of students without their consent, it was decided only a handful of participants would volunteer to participate in creation of the system, to test the system and to review the system.

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**2.11 Conclusion**

Different approaches in automated attendance management systems are researched and explained, based on them, it can be concluded that, manual procedures are annoying and time consuming. The risk of proxy/false attendance is very high with manual procedures. Automated systems are more secure and reliable, the best being Face recognition-based attendance systems proving to be the most efficient system. They are secure, time-saving and dependable to use because Face as a biometric methodology is broadly adequate for the overall population, and face recognition tools can meet the accurateness and demands of accurate and effective attendance system. Cost is also not an issue with this system because installing some specialized hardware for using it is not required, usually a camera and a computer are enough in this methodology. The system takes attendance at the time of entry and exit of students in the classroom, face recognition and detection are continuously carried out in 3D technology during lectures/classroom. Although it needs improvement with regard to different lighting conditions, it is comparatively better than other systems like Bluetooth, NFC, Mobile and RFID which are not fool proof, costly to implement and cannot guarantee an effective and efficient attendance system. Face recognition-based attendance systems on the other hand, uses different algorithms such as, Voila and Jones which is very good at face recognition and SVM and Bayesian which are comparatively better at classifying faces. Face recognition uses different techniques and approaches like Hybrid approach which results have shown that it is the best to use, as it makes use of two different methods. In this modern era, most researches are being carried out in hybrid methodologies which makes used of Face Recognition technology, therefore it is best to use Face Recognition based Attendance Management System for secure, fool-proof, efficient and effective attendance recording. These findings will be useful and closely considered when it is time to make the functional and non-functional requirements for the system.

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| **3 Design** |

**3.1 Introduction**

This chapter focuses on the systematic approaches to be adopted to guide help in the starting to the completion of the project, it will mainly focus on a development life cycle model and its advantages and disadvantages. The chapter aims to conclude with why the methodology was chosen for the duration of the project and the reasons behind choosing it. If the correct methodology is chosen and followed correctly, it should help to ensure the project stays on schedule.

**3.2 Life Cycle**

**3.2.1 Prototype Model**

In Prototype Model, a throw-away prototype is built with potentially few features included to closely understand the requirements. The prototype is not the complete system because many of the features are not built in the prototype, it is simply a prototype of what the final system will look like so that the client/user can get close feel of the system before the final system is even built.



**Figure 6 Prototype Model**

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**Advantages of Prototype Model to the project:**

• Errors can be detected much earlier in the lifecycle since therefore requirements can be changed with the feedback of the client, who are the students and myself in this case, if the error is time consuming to fix, as the project will have to be delivered on time.

• Feedback can be gathered early on in the development lifecycle through prototypes, this means that the feedback received from supervisor and participants students can be applied earlier than later in the lifecycle, saving time and helping to complete the project on schedule. This also means that the final system will satisfy the problem identified, as feedbacks from both supervisors and students will be regularly inputted in very prototype developed.

**Disadvantages of Prototype Model to the project:**

• Prototype have to be regularly developed which means, this could lead to continuous implantation and repairing, which could be time consuming.

• This methodology could increase problems, such as getting attached to prototype built and using that prototype design to the final system rather than changing it according to the feedback received. This means the final system cannot be according to the requirements and the requirements are not met.

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**3.3 Justification of Chosen Lifecycle**

The chosen lifecycle methodology to be followed by the system was Prototype Model. This methodology was chosen because it allows to work on different aspects of the system requirements separately, this allows to get feedbacks on different prototypes very quickly and allows changes to be made, so that the final system matches with the requirements specified. Furthermore, it also helps to see that the project schedule, Gantt chart, is accurate and achievable. The chosen lifecycle has different variations which can be used, chosen is that Evolutionary Prototyping variation is very effective for myself. It is first time making a system which requires different components to be researched and implemented because usually this was done in a group which meant shared workload and made it easier as each member were allocated certain aspects of the system. However, as this time it is an individual work, Evolutionary Prototyping lifecycle helps to create a prototype and keep adding new prototypes on top of the initial prototype and tested along with the components of the first prototype, i.e., Database+FacesCaptured, will have to bear in mind that the first prototype must be robust. This is better than the Waterfall Model as the waterfall model needs have all the requirements stated, along with the design and by the time it is coding stage, it could be late to make changes to the requirements, if a requirement proved to be hard to do or time-consuming, this could lead to delay in project schedule, prolong the delivery of the system and add additional constraints to other aspects of the project, i.e., Write-ups.

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**3.4 Design**

**3.4.1 Main Screen**

This is the first screen the user will see, upon starting the system. Although there was no requirement for how the interface of the ‘Main screen’ should look like. The requirement of other interfaces was to be easy to understand and use. The interface of the system that Home Screen, is not constrained with heavy use of images or colors and it is clear to see and understand.

webcam

**55%**

**Figure 7 Main Screen**

• The webcam will automatically be launched when the system is opened to capture the faces of students.

• Following the capture of the image, the matching process will go through all images in the images folder to find the matching image.

• You will see the percent match between the captured image and the image in the images folder.

• As a result of matching percentage attendance, the corresponding student will be marked as present or absent.

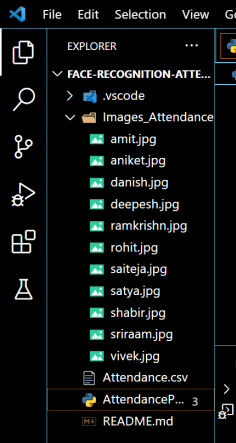
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**3.4.2 Adding Faces**

• In order to match the captured image with all student images, we must create a list of all student images.

• In order to accomplish this, we create an images folder and store the clear face visible photos of all the students in it.

• Every time a face is captured, it is matched against all of the faces stored in this folder.



**Figure 8 Add Student**

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**3.4.3 Real-Time Face Detection & Attendance**

This is the screen, where the faces stored in the images folder gets matched against the real-time video face, coming from the camera. The requirement stated that the interface to enable face detection needs to be easy to understand and use. As seen in the figure 7, The interface of the system that detects face and matches against the images, is not constrained with heavy use of images or colors and it is clear to see and understand.

• Following a match between the face and the image, the system must mark the student's attendance.

• Once the perfect match has been detected, the system retrieves the name of the detected student, along with the date and time of the match.

• Once the system has retrieved all the information, it opens an Excel spreadsheet and writes it there.

**3.5 Development Tools**

The Automated Facial Recognition attendance system is developed during this phase. It includes user interface, programming language Python built in Visual Studio 2022 and the data of the system. See justification in section 3.3 CV library – Algorithms – Voila and Jones algorithms and Eigen Object Detector algorithm. See justification in section 3.3. The chosen approach is Evolutionary Prototyping method as discussed. Therefore, the development includes producing the first robust prototype, if it matches the requirements, other prototypes are added into it.

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| **4 Implementation and Testing** |

**4.1 Introduction**

Face recognizers generally take face images and find the important points such as the corner of the mouth, an eyebrow, eyes, nose, lips, etc. Coordinates of these points are called facial-features points, there are such 66 points. In this way, a dif ferent technique for finding feature points give different results.

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**Steps involved in a face recognition model:**

1. **Face Detection:** Locate faces and draw bounding boxes around faces and keep the coordinates of bounding boxes.

2. **Face Alignments:** Normalize the faces to be consistent with the training da tabase.

3. **Feature Extraction:** Extract features of faces that will be used for training and recognition tasks.

**4. Face Recognition:** Matching of the face against one or more known faces in a prepared database.

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**4.2 Implementation**

**Steps to Build the Face Recognition System Install Libraries:**

We need to install 2 libraries in order to implement face recognition.

**dlib:** Dlib

is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real-world problems.

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| # Installing dlib  pip install dlib |

**face recognition:** The face recognition library, created and maintained by Adam Geit gey, wraps around dlib facial recognition functionality.

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| # Installing face recognition  pip install face recognition |

**OpenCV** for some image pre-processing.

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| # Installing opencv  pip install opencv |

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**Import Libraries**

We have to import the downloaded libraries to build the system

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| import cv2  import numpy as np  import face\_recognition |

**Loading Images**

After importing libraries, we need to load an image.

face\_recognition library loads images in the form of BGR, in order to print the image, we should convert it into RGB using OpenCV.

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| imgelon\_bgr = face\_recognition.load\_image\_file('elon.jpg') imgelon\_rgb = cv2.cvtColor(imgelon\_bgr,cv2.COLOR\_BGR2RGB) cv2.imshow('bgr', imgelon\_bgr)  cv2.imshow('rgb', imgelon\_rgb)  cv2.waitKey(0) |

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As we see RGB looks natural so you will always change the channel to RGB.

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**Find Face Location and Draw Bounding Boxes**

We need to draw a bounding box around the faces in order to show if the human face has been detected or not.

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| imgelon =face\_recognition.load\_image\_file('elon.jpg')  imgelon = cv2.cvtColor(imgelon,cv2.COLOR\_BGR2RGB)  #----------Finding face Location for drawing bounding boxes------- face = face\_recognition.face\_locations(imgelon\_rgb)[0]  copy = imgelon.copy()  #-------------------Drawing the Rectangle-------------------------  cv2.rectangle(copy, (face[3], face[0]),(face[1], face[2]), (255,0,255), 2)  cv2.imshow('copy', copy)  cv2.imshow('elon',imgelon) |

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**Train an Image for Face Recognition**

This library is made in such a way that it automatically finds the face and work on only faces, so we don’t need to crop the face out of pictures.

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**Training:**

At this stage, we convert the train image into some encodings and store the encodings with the given name of the person for that image.

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| train\_elon\_encodings = face\_recognition.face\_encodings(imgelon)[0] |

**Testing:**

For testing, we load an image and convert it into encodings, and now match encodings with the stored encodings during training, this matching is based on finding maximum similarity. When you find the encoding matching to the test image you get the name associated with train encodings.

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| # lets test an image  test = face\_recognition.load\_image\_file('elon\_2.jpg')  test = cv2.cvtColor(test, cv2.COLOR\_BGR2RGB)  test\_encode = face\_recognition.face\_encodings(test)[0]  print(face\_recognition.compare\_faces([train\_encode],test\_encode)) |

**face\_recognition.compare\_faces** returns **True** if the person in both images are the same other it returns **False**.

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**Building a Face Recognition System**

**Import Necessary Libraries**

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| import cv2  import numpy as np  import face\_recognition  import os  from datetime import datetime  from email.mime.text import MIMEText  from email.mime.multipart import MIMEMultipart  import smtplib |

Define a folder path where our training image dataset will be stored

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| path = 'student\_images' |

**Note**: for training, we only need to drop the training images in the path directory and the image name must be person\_name.jpg/jpeg format.

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for example:

As we see in my student\_images path I have 8 persons. Hence our model can recog nize only these 8 persons. We can add more pictures in this directory for more per sons to be recognized.

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• Now create a list to store person\_name and image array.

• Traverse all image file present in path directory, read images, and append the im age array to the image list, and file-name to classNames.

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| images = []  classNames = []mylist = os.listdir(path)  for cl in mylist:  curImg = cv2.imread(f'{path}/{cl}')  images.append(curImg)  classNames.append(os.path.splitext(cl)[0]) |

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• create a function to encode all the train images and store them in a variable **en coded\_face\_train**

|  |
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| def findEncodings(images):  encodeList = []  for img in images:  img = cv2.cvtColor(img, cv2.COLOR\_BGR2RGB)  encoded\_face = face\_recognition.face\_encodings(img)[0] encodeList.append(encoded\_face)  return encodeList  encoded\_face\_train = findEncodings(images) |

• Creating a function that will create a Attendance.csv file to store the attendance with time.

Note: here you need to create Attendance.csv file manually and give the path in the function.

|  |
| --- |
| def markAttendance(name):  with open('Attendance.csv','r+') as f:  myDataList = f.readlines()  nameList = []  for line in myDataList:  entry = line.split(',')  nameList.append(entry[0])  if name not in nameList:  now = datetime.now()  time = now.strftime('%I:%M:%S:%p')  date = now.strftime('%d-%B-%Y')  f.writelines(f'n{name}, {time}, {date}') |

• with open(“filename.csv”,’r+’) creates a file and ‘r+’ mode is used to open a file for reading and writing.

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• We first check if the name of the attendee is already available in attendance.csv we won’t write attendance again.

• If the attendee’s name is not available in attendance.csv we will write the attendee’s name with a time of function call.

**Read Webcam for Real-Time Recognition**

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| cap = cv2.VideoCapture(0)while True:  success, img = cap.read()  imgS = cv2.resize(img, (0,0), None, 0.25,0.25)  imgS = cv2.cvtColor(imgS, cv2.COLOR\_BGR2RGB)  faces\_in\_frame = face\_recognition.face\_locations(imgS)  encoded\_faces = face\_recognition.face\_encodings(imgS, faces\_in\_frame)for encode\_face, faceloc in zip(en  coded\_faces,faces\_in\_frame):  matches = face\_recognition.compare\_faces(encoded\_face\_train, encode\_face)  faceDist = face\_recognition.face\_distance(encoded\_face\_train, encode\_face)  matchIndex = np.argmin(faceDist)  print(matchIndex)  if matches[matchIndex]:  name = classNames[matchIndex].upper().lower() y1,x2,y2,x1 = faceloc  cv2.rectangle(img,(x1,y1),(x2,y2),(0,255,0),2)  cv2.rectangle(img, (x1,y2-35),(x2,y2), (0,255,0), cv2.FILLED)  cv2.putText(img,name, (x1+6,y2-5), cv2.FONT\_HERSHEY\_COM PLEX,1,(255,255,255),2)  markAttendance(name)  cv2.imshow('webcam', img)  if cv2.waitKey(1) & 0xFF == ord('q'):  break |

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• Resize the image by 1/4 only for the recognition part. output frame will be of the original size.

• Resizing improves the Frame per Second.

• **face\_recognition.face\_locations()** is called on the resized image(**imgS**) .for face bounding box coordinates must be multiplied by 4 in order to overlay on the output frame.

• **face\_recognition.distance()** returns an array of the distance of the test im age with all images present in our train directory.

• The index of the minimum face distance will be the matching face. • After finding the matching name we call the **markAttendance** function. • Draw bounding box using **cv2.rectangle().**

• We put the matching name on the output frame using **cv2.putText().**39

**Attendance Report**

**4.3 Limitations**

**Challenges faced by the face recognition system**

Although building facial recognition seems easy it is not as easy in the real-world images that are being taken without any constraint. There are several challenges that are faced by the Facial Recognitions System are as follows:

• **Illumination:** It changes the face appearance drastically; it is observed that the slight changes in lighting conditions cause a significant impact on its re sults.

• **Pose:** Facial Recognition systems are highly sensitive to the pose, which may result in faulty recognition or no recognition if the database is only trained on frontal face view.

• **Facial Expressions:** Different expressions of the same individual are an other significant factor that needs to be taken into account. Modern Recog nizers can easily deal with it though.

• **Low Resolution:** Training of recognizer must be done on a good resolution picture, otherwise the model will fail to extract features.

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• **Aging:** With increasing age, the human face features shape, lines, texture changes which are yet another challenge.

**4.4 Testing**

**4.4.1 Introduction**

With the completion of the system implementation stage, the system needs to be tested in-order to be reliable and stable. Various features in the system must integrate and work as planned so that correct results can be produced. To fulfil this aim, a test ing plan has been planned and conducted strictly. The testing was done on the per sonal computer where the system was created and implemented.

**4.4.2 Testing Results**

|  |  |  |  |
| --- | --- | --- | --- |
| Test ID | Test Description | Expected result | Outcome |
| T1 | BGR TO RGB | The scanned image must be converted from BGR to RGB. | PASS |
| T2 | Image mapping | Scanned image must be mapped with all the images in the dataset. | PASS |
| T3 | Facial Features Detection | When the camera is started Facial features must be correctly detected in Video Frame. | PASS |

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| --- | --- | --- | --- |
| T4 | Face Detection and Automatic Attendance | Face is identified with  student name and  attendance is marked  accordingly. | PASS |
| T5 | Student Name | The detected Student name matching the student’s face is displayed next to Detected image. | PASS |
| T6 | Detecting Multiple faces | When multiple faces  detected in the same video frame, the system should record attendance of both faces. | PASS |
| T7 | Attendance Marking | There needs to be a correct attendance entry on the excel sheet | PASS |

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| --- | --- | --- | --- |
| T8 | Duplicate entries | Excel sheets should not have duplicate attendance entries | PASS |
| T9 | Email Notification | Parents of absentee  students should be notified via email | PASS |
| T10 | Exception | As an exception, students who have obtained  permission should be  considered. | PASS |

**4.5 Acceptance Testing**

After implementation and personal testing, Acceptance Testing was performed with IIIT Manipur students who volunteered to participate in the project and gave their consent to use and store their data for this project. The students were simply asked to sit in front of the computer and see their attendance marked automatically. The overall feedbacks are shows below: -

**Interface:** Overall feedbacks on the interface were mostly positive, which indicates that the system easy to see and use, as people commented that the design of the system was simple.

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**Functionalities:** The feedbacks were positive for functionalities, most students commented that they liked the ease just sitting down and their attendance recorded. **General comments:** The feedbacks indicate that the show could be more effective at recording attendance than the current card-based system, if implemented right. **Future Suggestions:** General suggestions include, better cameras should be used, and the system could replace the current card-based system in the future.

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| **5 Conclusion** |

**5.1 Summary**

The aims and objectives of The Automated Facial Recognition Attendance System were successfully met and therefore the overall project is considered successful. The system has shown strengths, going through months of development which included, prototypes of various features and functionalities. As testing is done to the system, it proves that the system is fully functional, stable and reliable to use, this is further confirmed by the user acceptance testing. Although there are always some bugs that will always be missed, even with intense testing, all knows bugs are detected and debugged off the system.

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