Using Face Recognition to Detect

the Identity

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| --- | --- |
| Abbreviation | Definition |
| FRT  NIST  DHS  EU  SVM  VS  GUI | Face Recognition Technology  National Institute of Standards and Technology  Department of Homeland Security  European Union  Super Vector Machine  Visual Studio  Graphic User Design |

# Acknowledgement

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# Abstract

Face Recognition is essential software for human society because, numerous times, the algorithm has provided us with some rich content to keep our daily lives very into the community. Having the human face analysed in public has a good side of the beneficiary secured for all individuals. There is a positive side to this programme. I believe this is a great movement to stop all crimes slowly reduced. The measurement behind face recognition has gone and begun to its reach. The purpose of the programme is to assist in helping the security to find the target of the fugitive within any camera set onto the environment. The tutorial for this step into face recognition is used with a camera that will allow capturing the user's image or a video, the most sophisticated side of this algorithm is to extract the image and narrow the image into the most clarity to find the users face feature, and from that stage of the extraction, you have the final part in the decision into taking the fugitive in for question.

# Introduction

Face Recognition is essential software for human society because, numerous times, the algorithm has provided us with some rich content to keep our daily lives very into the protecting the community. Having the human face analysed and captured in public has a good side for the beneficiary such as feeling secure from all insecurity. There is a positive side to this programme. I believe this is a great movement to stop all crimes slowly reduced. The measurement behind face recognition has gone and begun to its reach. The purpose of the programme is to assist in helping the security to find the target of the fugitive within any camera set onto the environment. The tutorial for this step into face recognition is used with a camera that will allow capturing the user's image or a video, the most sophisticated side of this algorithm is to extract the image and narrow the image into the most clarity to find the users face feature, and from that stage of the extraction, you have the final part in the decision into taking the fugitive in for question. As part of my final year project, I have considered learning more about the most upcoming trend in the application of face recognition. Face recognition has been receiving significant attention from all angles from companies and law enforcement. The application has been very substantial towards big cooperates such as giant tech companies. The application of face analysis has been heavily invested in phones, homes, public streets, and even automobiles.

In my research project, I have chosen to approach biometric face recognition. I have long lasted to further research this subject as I believe it still needs to be improved in today's society. Today, face recognition is demonstrated on every device, from mobile phones, Tablets to public street cameras. Even future cars are being installed with the fantastic face recognition detection scanner within the car interior.

The element that I want to expose within the face recognition is not only the face deferral-time real-time but to capture the user's angles angle from the environment, scanning this perhaps by picking up anything the camera can capture, but my main goal is to target the bias of the face recognition and try to gather information within the data that can output the user identity without making too much confusion in the human complexion and face shape and what their ethnicity might come from.

In this circumstance of the research, I have been very sophisticated with the complex algorithm behind this excellent identification capture, as the most recent accuracy level that has been recorded is to be 99.97%. The ultimate challenge of this algorithm is to have many testers tested out from natural ageing; the profound research needs to consider the age to be vital to have different aspects to analyse the depth of analysing the feature of the wrinkles. Alongside this further investigation, I will argue the other features such as human complexion, IRIS, facial expression, and poses. I further demonstrate this meaning and prove the statics of further analysis based on these features of the video recognition systematic review.

## 1.1 Aims and Objective

This research project aims to evaluate the face recognition techniques; the most troubling issue try to solve is to handle the face detection of the different ethnic groups, but our very aim is to detect faces with the most possible the possible enhancement to capture the very high selective of the beginning towards the application.

*The objective of this research:*

1. Determine the person's identity using the open libraries to the best of your ability.
2. Develop test applications with the help of the chosen libraries to evaluate the methods and algorithms for face detection and face recognition.
3. Choose a database of test images that contains a variety of human features and positions that is sufficient for testing the efficacy of the applications that have been developed.
4. Gather the results of the experiments and analyse the efficiency of the selected libraries
5. Using the analysis findings, develop an application that is capable of incorporating the most recent developments in face recognition technology.
6. Create a proof-of-concept system capable of functioning in a constrained environment, prioritising functionality and optimisation as your primary design considerations.

## 1.2 Research Question

### Main Question

1. ***Is facial Recognition biased?***

It is well-documented that there are demographic differences in facial recognition accuracy rates, but the evidence suggests that this issue will disappear as technology advances.

In 2019, the National Institute of Standards and Technology (NIST) conducted the most comprehensive study to date on the demographic effects of facial recognition. The National Institute of Standards and Technology (NIST) discovered that the majority of algorithms exhibited significant demographic differences in accuracy rates. However, (NIST) also reached a number of positive conclusions. The first is that differences between demographic groups were significantly smaller for algorithms with greater overall precision. This implies that as facial recognition systems continue to advance, bias will diminish. Even more encouraging was the fact that some algorithms exhibited no discernible bias, indicating that bias can be completely eliminated with the right algorithms and development processes.

It appears that the selection of training data used to develop algorithmic models is one of the most important factors in reducing bias. If facial recognition algorithms are trained on datasets with very few examples of a specific demographic group, the resulting model will be less accurate at accurately recognising members of that group. This may explain why the NIST found that Chinese algorithms performed better on Asian faces. EU proposals for facial recognition regulatory frameworks include requirements that training data reflect "all pertinent dimensions of gender, ethnicity, and other potential prohibited grounds of discrimination." This is an instructive example for the United States.

In addition to better training data, improving the quality of the captured images can reduce demographic differences. The Department of Homeland Security (DHS) evaluated eleven commercial facial recognition systems and found that skin reflectance was a better predictor of accuracy differences than the subjects' self-reported race. This suggests that higher-quality cameras and improved image capture could contribute to the elimination of bias. Similar to (NIST), (DHS) discovered that the most accurate algorithms had a nearly negligible effect on demographics, supporting the conclusion that algorithm and hardware quality improvements will reduce bias in these systems.

### Sub Question

1. ***Does facial recognition ensure enough accuracy for law enforcement agencies?***

The requirement for a prior public evaluation of the technology itself is one of the elements that make up a reasonable use policy. Therefore, it may not be reasonable for a police agency to use FRT unless the agency is aware of the fallibility of the technology and how frequently it makes errors, particularly when applied to subgroups that are defined by gender, race, age, and ethnicity. Before these systems can be sold or used for law enforcement purposes, developers should be required to submit their (FRT) systems to (NIST) for an assessment of their accuracy and fairness as part of a reasonable use policy, and (NIST) should be required to make the results of this assessment publicly available, including to potential purchasers. This is required before these systems can be used for law enforcement purposes.

According to previous research, Europe is moving in the direction of implementing a facial recognition system. The European Commission has proposed new regulations for applications of artificial intelligence, and one of those regulations would require prior third-party conformity assessments for biometric systems, including facial recognition technology (FRT) systems, that are used for mass surveillance in real-time by law enforcement. Fingerprints and scans of the retina can also be used by biometric systems to differentiate between people, in addition to facial recognition. Real-time mass surveillance, which is used for the purposes of law enforcement, involves the scanning of public areas without discrimination.

It is recommended that the government of the United States adopt a system for prior evaluations of facial recognition systems in law enforcement that is analogous to the one described above. This system should be mandated or encouraged by the federal government and should be applicable to all national, state, and local law enforcement agencies.

## 1.3 Structure of the Report

## **I**ntroduction

In the introduction, the significance of the project is discussed by focusing on the reasons that led to the choice of the particular topic, as well as the project's goals, objectives, and the methods that were utilised to accomplish these things in order to achieve the desired results. Discussion is held regarding the research questions that, as this investigation continues, will be given responses to.

## Literature review

The purpose of this section is to provide context for the classification of images, including the process of data collection, the various types of models, and the various training models along with their respective formulas. In addition to this, the performance of the model is analysed and discussed, along with the various kinds of performance metrics that are utilised to evaluate and contrast the models.

The application of machine learning to the field of face recognition, the level of accuracy required, and the definition of face recognition would all be discussed in a review of previous work. previous literature on the topic, the models used to complete the task, and the results obtained using these various models are all going to be covered in this section.

In addition, the limitations of the research done in the past are discussed, as are the strategies that will be utilised by me in order to circumvent these limitations.

## Methodology

There will be numerous paradigms in the methodology, and by highlighting the benefits and drawbacks of each, I will be able to determine which one is the most effective as I move forward with this research. This section will contain an outline of the process and framework that will be used to achieve the aims and objectives.

Following the selection of an appropriate framework, there will be a discussion on the approach taken in this research, followed by an investigation into qualitative and quantitative analysis, followed by a justification for employing one of the two types of analysis. This section will also investigate a variety of libraries and the prerequisites for the system. At long last, there will be a discussion on the gathering of data, the analysis, and the kind of software that will be utilised to put into action the ultimate software.

## Analysis and Design

The interface for the system, its components, and the overall structure of the application will be developed using the design section of the process. Utilization of a variety of categorization techniques and logic In addition to this, the formulation of requirements that are open to scrutiny will be addressed. In the analysis section, you will be asked a variety of questions concerning the kind of data that was used, the implementation of different algorithms, and how they will react to questions pertaining to the complexity and efficiency of the problem. During front-end development, it is possible to create a prototype that will demonstrate how the final product's appearance and functionality will be.

## Conclusion

After the work on the project and the research have been finished, this section will discuss the most important findings, as well as whether or not the question has been answered. In addition, the limitations of the project, in terms of the constraints that were encountered during the development of the solution, will be investigated. The section on future work will provide recommendations for future researchers who may wish to undertake the same research; rather than recreating all of the steps taken by previous researchers, they can use the recommendations as a starting point for their own investigation by using the recommendations as a starting point for their own investigation. This will encourage progress in both the industrial and technological sectors overall. This brings the entire project to a close with a synopsis of all of the earlier sections.

## 1.4 Relevance of this Study

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# Literature Review

## 2.1 Introduction to literature Review

Recent decades have seen the widespread adoption of biometric-based authentication systems, with face recognition being one of the most significant applications. Face recognition is a type of recognition task pattern. A face is classified as known or unknown based on its comparison to photos of a known person stored in a database, with the classification determined by the comparison. Because of the inherent diversity in information caused by random variation across individuals and systematic differences caused by a variety of circumstances such as lighting conditions and position, face recognition is complex. When it comes to facial recognition, computational approaches must overcome many difficulties. They arise because faces must be represented to make the most of available face information to distinguish one face from all of the other faces in a database, which raises several issues. Face posture is a tough challenge in this context because all faces appear identical; specifically, all faces consist of two eyes, a mouth, a nose, and other features located in the same general area of the face.

###### Advantages

1. In feature-based techniques, the feature points are extracted before the analysis necessary to match the image to a known individual.
2. It is possible to make the feature-based technique insensitive to size, orientation, and lighting changes.
3. It is distinguished by a compact representation of facial images and a high rate of matching/recognition/identification.

### Disadvantages

1. Techniques based on features are ineffective at discriminating between them.
2. In this approach, automatic detection of features is a difficult task to accomplish.

## 2.2 Image Classification:

The projection of the labelling and category of vectors and pixels within an image in accordance with a predetermined rule is what constitutes the classification of an image. In terms of the description of the image's facial recognition capabilities, classification is an example of supervised learning. As the algorithm works its way through the process, it determines whether or not the image is likely to be a match.

### 2.2.1 Data Collection:

A formal strategy for gathering information from the dataset, a set of data collection is a formal strategy for gathering information; this allows for the creation of a broad concept for solving the prediction in many different areas. In actual practice, having a set of variables that align the same dataset in order to make it possible to match it is the best option. The results of the image data collection have a greater bearing on the assignment of classification labels to the images.

### 2.2.2 Model Selection

Model selection is when multiple models are used to determine which one provides the best fit to the data that was observed. Over the course of time, a great deal of work has been put into the development of various image classification models. For research and other purposes in the industry, some of the models that are used most frequently are as follows:

#### 2.2.2.1 Super Vector Machine:

Support vector machines, also known as SVMs, are intended to resolve problems with pattern recognition that involve two classes. We modify the interpretation of the output of an SVM classifier and develop a representation of facial images that is consistent with a two-class problem in order to adapt support vector machines (SVM) for use in face recognition. The binary value of the object's class is what is returned by traditional SVM. The problem is formulated in a space that explicitly captures the dissimilarities between two facial images so that our SVM algorithm can be trained using this space. This is in contrast to traditional face space or view-based approaches, which encode each facial image as a unique view of a face. These approaches have been around for quite some time.

A picture containing text

Description automatically generated

Figure 1: Equation for VSM

Formula:

## 2.3 Performance Model

After the model has been constructed, its performance against other models must be evaluated. Various metrics are used to evaluate the performance of a particular model; these are discussed below.

## 2.4 Evaluation matrix

At the moment, a number of different metrics are employed in order to assess the efficiency of the face recognition system. This section delves deeper into a few of those topics. The idea of positive and negative detection forms the foundation of the standard approach to assessing the performance of face recognition systems. The confusion matrix is presented here in Figure 2. The asymmetrical nature of detection tasks, in which one class is considered to be the relevant pattern class and another class is considered to be the irrelevant pattern class, is revealed by the terms "positive" and "negative."

Table

Description automatically generated

Figure 2: Example of Confusion Matrix Table

#### 2.4.1 Precision

In computer vision, precision refers to the proportion of detected images that are relevant to the needs of the user. It is also referred to as dependability or repeatability, and it refers to the degree to which repeated measurements that are carried out under conditions that are identical yield identical results.

**Example 1**

Precision = No of True Positive / no of all detected patterns

The term "positive predictive value" can also be used to refer to precision in binary classification.

**Example 2**

Precision = TP /TP+TP

#### 2.4.2 Recall

The term "recall" describes the percentage of positive cases that are accurately identified. It is a representation of the percentage of relevant images that have been successfully identified. The true positive rate is another name for this particular statistic.

**Example 1**

Recall = no of true positive/ no of relevant patterns

In the context of binary classification, recall is more commonly referred to as sensitivity.

**Example 2**

Recall = TP/ TP + FN

#### 2.4.3 Fall Out

The term "fall out" refers to the percentage of irrelevant images that contain positive detections out of the total number of irrelevant images.

**Example 1**

Fallout = |{non – relevant} ∩ {detected}| / |{non- relevant}|

**Example 2**

This equation is optimised for a face detection image that does not contain any relevant faces. Quite often, it is measured as the probability that unimportant images will be identified as positive.

Fallout = TN /TN +FP

### 2.4.4 Accuracy

Accuracy can be defined as the percentage of instances that are correctly classified out of a total of N. "the proportion of correct classifications over the total number of samples" is how accuracy is typically referred to in academic circles. The number of predictions that can be made using classification methods is contingent on the number of test records that were accurately or inaccurately predicted by the model.

**Example 1**

Accuracy = No of correctly detected pattern / Total number of validations set

**Example 2**

Accuracy = TP +TN / TP + TN +FP + FN

## 2.5 Holistic Approach

Holistic or subspace approaches do not utilise face regions or feature points because they are unable to process the entire face in this manner (eyes, mouth, noses, and so on). In many of these approaches, the face is represented by a pixel matrix, which is then frequently converted into feature vectors in order to reduce the amount of time required for the processing. After that, these feature vectors are enacted in a space that possesses a constrained number of dimensions. Even though they are widely used, holistic or subspace approaches are extremely sensitive to variations in the data (facial expressions, illumination, and poses). On the basis of the method that was utilised to represent the subspace, these methods can also be categorised as either linear or non-linear.

## 3.5 What is Face Recognition?

Diagram

Description automatically generated

The process of determining or reaffirming a person's identity based solely on an examination of their face is referred to as facial recognition. Individuals can be recognised in photographs, videos, and even in real-time using face recognition technology. Facial recognition is a subset of the broader category known as biometric security. Additional types of biometric software include those that recognise the human voice, fingerprints, the iris or retina of the eye, and voiceprints. The technology is utilised most frequently for the purposes of security and law enforcement; however, there is a growing interest in applying it in other contexts.

(Parmar, 2014)

Figure 3 Face Recognition Model Application

## 2.6 The public-use for Face Recognition:

The face is an essential part of the human body since it helps create the user's identity (Singh, 2018). A particular facial trait may be found on the face of every person in the world. As a result, the difficulty is finding techniques for extracting the user's face; nevertheless, this solution necessitates a time-consuming process of developing the code required to access the user's specific picture from a rear/front camera, photos, or video usage. All of the elements listed below that he achieved integrate many different features of the human [ageing, thermal image, IRIS, occlusion, facial expression, pose, and facial advancements] into a single image or video.

These near-instantaneous alerts assist security experts in deterring criminal activity. Individualised notifications are also an option. For example, if a known shoplifter enters a retail establishment, the watch may signal the start of the monitoring procedure. An expert in loss prevention may approach individuals who need customer service. They can prevent retail crime by keeping an eye on the possible criminals all of the time.

On the other hand, specific individuals should not have been addressed in the first place. Consider the following scenario: a person walks into a stadium and meets face to face with someone who has been charged with international terrorism. Security personnel may be called to request assistance from the police.

Further investigation I have learned that the study of this article, and the bibliography contain much exciting information. If I am selected for this position, I would recommend that I begin thinking about developing innovative software that can be used in conjunction with glasses or sunglasses to provide a more robust framework for recording and analysing the environment around the users (Singh, 2018). If it was my decision to have a simple artefact that can be executed on a wear eye wear would be fantastic in terminal the webcam can pick up objects and face detection by using python library that can analyse the environment around the user.

## 2.7 Smartphone Face Unlock

Personal electronic devices such as smartphones and laptops are increasingly reliant on facial recognition. It appears to be a futuristic concept on the surface; however, only a few years ago, most of us unlocked our devices using a PIN, password, or pattern. Contrary to the technology's increasing widespread acceptance, it is critical to recognise that not every face-recognition system is the same. Specific techniques are inherently more secure than others, while others include optional settings that reduce the likelihood that an intruder will be able to trick them. So, let's take a look at the different types of facial recognition techniques currently available. It will be discussed in greater detail later and whether or not you should enable it on your devices in the meantime.

This method uses the front-facing cameras on your device to identify your face, as the name implies. As of Android 4.0 Ice Cream Sandwich, which was released in 2011, this feature has been included in virtually all Android-based smartphones. Being the first biometric unlock option, this was accomplished before the widespread adoption of fingerprint sensors.

It works as follows: When you enable the feature for the first time, your device prompts you to take pictures of your face from various perspectives. An algorithmic software programme is then used to extract and store your facial features. When you attempt to unlock your device in the future, the front-facing camera's live image feed is compared to the reference data stored in the database.

To conclude, the unique faceprint is compared to a database of previously identified faces to determine whether they are the same person. If the unique faceprint matches a known faceprint in the database, the match has been determined to be correct. Recent years have seen the emergence of Artificial Intelligence and Machine Learning as emerging technologies for face recognition applications. Artificial intelligence models are trained to match faces in various poses and lighting conditions by using image recognition algorithms and training sets. Deep Learning and Convolutional Neural Networks are two types of neural networks commonly used in these models.

Comparing facial recognition to other forms of biometric recognition, facial recognition is considered the most natural method of matching because it is the method by which humans determine how one person can be distinguished from another: by comparing facial characteristics. Face Recognition is the most user-friendly biometric screening method compared to other biometric screening methods. A particular sensor must purposefully scan several parts of the human body for the sensor to recognise a person's fingerprints, hand palms, or iris. With just a simple user selfie, face recognition can be implemented.

## 2.8 Wearable Technology:

The popularity of augmented reality has skyrocketed in recent years (Dedović,2018)

Thanks mainly to the Google Corporation and its product Google Glass, (1) which has gained widespread attention. As humans perceive their surroundings primarily based on sight alone, it's easy to comprehend the preference for smart glasses to exploit augmented reality. In addition, we now have Microsoft's HoloLens 1 and are anticipating the release of Magic Leap's One glasses later this year, both of which make use of mixed reality technology. According to the author, recently published research indicates that the brain can identify the content in images in less than 13 milliseconds. We can easily understand why the brain must process such a large amount of information if we consider that the resolution we can see is 575 mega-pixels.

The registered frames per second are nearly 75. Despite this, due to humanity's progress and desire to reach the same technological benchmark, it is now possible to process large amounts of data due to the increasing power of processors, the resolution and capabilities of cameras, and to do so at a reasonable cost.

Therefore, it is fashionable to incorporate computer vision and its algorithms into all branches of science as a result of this. OpenCV (Open Source Computer Vision Library) is a well-known computer vision library, which stands for "Open Source Computer Vision Library." This is not surprising given the platform's multiplatform and multilingual support and the platform's user community's strength of 47,000 members.Using the most popular augmented reality product and the most popular computer vision library, the authors of this paper hope to determine whether it is possible to develop an application by combining the two technologies. In addition, we will go over all the issues that I discovered while conducting this investigation with Google Glass, OpenCV, the application itself, and the solutions that I found to resolve those issues. To achieve this goal, the findings and a unified conclusion regarding an attempt to exploit these two technologies in combination will be presented and discussed in detail in this paper.

While the hype surrounding Google Glass 1,2 has failed to continue in the market, this article concludes that a more advanced algorithm may be at the heart of this project. The experiment revealed that the device experienced some overheating issues when fully charged, that the circumstances were unfavourable when attempting to try the glasses, that there was a problem with the blur, and that the lenses were beginning to turn white. As a result, the glasses you are wearing have a severe flaw, and you are unable to wear them because they blur your vision. (2) Because of the computational complexity associated with this limitation, a more advanced algorithm and extensive testing will be required before the hardware can be made available to customers.

## 2.9 Face Recognition Q Project

The attempt from (Spreeuwers et al., 2012) has set research for border control from entry from another citizen of another country to be scanned to enter the country; this only happens on verification of the bordering into the plane and exit towards the gates. This research was conducted in Schiphol Airport, Amsterdam; the practice was taken in The Netherland in June 2010. into the research project, the operation was supported by two gates; Gate 1 was a built-in research proposal for these evaluation studies, and Gate 2 was presented for the regular passengers. Even though gate 2 decided to participate in evaluating the project to further into the study, based on validating the passport, the user had to scan the Identification. If the identification matched the database, the passenger enjoyed the procedure of leaving the exit.

Regarding the people who have entered this evaluation participation, they can experience the same process. Those who did not have the identification was not match were able to retry the evaluation.

One major suggestion that I would consider implementing into this project is to make the face-scanning to be engaging; this will help passengers to create a movement around the 360-degree surrounding system that will pick up the motion, face and pose.

One problem with this correspondence towards the Q Project, during the practical evaluation, there will be a slight problem with some travels document; this could be multiple issues such as (1) this could be the quality of the image, blur within the photograph also sunglass could have an effect when coming into the scan. (2) colour smudge can change the behaviour of the scan; this could cause confusion with the algorithm of the traveller's skin complexion. (3) Compression artefacts that manifest themselves as blocks or posterization. Numerous images have moderate to severe compression artefacts, which can be seen in many of the images.

# Methodology

In this section, we will talk about the logistics of how this study will be designed in a methodical way to produce results that are not only reliable, valid, and unbiased but also address the stated aims and objectives that were presented at the beginning of the study. These aims and objectives were presented at the beginning of the study.

## 3.1 What is Agile Development?

The method of software development known as agile foresees the requirement for adaptability and takes a realistic and down-to-earth approach to the delivery of the finished product. Because it places more of an emphasis on the timely and error-free delivery of individual software components as opposed to the application, agile software development frequently calls for a change in the organisational culture.

One of the many benefits of using agile is that it helps teams work more effectively in dynamic environments, all the while retaining its primary emphasis on the timely delivery of business value. The culture of collaboration that is fostered by Agile helps increase the organization's overall efficiency. This is because it allows teams to work together and better understand their specific roles within the process. Finally, businesses that utilise Agile software development can be confident that they will release a product of a high quality because testing is performed throughout the development process. This enables teams to adjust as necessary and alerts them to potential issues that may arise.

## What does it contain:

* Processes and tools are overshadowed by one-on-one interactions.
* As opposed to exhaustive documentation, focus on working software
* Collaborate instead of negotiating contracts.
* An immediate focus on flexibility and responsiveness

## The benefit of Agile Development Cycle

Agile produces essential metrics such as lead time, cycle time, and throughput that assist in measuring the performance of the team, locating bottlenecks, and making decisions that are data-driven to eliminate them. The Agile framework is an extremely helpful resource for managers, members of teams, and customers alike.

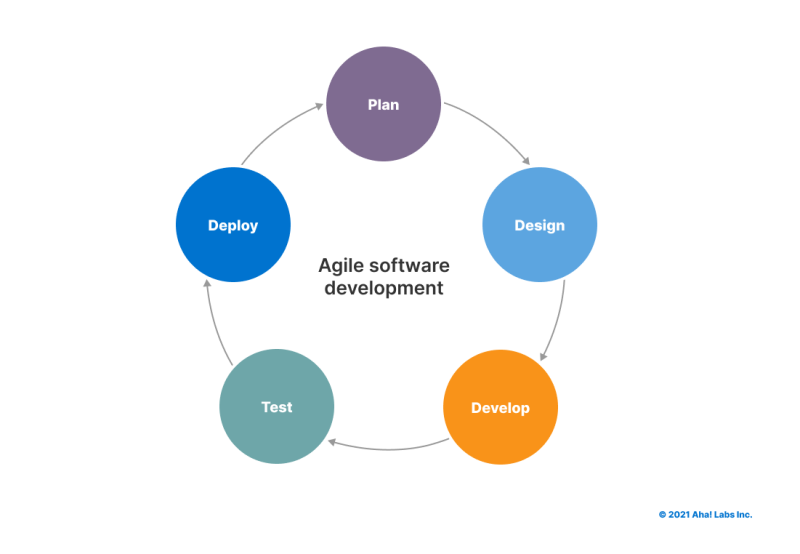


Figure 4:Agile Software Cycle Programme

## 3.2 What is a Scrum Development?

Project management and rapid response are the primary responsibilities of Scrum development. In order to make quick adjustments, teams can communicate and self-organize within this Agile-compliant framework for project management.

Obviously scrum master relates to a group development situation as this too applies to only to be itself.

## What does it contain:

1. As a consequence of this, based on my consideration of the various kinds of roadblocks, I ask myself:
2. What did I do yesterday?
3. What goals will I have set for today?
4. What kind of changes will be implemented for this project?

## The benefit of Scrum agile development cycle

Throughout the course of the product development process, Product Owners and other stakeholders are encouraged to participate thanks to Scrum. As a result, both the progress being made and the current state of the product are significantly more transparent, which helps to ensure that expectations are effectively managed.

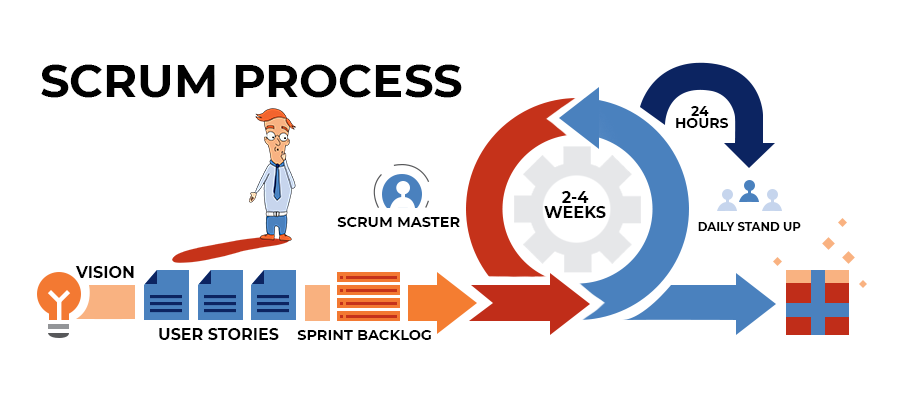


Figure 5: Scrum Agile Development Cycle Programme

## Sprints

The sprint is the primary unit of work for a Scrum team. This is the most significant difference between Scrum and other agile development methodologies.

Sprints allows the project to be more manageable for the enterprise to work with high-quality, this makes the work more faster and more frequently and allow the workforce to be more flexible and adaptable to the situations.

Sprint stories

What and how the Sprint will be completed is laid out in a Sprint Planning document. At the beginning of each Sprint, the Product Backlog's phases and deadlines are reviewed to determine the project's strategy.

Daily Scrum

In addition to making it easier to plan releases and iterations, a well-prioritized agile backlog communicates all the work your team intends to do, even if the customer won't notice it. In the event that other teams or stakeholders bring in additional work, you can use this to help set expectations and turn engineering time into a fixed asset.

Sprint Review

The goal of a sprint review is to showcase the efforts of the entire team, including the product owner, designers, and developers. During sprint reviews at Atlassian, we prefer to keep things lighthearted. During informal demos, team members gather around a desk to talk about their work for the current iteration. It's a good time to ask questions, experiment with new features, and provide feedback.

Retrospectives

Product owners, designers, and developers are all included in a sprint review. During sprint reviews, Atlassian prefers to keep things lighthearted. Members of the team gather around a desk for informal demonstrations of their current iteration's work. Questions, testing new features, and feedback are all appropriate at this time.

## 3.4 Gantt Chart Estimating results within Project.

The current position on the project can be seen in this Gantt chart. I have finished the first part of my report, which is the report; now, my next step is to get started with my development in software; I will begin by doing some research on the code that is being imported into the software from the library code. While I'm programming, I will start typing up the report of my progress in my software.

Timeline

Description automatically generated

**3 January 22 – 10 January 22**

Throughout the seven days, I took advantage of my free time to write out what I wanted for the report; in essence, I began with a brief paragraph demonstrating how I would explain the entire project report in greater detail.

**15 January 22 – 10 May 22 - > Literature Review**

It shows your readers that you have a thorough understanding of your subject and that you are cognizant of how your research fits into and contributes to an existing body of accepted knowledge.

Consequently, I've been reading a variety of articles that could potentially contribute to the essence of my report research; with my literature, I've spent over 25 hours attempting to strengthen the report, and I aimed to make the reader feel as though following the guide was straightforward, while also ensuring that they are aware of the fact that my report research was used to create the report. Also included was a demonstration of my recommendation to the author and my conclusion to the author's research paper. As a result, I've outlined the issues and the best course of action for the author should any changes be required to the research paper.

**10 January 2022 – 25 April 2022 -> Design and Methodology**

The design of the layout Essentially, the research design is a strategy for answering a particular research question. A research method is a strategy for putting a plan into action that has been developed. Because good research design ensures that the data you obtain will aid you in answering your research question more effectively, research design and methods are distinct but closely related.

**17 January 2022 – 17 March 2022 -> Finding**

proposing the finding for this research has structured this report to be a more clear and suitable structure for my project to give out clear meaning to what the understanding comes from reflecting from this research. Reading all of the articles that I have come across helped me understand much more in-depth into the research.

**25 January 2022 – 25 MARCH 2022-> Analysis and Discussion**

During the course of these past few months, I have been analysing and will discuss a project that is very motivational and inspirational towards my passion. As a result, in theory, I have covered most of the topic in this article. Nevertheless, I have a problem with the analysis that collects significant data concerning the ethnic group. Towards the end of the discussion, I will provide some of my theoretical reflections on the entire research project and how this experience has steered my thinking in a very fruitful direction, allowing me to gain a deeper understanding of machine learning. I will also discuss how this experience has broadened my knowledge of machine learning.

**10 May 2022 – 30 May 2022 -> Conclusion**

During the final month, I will take my time proofreading it, and I will also send a manuscript to my supervisor and a professional proof-reader so that they can review my report essay and give me advice on how to have a selective and robust report before I write the conclusion for the entire project dissertation. I will do this before I write the decision for the entire project dissertation.

**3 January to 6 June 2022 -> Reference**

My reference will begin at the beginning of the academic year in 2022 and continue until the end of the module that has been submitted. I will make sure that each page has the appropriate links and citations in reference to the author. For the purpose of my face recognition project, the reference will cover what I have read and observed in the article that is relevant to the topic. My boss will be able to keep better track of the report and more easily locate the path of each paragraph with this information.

# Analysis and Design

Within the context of face recognition, this section will focus on the data section. The results, the testing, and the training are going to make up the bulk of the data. py is the name of the file that delves more deeply into the process of developing the code and discusses the potential outcomes of using the software.

Graphical user interface, application

Description automatically generated

Figure 6:Data Collection for FP

1. The Result file will contain the variable for the testing of face matching detection.
2. The Test file will be used for testing the image, so all of the data of the image will be stored in this file.
3. The training file is used for training the data of the image.
4. main.py is the main application to code the python project.

Now will go into details on how to install the open library:

The design phase will include a demonstration of the Python installation, the import of the library from the [PyPI website](https://pypi.org/) , and the coding of the application. In addition, the demonstration will include instructions on how to create the software. The code also includes a guideline that explains how the code will function.

## How to install the library?

In the first stage, we install those 5 libraries to the command line.

*The links are listed here:*

Line 1: <https://pypi.org/project/face-recognition/>



*The links are listed here:*

Line 2: <https://numpy.org/install/>



*The links are listed here:*

Line 3: <https://pypi.org/project/glob2/>

Text

Description automatically generated with medium confidence

*The links are listed here:*

Line 4: <https://pypi.org/project/opencv-python/>

Graphical user interface, text, email

Description automatically generated

*The links are listed here:*

Line 5: <https://pypi.org/project/argparse/>

Text

Description automatically generated

## Coding: Start

Graphical user interface, text

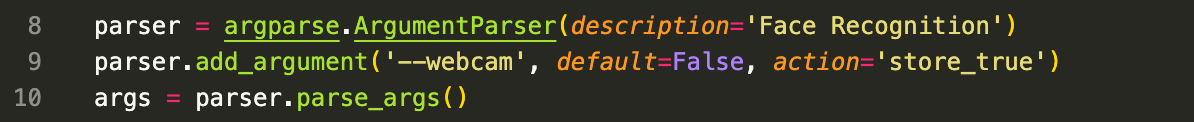
Description automatically generated

Figure 7: After Installation from Python Libraries

## Code Line: 1- 25

By starting the project, we start with python by importing the different library that supports face recognition. First, we have the built-in face recognition package that has will allow exploring more with the face analysis. NumPy has the image processing that will allow the domain to support the face recognition application.

## Code Line: 8- 10



The import of argparse will make it possible to create a communication network to the command line in order to give out the keyword that will give us access to the webcam in Python.

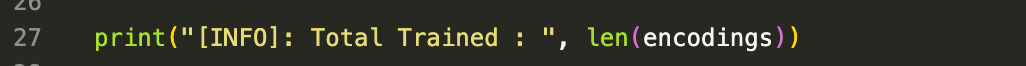
## Code Line: 12- 24

Text

Description automatically generated

From lines 12-16 I have listed an empty list that will basically store and pass in the variable name files. For the files to be recognised I have to use the import glob, the glob library allows the service to read the file and recognise the file path. Using the for loop will loop into the file and should locate the face using the face recognition library. And if not, if a loop is not greater than one the name will appear on the image.

## Code Line: 27



This line will state the print statement output from the command line passing into this argument will be the length of the variable name file.

## Code Line: 29- 43

A screenshot of a computer

Description automatically generated with medium confidence

From lines 29-31 the args file will access the cam and display the length number of the face that will be trained to display the result. Line 32 to 43 is invoking the import that will call from opencv2 library that will aloe the access on the infrastructure on computer vision that I can use to compare the faces from the training file and the training data that can get a better analysis to see if the accuracy will match.

## Code Line: 45- 54

Text

Description automatically generated

Line 45-54 is to have the rectangle to display the capture on the webcam of the user when it recognises the user.

## Code Line: 66- 95

Text

Description automatically generated

This is where we design the algorithm for the user's match, where if there is no match increment the process\_this\_frame also to continue the algorithm. For ( top, right, bottom, left) these are the four arguments that will be used to create the parameter are the user's image. This will aloe to capture the image of the surrounding.

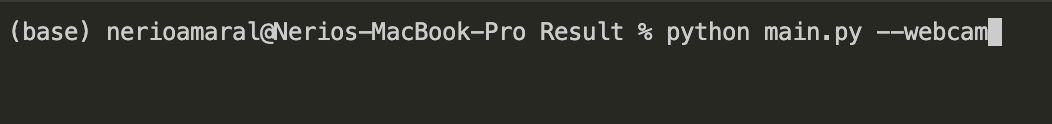
## Code Line: 97- 105

Text

Description automatically generated with medium confidence

Here is the final line of execution of the face recognition, here we the release for the variable cap and out.

## The outcome of the Software:



This is the evidence of the [import Argparse](#CodeL1) result, as you can see the command line understood the keyword of –webcam. This keyword was the access to the file path that recognises the main.py.

Text

Description automatically generated

Here is the structure of the file length of the [training file](#CodeL2) as shown in the info displayed the training file has the variable name of the image that will detect the image and to display the name on the command line.

Graphical user interface

Description automatically generated

As above is displayed I have executed the algorithm, this execution is a reflection of [code lines 65- 95](#CodeL3). Here is a display of the code being run.

The application displayed is fully executable on the python webcam.

The detection was carried out with the help of a training file that featured an image of Imran Khan's face. In addition, as part of the successful implementation of the for-loop algorithm that I developed, I verified that my face could be recognised.

# Conclusion

Face recognition has come a long way within the two decades. Today the algorithm in Face recognition can automatically identify the person's details by scanning the person's face. In this present time, face recognition is used all over for surveillance and security tasks. Having access to the database within the face recognition is very limited to the public, as the authorities have the means to find out the individuals detail of the record and locate the user's home etc.

Throughout this research, I have conducted some errors with this participation in my research on face recognition. I have come across some slight meaning of technical algorithm troubles with the darker complexion. This conduct in the algorithm can cause a dire circumstance for the colour people, which means that some innocent people could have their life be spent in jail if and only if the algorithm doesn’t just target the issue that I have just mentioned. Face recognition could get better in the future and, future end considering the future. In this face recognition scenario, significant, considerable cooperation is still unreviewed with the algorithm.

Given its enormous potential application and theoretical significance, face recognition is a crucial study problem in image processing and computer vision, among other fields. A wide range of real-world applications, including security, surveillance, homeland security, access control, image search, human-machine interaction, and entertainment, have substantially used this technology. On the other hand, these applications have their own set of challenges in terms of lighting and facial expressions. A particular emphasis is placed on methods that are based on local, holistic (subspace), and hybrid characteristics, as well as approaches that combine several of these characteristics. A comparative study was carried out in order to evaluate the two approaches in terms of processing time, complexity, discrimination, and robustness, among other factors. We may conclude that local feature techniques are the most accurate when it comes to discrimination, rotation, translation, complexity, and accuracy, and that they are the greatest option when it comes to rotation, translation, complexity, and accuracy. We hope that the results of this survey report will encourage more researchers in this field to participate in future surveys and to pay more attention to the usage of local techniques for facial recognition systems in the future.

During the last two decades, facial recognition technology has advanced significantly. By scanning a person's face, the algorithm in Face Recognition can now automatically identify their details and provide them to the user. Face recognition technology is now being utilised extensively for surveillance and security purposes all around the world, including the United States. In order for authorities to obtain information about an individual's record and to identify the user's house, they must first gain access to the database within the facial recognition system. The public's ability to gain access to this database is extremely limited.

This study on facial recognition has been fraught with flaws, which I have discovered during this process. Some modest meaning of technical algorithm problems with the darker complexion has been discovered by me. According to the algorithm, this behaviour might result in the colour individuals experiencing a desirable situation. As this study progresses, I've noticed certain improvements in the algorithm's adaptability. For example, the algorithm for face identification is moving in the correct direction, and the method for face scanning is moving in the right way, as shown in the following graph. In addition, I have read some poor quality articles as well as some excellent ones, With problems with the facial texture, this study has been quite advanced overall.

## Limitation

I wanted to achieve image output that was based on the brightness behind the user's image and webcam, and there was an incursion of background lighting while I was developing the programme. The challenge I faced was completing the data collection from the user and comparing all of those images with different light backgrounds or facial expressions in order to train a large amount of data simultaneously on a computer with an Intel Core i5 processor that did not overheat on my personal laptop. This was the case regardless of the variation in light and facial expression made by the user in the original image.

Nevertheless, despite the fact that I have put in a lot of effort, I have finished 86 percent of my project development project.

## Future Work

Based on my limitation provides a report on face recognition as well as the various techniques for assessing the performance of face recognition systems. The faces are made up of patterns that are extremely intricate and can be differentiated in a variety of subtle ways, such as by changing the angle or the lighting. Therefore, the system for face recognition needs to take into account factors such as changes in facial expression with age, changes in a pose with age, changes in illumination with age, scaling factor, frontal versus profile presence and absence of glasses, occlusion due to scarf, mask in front, beard, and moustache. Precision and recall are two methods that can be used to evaluate accuracy in situations where the training set only contains the face of a single person. Confusion matrices are useful tools for evaluating a test face when the training set contains multiple faces belonging to a number of different individuals, while the test set contains multiple faces belonging to the same individual.

When the test set is unbalanced and the training set contains faces of interest along with other faces, various accuracy measures that are dominated by true negatives can be used to evaluate face recognition. These measures of accuracy are described below. A complete face recognition system will have multiple subproblems, each of which will be treated as its own independent research problem. Evaluation of various machine learning algorithms that can be used for face recognition along with feature mining is going to be a part of the work that will be done in the future. On the other hand, the subsequent generation of face recognition technology will have enormous applications in intelligent environments, in real-time, and in circumstances with a lot less control.

## Summary

The purpose of the report was to analyse the whole situation behind face recognition. The technique that I was trying to exploit was the brightness behind the user's background that could manipulate the situation behind the background of the user. This entire chapter will allow an insight into the whole report of a clear completion of the project. The literature review was an effort to expand the knowledge into the face recognition world, also to address the design and provide the formulas behind the face recognition system behind it.

The evaluation of the screenshots has the domains to showcase the code being successful.

The term "methodology" refers to the strategies that were used to not only locate but also analyse the material of the study. This resulted in the construction of a reliable pipeline on the development cycle, which allowed the goals and objectives to be addressed, the project to be finished, and a valuable product to be produced.

During the phase of analysis and design, the data, as well as how it will influence the model, as well as the accuracy of the data, are both taken into consideration. The design section will produce a prototype design, which will be constructed to be as accurate to scale as is physically possible. In order to establish the most effective method of utilisation, it will be necessary to, in addition to building and analysing the models and user interface, compare the accuracy. The most important findings regarding the research questions, limitations, and future research are discussed in the tenth and final chapter of the report.

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Introduction

Literature review

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Theorical framework

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Discuss and method

Aims and objective

Methodology

Finding

Conclusion

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