PAY USING FACIAL ID SOFTWARE USING FACE RECOGNITION

A PROJECT REPORT

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In Partial fulfilment for the award of

the degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING (AI)

Under the Guidance of

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Parul University, Vadodara

February, 2023

PARUL UNIVERSITY

CERTIFICATE

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Under my guidance in partial fulfilment of the Bachelor of Technology (B.TECH) in Computer Science and Engineering of Parul University in Academic Year

2022-2023

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ACKNOWLEDGEMENT

Every significant accomplishment by an individual is the result of the collective effort of those who aided them in surmounting obstacles to attain their objective.

I am thrilled to convey my profound appreciation to my esteemed kind guide **Prof. Amit Kanungo**, (Assistant Professor), for his unwavering, exceptional, and priceless collaboration and direction. It is a crowning achievement for me to have received guidance from him. He is a consistent source of motivation and drive, making even the most complicated situations seem simple. Throughout the entire project, I received a great deal of valuable advice and timely suggestions from him. I will remain indebted to him for eternity and take pride in working under his tutelage.

I would also like to extend my sincere respect and thanks to **Dr. Amit Barve**, (Professor and Head of the Computer Science and Engineering Department). I feel incredibly privileged to have had the opportunity to benefit from their valuable counsel, guidance, and leadership. Their expertise and experience were a great asset to my project, and I am grateful for their contribution.

Lastly, I offer my humble appreciation to the Almighty for their blessings and assistance, without which none of this would have been possible.

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Abstract

Mobile payments have revolutionized the way people conduct transactions in India, with millions of people using various digital payment methods every day. However, the rise of digital payments has also led to an increase in fraudulent activities, causing significant financial losses to both individuals and businesses. In response, our software solution using facial recognition technology aims to reduce the incidence of fraudulent transactions and provide a secure and convenient payment option for all. Forgetting a QR code scanner or losing it somewhere else or any minor damage will lead to a loss or problem in payment to anyone. Fraudulent transactions occur in India every day, causing financial problems for middle-class families, lower-class problems, and even everyone who uses QR code scanning payment. One more problem is that whenever you are paying using a UPI ID, entering the wrong UPI ID for payment may lead to payment unsuccessful, and money will be credited to someone else. India is the world's largest nation using online payment every day. According to a 2022 report by all UPI apps in India, there are over $1.09 trillion payments transferred using only UPI apps. In those transactions, almost 20% to 30% are fraudulent transactions, with people losing their money. Some people scan to some other QR code to do payment and make their sounds for payment, cheating the shopkeepers. Many uneducated shopkeepers give groceries to customers without knowing this, which may not happen to all people, but there are some people who are facing this. Scammers and unknown destiny have taken $2.5 billion of Indian money. We are here to stop it with our own unique idea using software that scans the person's face and shows them the respected UPI IDs that are linked to their original UPI apps to make the secure transaction. The user has to download the software on their local machine to make payment, then the user has to train the face recognition model with 3-4 photos of themselves, and the data will get stored in the database. Initially, we are using our own database server, and in the future, we are about to use any secured cloud-based service like AWS or Azure, etc. The opposite person who also wants to pay has to download the software and then scan the face of the shopkeeper using the scanner in the application. If the image matches the image that is there in the database, it will show them the linked UPI ID like Paytm, GPay, Phone Pay, or Amazon Pay UPI apps. We are using a machine learning model to recognize the face with good accuracy. If the face didn't match, it won't direct to any UPI apps; instead, it will show not face is recognized. We will be using Python for the machine learning model and one secured database, and Flutter and Dart for beautiful interface to users such that they won't get irritated with the colours or lighting on the screen. Our facial recognition technology is highly accurate, ensuring that transactions are processed quickly and without errors. Additionally, our software can store multiple UPI IDs, allowing users to switch between different payment apps quickly and easily. We also plan to incorporate the use of secure cloud-based services like AWS or Azure in the future to further enhance the security of our software. We believe that our software can help reduce the financial losses associated with fraudulent transactions and provide a more secure and convenient payment experience for users. Moreover, the potential benefits of our solution extend beyond just financial transactions. For example, our software can also be used for identity verification, access control, and attendance tracking, providing a range of applications for both individuals and businesses. With the increasing adoption of digital payments in India, the need for secure and efficient payment methods has never been greater. Our software solution using facial recognition technology provides a significant step forward in this regard and can help to safeguard the interests

Keywords: Machine Learning, Facial Recognition, UX and UI, Cloud Based Storage.

Contents

Chapter 1

Introduction

In this project, we are proposing a smart payment software using face recognition. Software starts processing when the user uploads his/her images. The images then can be trained using machine learning model. Our model will grab the patterns in the face and send the collected data to the sever where we store the information securely. This process is wirelessly over the internet through any network topology. We use this method as the accuracy in face recognition is more. The data in the sever monitored continuously and any unused photos will be deleted with informing to the user.

1.1 Problem statement

The current problem with digital payments in India is the high incidence of fraudulent transactions and the potential financial losses incurred by individuals and businesses. This is largely due to the vulnerability of current payment methods, such as QR code scanning, which can be easily manipulated by fraudsters. Additionally, the need for users to remember multiple UPI IDs and the potential for input errors can lead to payment failures and money being credited to the wrong accounts. To address these issues, a software solution is needed that can provide a secure and convenient payment option for all users while reducing the incidence of fraudulent transactions. The solution should incorporate facial recognition technology, a secure database, and user-friendly interfaces to ensure accuracy, security, and ease of use.

1.2 Scope

The scope of the project is to develop a software solution that uses facial recognition technology to provide a secure and convenient payment option for users in India. The software will allow users to link multiple UPI IDs to their account, switch between different payment apps quickly and easily, and process transactions quickly and accurately. The project will use Python for the machine learning model, Flutter and Dart for the user interface, and a secure database to store user information. In addition to providing a secure payment option, the software can also be used for identity verification, access control, and attendance tracking, providing a range of applications for both individuals and businesses. The project will focus on reducing the incidence of fraudulent transactions and providing a more secure and convenient payment experience for users. With the increasing adoption of digital payments in India, the project has the potential to make a significant impact on the financial security of millions of people.

1.3 Aim and Objectives

The aim of our project is to provide a secure and convenient payment option for all in India by using facial recognition technology. Our objective is to reduce the incidence of fraudulent transactions, which causes significant financial losses to both individuals and businesses. Our software solution will be developed using various technologies, including Python for the machine learning model, Flutter and Dart for the user interface, and a secure database to store user information. We will incorporate the use of secure cloud-based services like AWS or Azure in the future to further enhance the security of our software. The software will also allow users to store multiple UPI IDs, enabling them to switch between different payment apps quickly and easily. Our solution extends beyond just financial transactions and can also be used for identity verification, access control, and attendance tracking, providing a range of applications for both individuals and businesses. Our ultimate goal is to make digital payments more secure and convenient for everyone and help safeguard the interests of all those who use digital payment methods in India.

Chapter 2

Literature Review

In this chapter, we have given our critical evaluation & summary of all research papers that we read related to our project. After reading many reference and research papers covering the topics related to face recognition, secure data storage, accuracy in payment transaction, impact of facial payment, importance of user interface to the application, etc. We studied the latest or last 2 to 3 years papers and found very less data because of the idea is new and unique. All those details are given below.

2.1 Critical Evaluation of Journal paper

Paper 1: Face Recognition-semi supervised classification with InTechOpen.

The objective of this paper is Facial recognition has recently gained attention as one of the most successful applications of image analysis, thanks to feasible technologies including mobile solutions. Although research in automatic facial recognition has been conducted since the 1960s, the problem is still largely unsolved, and reliable facial recognition still poses a great challenge to computer vision and pattern recognition researchers. The past decade has shown significant progress in this area due to advancements in facial modelling and analysis techniques. The need for identity verification in the digital world, face analysis and modelling techniques in multimedia data management, and computer entertainment has led to increased interest in facial recognition.

This chapter discusses the major components of facial recognition processing, including face detection, tracking, alignment, and feature extraction, and highlights the technical challenges of building a facial recognition system. The chapter also emphasizes the importance of the most successful solutions currently available and describes selected facial recognition methods and applications and their potential use beyond facial recognition. Face recognition has a wide range of practical applications, including security systems, access control, and forensic investigations. It is also used in digital marketing and social media applications to analyse user demographics and behaviour. However, face recognition systems have raised privacy concerns, and there is a need for ethical considerations in their development and deployment.

The accuracy and reliability of face recognition systems also remain a challenge, especially in unconstrained environments with varying lighting conditions, pose, and expression. Ongoing research is focused on developing robust and efficient algorithms to improve the performance of face recognition systems.

Paper 2: Secure Online Payment with Facial Recognition Using CNN by IRJET.

This Paper describes the use of Convolutional Neural Networks (CNNs) for facial recognition and authentication. CNNs are efficient in analysing images due to their ability to use relatively little pre-processing compared to other image classification algorithms. A CNN consists of an input and output layer and hidden layers, with different types of layers including convolutional, pooling, normalization, and activation functions.

The inception v3 model is used for CNN architecture, which includes multiple inception blocks consisting of a combination of convolutional layers, pooling layers, and activations concatenated together. In addition, the system uses a Siamese network with two CNNs to compare input images from a database and a real-time captured image. The triplet loss function is used to find the difference between the outputs of both CNNs, which is used for training the complete model using backpropagation.

CNNs take an input image and extract various features of the input, which are sent to the following layer, typically a convolutional layer. The Convolutional Layer performs most of the computations in the CNN architecture, taking an input image with parameters such as size and number of filters to extract useful features. The output of one convolutional layer acts as input to the following layer. The Pooling Layer reduces the number of parameters in the input image to make computations more efficient, with several activations that can be used, including the max pool function.

In summary, CNNs are a powerful tool for analysing images, and the use of Siamese networks and the triplet loss function can improve the accuracy of facial recognition and authentication systems. The inception v3 model and various types of layers, such as convolutional and pooling layers, can be used to improve the performance of the system.

Paper 3: Secured Payment System Using Face Recognition Technique by AIP conference.

This module involves creating a dataset to store user images along with their details using various libraries like cv2, NumPy, and sqlite3. The images are stored as arrays, with the pixels of the image being stored in the form of an array. The module uses the cascade classifier function of cv2 module to detect the face structure of the user's image and store it in grayscale format using the LBPH algorithm. The user is prompted to enter their name and ID details, and the module captures the user's image using the camera. The number of images stored is specified in the code, which is currently set to 51.

Module 2 involves training the image dataset using the local binary pattern (LBP) algorithm and adaboost. This module uses NumPy, the Python Imaging Library, and other libraries to modify and classify the pixels of the image. The trained data is passed through adaboost, which is an intensive process and is stored in ada. The trained images are used as raw material for individual identification.

Module 3 is the main module used for real-time input stream and recognition of the user's image. It uses the LBP algorithm to match the face in the input image and returns two values - confidence value and ID of the recognized person. It also involves creating a .yml file out of the trained dataset for accessing and creating blueprints for individual identification.

The detector client is used to get output in real-time and involves capturing an image from the camera, manipulating the array of pixels using NumPy library, and using the pattern histogram to match the face in the input image. LBPH is a simple and effective texture operator used for labelling the pixels present in the neighbour of the pixel we are labelling and forms the basis for individual identification. The output of this module is a confidence value that tells us an estimate of how accurate the machine recognition of the person is.

Overall, these modules use various libraries and algorithms to create, train, and recognize the user's face image for individual identification, with the output being a confidence value and the ID of the recognized person.

Paper 4: A Study on the Impact of Face Recognition Payment System Characteristics and Innovation Resistance on Intention to Use by TURCOMAT

This article discusses the development and usage of face recognition technology for identity recognition, including for payment systems. It explains how the technology works, highlighting the use of a camera to scan a person's face and extract data for comparison with a stored database. The article also notes the increasing prevalence of face recognition systems in various fields, including medical health, government, and retail, with the global market size for face recognition technology expected to grow significantly in the coming years.

However, the article also acknowledges the concerns around the collection of personal data by face recognition providers, which has led to resistance to its usage for payment systems. Two payment services that use facial recognition are discussed: mobile simple payment and the Uniqul payment platform. The characteristics of a face recognition payment system are identified as convenience, reliability, security, and non-contact.

The article explains how the adoption of a face recognition payment system would need to provide convenience for users, such as simplifying the operation process, and offer high levels of reliability and security to protect personal data. It concludes by stating that while there are challenges to the adoption of face recognition technology for payment systems, it has the potential to offer a more convenient and secure payment option.

Paper 5: Implementation and performance of Face Recognition Payment System Securely Encrypted.

Face recognition technology has seen rapid growth in recent years, especially in the biometric field. It has also been adopted by major payment institutions like Alipay, WeChat, and UnionPay, and is now widely used in mobile payments. Face payment has brought about a significant improvement in user experience, transaction efficiency, and the development of various industries. One of the key benefits of using face recognition technology for payment is the enhanced security it provides. The SM4 encryption algorithm is used to ensure the security of user data transmission, making it more efficient and convenient.

The security of face detection, data transmission, and payment transactions is critical for payment systems. Researchers have been working to improve these areas by conducting studies and experiments. One such paper outlines the performance and advantages of the system in terms of system architecture, hardware and software design, key management mechanism, SM4 algorithm performance, and face system architecture. The study also includes the system's development environment, storage space, and core processor upgrades, which have improved performance, reduced power consumption and cost, making it suitable for multi-scenario applications. The system has a built-in security encryption module, peripheral driver software, and a load balancing mechanism for storage. The hardware adopts the technology of "disassembly and self-destruction" to ensure system security. The software adopts "firmware encryption and self-checking" technology to ensure system security.

The face recognition system used for payment transactions includes a living body detection algorithm and a quality assessment algorithm. This enhances the recognition accuracy, which has been tested and verified by the State Cryptography Administration. The safety performance of the system has been greatly improved, and it is expected to have a positive impact on the industry. Face payment has not only optimized the payment process but also improved user experience and transaction efficiency. With the adoption of the SM4 encryption algorithm and the development of a robust security system, face recognition technology has become a reliable payment method for the future.

In conclusion, face recognition technology is increasingly being used in payment systems, with Alipay, WeChat, and UnionPay being the major payment institutions that have adopted this technology. Face payment is bringing about significant improvements in user experience, transaction efficiency, and various industries. Security is a key aspect of payment systems, and researchers have conducted studies to enhance the security of the face detection, data transmission, and payment transaction processes. The adoption of the SM4 encryption algorithm and the development of a robust security system have made face recognition technology a reliable payment method for the future.

Paper 6: Design and Implementation of Real Time Face Recognition System (RTFRS)

Z. Q. Jaber and M. I. Younis presented a research paper that describes the design and implementation of a real-time face recognition system (RTFRS). The RTFRS consists of three main stages, namely face detection, feature extraction, and face recognition. To detect faces in an image, the face detection stage utilizes the Viola-Jones algorithm. The Local Binary Pattern (LBP) method is used in the feature extraction stage to extract facial features. Finally, the face recognition stage matches the extracted features with those in a database, using the Euclidean distance metric. The system was implemented using MATLAB and tested on a dataset of 200 face images, achieving a recognition rate of 95%.

According to the authors, the proposed RTFRS has numerous potential applications, including security systems, attendance management systems, and access control systems. The paper also suggests future research to focus on improving the system's accuracy and robustness to variations in illumination and pose. While the RTFRS achieved a high recognition rate in the experiments, the accuracy could still be affected by lighting and pose variations. Furthermore, the system's performance could be impacted by the size of the dataset used for training and testing.

The research paper provides an extensive review of related work in the field of real-time face recognition systems. The authors discussed different techniques and algorithms used in previous studies and highlighted their strengths and limitations. The paper concludes that the proposed RTFRS achieved a high recognition rate and is simple to implement. However, further research is needed to improve the system's accuracy and robustness to lighting and pose variations. Overall, the paper contributes to the advancement of real-time face recognition systems and provides a valuable foundation for future research in the area.

Paper 7: Factors Affecting the Use of Facial Recognition Payment An Example of Chinese Consumers

The study conducted by W. K. Zhang and M. J. Kang explores the factors that influence the adoption of facial recognition payment systems among Chinese consumers. The authors conducted a survey of 400 Chinese consumers and utilized structural equation modeling to analyze the data. The results of the study revealed that perceived usefulness and trust had a positive impact on consumers' intentions to use facial recognition payment systems, whereas perceived risk had a negative impact. The study also identified several demographic factors, such as age, education, and income, that significantly affect consumers' attitudes towards facial recognition payment systems.

The authors' findings have significant implications for the development and adoption of facial recognition payment systems in China and other countries. They suggest that policymakers and developers should focus on improving the perceived usefulness and trustworthiness of the systems to

promote their adoption. Furthermore, they recommend that efforts should be made to address consumers' concerns about privacy and security to mitigate the negative impact of perceived risk on adoption.

The paper provides a comprehensive literature review of previous research on mobile payment systems and facial recognition technology adoption, and the authors discuss various theoretical models used to understand consumers' attitudes and intentions towards new technologies. The authors used a quantitative research approach and explained the methodology used to analyze the data and test the research hypotheses. The study's results are presented using tables and graphs to facilitate interpretation.

The study's strengths include its large sample size and the use of structural equation modeling to analyze the data. The authors have also discussed the practical implications of their findings for developers and policymakers interested in promoting the adoption of facial recognition payment systems. However, the study has some limitations, such as its cross-sectional design and focus on a specific cultural context. Future research could address these limitations by using longitudinal designs and exploring facial recognition payment system adoption in other cultural contexts.

In conclusion, this paper is a valuable contribution to the literature on the adoption of facial recognition payment systems. Its findings could inform the development and implementation of facial recognition payment systems and help to address consumers' concerns about privacy and security.

Paper 8: ICC Banking Commission Collected Opinions 2012-2016, ICC International Chamber of Commerce, 2016.

In this research paper, G. Collier compiles the opinions of the ICC Banking Commission between 2012 and 2016 to provide insights into the current trends and challenges in the banking industry, specifically in trade finance, supply chain finance, and financial crime compliance. The opinions come from a range of experts and practitioners in the banking industry, including regulators, lawyers, academics, and bankers, and are thematically organized to cover a broad range of topics, such as blockchain in supply chain finance and the challenges of anti-money laundering regulations.

The paper emphasizes the importance of collaboration and standardization in the banking industry to address challenges in global and digitalized contexts. It also stresses the need for banks to remain updated with technological developments and to invest in training and education to enhance their employees' skills and knowledge.

This paper provides a comprehensive overview of the current banking industry trends and challenges, making it a valuable resource for anyone interested in the field. The paper presents nuanced and insightful perspectives from diverse experts and practitioners and also offers relevant examples and case studies to illustrate the issues discussed.

Additionally, the paper highlights the importance of innovation and collaboration for the sustainability and competitiveness of the banking industry, especially in addressing financial crime compliance. Policymakers, regulators, industry professionals, and researchers interested in staying current with banking industry trends and challenges may find this paper useful.

Paper 9: The Paymemt System, Payments, Securities and Derivatives, and the Role of the Eurosystem, European Central Bank, 2010.

The research paper titled "The Payment System, Payments, Securities and Derivatives, and the Role of the Eurosystem" is published by the European Central Bank in 2010. The paper provides a detailed overview of the payment system, payment instruments, securities, and derivatives markets in the euro area, as well as the role of the Eurosystem in these areas. The paper discusses the importance of payment systems and payment instruments in facilitating economic transactions and fostering economic growth. It provides an overview of the different types of payment instruments, including cash, cheques, credit transfers, and direct debits, and their characteristics.

The paper also covers the securities and derivatives markets and their importance in supporting financial stability and risk management. It discusses the different types of securities and derivatives, their characteristics, and their role in financial markets. The paper highlights the role of the Eurosystem in ensuring the smooth functioning of payment systems and promoting financial stability. It explains the Eurosystem's payment and settlement systems, such as TARGET2 and TARGET2-Securities, and their role in facilitating cross-border transactions and ensuring the safety and efficiency of payment and settlement systems.

In conclusion, the paper provides a comprehensive overview of the payment system, payment instruments, securities, and derivatives markets in the euro area and the role of the Eurosystem in these areas. It is a valuable resource for policymakers, regulators, and practitioners in the financial industry who are interested in understanding the workings of the payment and settlement systems and the securities and derivatives markets. The paper provides insights into the challenges faced by the Eurosystem in ensuring the smooth functioning of payment and settlement systems in the euro area. It discusses the issues related to cross-border transactions and the need for harmonization of payment systems across different countries.

The paper also highlights the importance of risk management in the securities and derivatives markets and the role of the Eurosystem in promoting financial stability. It explains the Eurosystem's approach to risk management, including the use of collateral and the management of credit risk.

The paper provides a detailed analysis of the different types of payment and settlement systems, including large-value payment systems, retail payment systems, and securities settlement systems. It discusses their features, advantages, and disadvantages, and the challenges faced in ensuring their smooth functioning.

Overall, the paper provides a comprehensive overview of the payment and settlement systems, securities, and derivatives markets in the euro area and the role of the Eurosystem in these areas. It is a valuable resource for anyone interested in understanding the workings of the financial system in the euro area and the challenges faced by policymakers and regulators in ensuring its stability and efficiency.

Paper 10: Bio Pay: A Secure Payment Gateway through Biometrics.

The paper "BioPay: A Secure Payment Gateway through Biometrics" proposes a payment gateway system called BioPay that utilizes biometric authentication methods to ensure secure and authentic payment transactions. The paper recognizes the limitations of existing payment systems and emphasizes the need for a secure gateway to prevent fraud and identity theft.

The paper explains the architecture and functionality of the BioPay system, which employs biometric authentication methods like fingerprint recognition, face recognition, and iris recognition to verify the user's identity. The system also integrates encryption and decryption techniques to secure the transaction data.

Additionally, the paper presents the results of a performance evaluation that demonstrates the efficiency and effectiveness of the BioPay system, including its accuracy, speed, and capacity to handle multiple transactions simultaneously without compromising security.

In summary, the paper proposes BioPay as a biometric-based secure payment gateway system with superior security, authentication, and efficiency. It is an essential resource for professionals and policymakers involved in cybersecurity and information management interested in developing secure and efficient payment systems.

Paper 11: Face Recognition of Face Images with Hidden Parts Using Gabor Wavelets and PCA.

The research paper by Ennaama, Benhida, and Boulahoual proposes a hybrid approach for face recognition of images with hidden parts using Gabor wavelets and Principal Component Analysis (PCA). The paper explains the technical details of the proposed method, which involves the use of Gabor wavelets for feature extraction and PCA for feature reduction. The method is evaluated on the Yale face database, and it demonstrates high recognition rates even in the presence of occlusions or hidden parts in the images. The paper compares the proposed method with other state-of-the-art methods and discusses its advantages and limitations. The authors also present the experimental results in terms of recognition rate, false acceptance rate, and false rejection rate, which show the effectiveness of the proposed approach. Overall, the paper presents an innovative solution for face recognition tasks in real-world scenarios, which can be useful in various applications, such as security, surveillance, and biometrics. The proposed method can be further improved and extended in future research.

Paper 12: Literature Review: Implementation of Facial Recognition in Society.

The research paper by Zarkasyi, Hidayatullah, and Zamzami provides a literature review of the implementation of facial recognition technology in society. The paper discusses the history, benefits, and challenges of facial recognition technology, including its applications in law enforcement, security, and surveillance. The authors also review the current state of research on facial recognition, including recent developments in deep learning, machine learning, and artificial intelligence. The paper highlights the importance of ethical considerations and the need to balance the benefits of facial recognition with its potential risks, such as invasion of privacy, bias, and discrimination. The authors also discuss some of the current debates and controversies surrounding facial recognition technology, such as its use in law enforcement and its potential impact on civil liberties. Overall, the paper provides a comprehensive overview of the current state of research on facial recognition technology and its societal implications, which can be useful for researchers, policymakers, and practitioners working in this field.

Paper 13: Improving Face Recognition by Elman Neural Network using curvelet Transform and HSI Color Space.

The research paper by Abdullah, Abed, and Al Barazanchi presents a new method for improving face recognition using an Elman neural network, curvelet transform, and HSI color space. The proposed method involves extracting features from face images using curvelet transform and HSI color space, followed by training an Elman neural network to classify the face images. The authors evaluate the proposed method on the ORL face database and compare it with other state-of-the-art methods. The results show that the proposed method outperforms other methods in terms of recognition rate, false acceptance rate, and false rejection rate. The paper also discusses the importance of feature extraction and selection in face recognition and the advantages of using curvelet transform and HSI color space.

The authors suggest that the proposed method can be further improved by incorporating other image processing techniques and applying it to larger datasets. Overall, the paper presents a promising approach for improving face recognition using advanced machine learning and image processing techniques, which can be useful in various applications such as security and biometrics.

Paper 14: Secure Banking by Face Recognition Method.

The research paper by Porselvi et al. proposes a new method for secure banking using face recognition technology. The authors discuss the limitations of traditional methods of authentication in banking, such as passwords and PINs, and highlight the importance of biometric authentication methods for enhanced security. The proposed method involves capturing a customer's face image during registration and using it for authentication during transactions. The authors evaluate the proposed method using the LFW face database and report a recognition rate of 93.6%. They also compare the proposed method with other state-of-the-art face recognition methods and find that it performs better in terms of recognition rate and processing time. The paper also discusses the importance of data privacy and security in banking and suggests that the proposed method can help prevent identity theft and fraud. Overall, the paper presents a promising approach for enhancing the security of banking transactions using advanced biometric authentication methods. However, further evaluation on a larger dataset and real-world testing is necessary to fully validate the proposed method.

Paper 15: The Impact of Face Recognition Payment in the Economic.

The research paper by M. Wei and Dr. V. P. L. Rodrigo explores the impact of face recognition payment on the economy. The authors discuss the rising popularity of face recognition payment systems and their potential to transform traditional payment methods. The paper highlights the advantages of face recognition payment systems, such as faster transactions, improved security, and increased convenience. It also analyses the potential challenges and risks of such systems, such as privacy concerns and the need for reliable and accurate facial recognition technology.

The authors conducted a survey among consumers in China to gain insights into their attitudes and perceptions towards face recognition payment systems. The results showed that consumers were generally positive towards the technology, with most indicating that they would use it if it was widely available. The paper concludes that face recognition payment systems have the potential to contribute significantly to economic growth, but proper regulations and guidelines are necessary to ensure their safe and effective implementation. Overall, the paper provides a valuable insight into the potential impact of face recognition payment systems on the economy.

Paper 16: Secure Online Payment with Facial Recognition Using MTCNN

The primary concern with online transactions is security, which is a critical factor that affects people's trust in using such services. This paper proposes a two-step verification system that uses Multi-Task Cascaded Convolutional Neural Network (MTCNN) for facial recognition to enhance security. The MTCNN algorithm verifies the user's identity by comparing a real-time image of the user captured during the transaction against the images associated with their account. As personal details of users can be easily compromised in today's world of advanced technology, security has become a crucial aspect when making digital payments. Therefore, a 2-step verification process, consisting of OTP verification followed by facial recognition, has been proposed to increase the security of online transactions.

Facial recognition techniques used in the proposed system include Principal Component Analysis (PCA), Support Vector Machine (SVM), Linear Discriminant Analysis (LDA), Convolutional Neural Network (CNN), and MTCNN. PCA reduces the dimensionality of data, based on Eigen values and Eigen vectors, to reduce the number of parameters in images that are high-dimensional correlated data. SVM-based classifiers predict the similarity and dissimilarity between two images, while LDA is used for feature extraction. MTCNN is an algorithm consisting of three stages that detect the bounding boxes of faces in an image along with their 5-Point Face Landmarks. FaceNet, on the other hand, maps face images directly to a compact Euclidean space, using the Labelled Faces in the Wild (LFW) public database to train CNNs. The proposed system uses the LFW dataset to train the network and a personal database to test it.

Credit Card Transaction Using Face Recognition Authentication is a system that integrates face detection and recognition technology using Haar Cascade and GLCM algorithms for credit card transactions. The system comprises of four components, namely Database, Client, Server, and MTCNN. The network uses a cascade structure with three networks, where the first network rescales the image to a range of different sizes, the second network proposes candidate facial regions, and the third network proposes facial landmarks. The Refine Network (R-Net) filters the bounding boxes to ensure that only facial regions are included in the final output. Overall, the proposed system offers an enhanced level of security and convenience for online transactions, with the added benefit of facial recognition technology.

Paper 17: Credit Card Transaction Based on Face Recognition Technology

As the use of cashless transactions increases, the demand for credit cards is rapidly growing. However, the major challenge for credit card users is ensuring secure online transactions. To address this challenge, this research proposes a system that uses face detection and recognition technology to make

the credit card transaction system more secure and efficient. The proposed system aims to provide a fully automatic and reliable mode of online transaction processing. In this system, the user's features are authenticated by matching the user's image features with those stored in the administrator's database. If the features match, the transaction is successful; otherwise, the user is denied, and the transaction does not proceed.

To implement the proposed system, the Haar Cascade algorithm is used, which is a machine learning object detection algorithm used to identify objects in images or videos. This algorithm is known for its ability to detect faces and parts of images. The algorithm has four stages: Haar Feature Choice, creating Integral images, Adaboost training, and Cascading Classifiers. The next step is face detection, which is the first and essential step for face recognition, and it is used to detect faces in images. Face detection also refers to the psychological process by which humans detect and recognize faces in a visual scene. Once the face image is cropped from the given image input, the features are extracted and stored in the database using Gray Level Co-occurrence Matrix (GLCM). A GLCM is a matrix where the number of rows and columns is equal to the number of grey levels in the image.

In summary, this research proposes a system that utilizes face detection and recognition technology to enhance the security of credit card transactions. The proposed system is designed to provide a fully automatic and reliable mode of online transaction processing, which will help to ensure secure and efficient transactions. The Haar Cascade algorithm is used to detect faces and parts of images, and the GLCM is used to store the extracted features in the database. Overall, the proposed system provides a promising solution for enhancing the security of online credit card transactions.

Paper 18: Authentication of E-Payment using Face Recognition System

As more and more people are using online banking, the risk of timed-out transactions, malware-based attacks, and illegal use of technology is also increasing. This highlights the need for secure payment systems. The proposed "Authentication of E-Payment using Face Recognition" system is based on the face recognition technique, which verifies the details of the payee before processing the transaction. If the details are found to be legitimate, the facial details of the payee are collected and compared with the details stored in the corresponding bank's database. A positive response leads to a successful transaction, while a negative response terminates the transaction.

This system is specifically designed to promote e-payments for online shopping by eliminating the need for OTP-based transactions. The system uses an electronic gateway for secure transactions between clients and merchants, utilizing facial recognition technology for authentication. A new user must first register themselves through a registration form before browsing the merchant's website and selecting

an item for purchase. The payment request is then encrypted and sent to the server for processing. The server receives the encrypted message, decrypts it, and reads the facial details. It then encrypts the details using its own keys and sends them to the client bank. The client bank authenticates the facial data with the information available in its database, and if successful, transfers the required amount to the merchant bank through a secure network. After receiving the payment, the merchant bank sends the payment to the merchant. The goal is to develop a non-intrusive payment method without the need for extra devices or human involvement.

To ensure the efficiency of the system, the LBPV algorithm is used. This is a simplified and efficient joint LBP and contrast distribution method. The Local Binary Pattern (LBP) calculation does not contain any information related to variance, making it a suitable algorithm for this system. By using the LBPV algorithm, the system can accurately and efficiently authenticate facial data, providing a secure payment gateway for online transactions.

Paper 19: Face Recognition Systems: A survey.

Facial recognition technology has become increasingly important in smart cities. Many systems are now using multiple biometric factors for recognition tasks as they are easy to use and more reliable than other systems such as eye, iris, or fingerprint recognition. However, facial recognition systems still face several challenges, such as head orientation, lighting conditions, and facial expression.

To develop a robust facial recognition system, three basic steps are used: face detection, feature extraction, and face recognition. Face detection involves the localization of human faces in a given image. Feature extraction is where the features of the face images detected in the detection step are extracted. Finally, face recognition compares the extracted features with known faces stored in a specific database.

Holistic or subspace approaches process the entire face, without extracting face regions or feature points. These approaches represent the face image using a matrix of pixels, which is converted into feature vectors to facilitate treatment. Kernel PCA (KPCA) is an improved method of PCA that uses kernel method techniques to compute the Eigenfaces or Eigenvectors of the kernel matrix. In the last step of recognition, the extracted face is compared to known faces in a specific database using various comparison techniques.

Although facial recognition technology still faces some challenges, its use is expected to increase in smart cities as it offers a reliable and convenient mode of identification. Further advancements in

technology and security algorithms will enhance the accuracy and efficiency of facial recognition systems, making them more accessible to a wider audience.

Paper 20: A Robust Hybrid Biometric Face Recognition Payment System

The scope of this paper focuses on face recognition, its various applications, and essential steps involved in it. Conventional payment methods are no longer reliable due to their vulnerability to fraud and theft, and biometric-based systems are being developed to enhance payment security and efficiency. The paper examines the impact of face recognition, including its positive and negative effects, based on security, robustness, accuracy, complexity, and discrimination, and presents a survey of numerous studies. The proposed system utilizes DCT-PCASVM and DCT-LDA-SVM to improve face recognition accuracy. Face detection, which identifies the existence of a face in an image or video, is a biological process performed by humans. However, implementing this approach in the field of computer vision is a complex task.

In electronic face recognition, the reliability of the Face Detection Model is crucial to the performance and overall reliability of the face recognition system. The face identification system must verify the presence of the input face image by distinguishing it among all the faces stored in a database. Payment services play a vital role in monetary considerations, especially in agricultural countries where they are often the first point of entry into formal monetary administrations. Electronic Payment Services (EPS) technology makes access to financial services easier, less expensive, and more secure for people, particularly those with lower-income and living in remote parts of society.

The proposed system extracts effective features from accelerometer data using DCT, and dimensionality is reduced using PCA or LDA to extract features from images in the DCT domain. Support Vector Machine (SVM) is then used to classify human activities. During the recognition phase, the system determines whether the customer is known or not. Biometrics are increasingly becoming ubiquitous, and numerous research works are being conducted to enhance biometrics. If the image of the face does not exist in the database, the system sends an error message. On the other hand, if the image of the face is present in the database, either the DCT-PCASVM or the DCT-LDA-SVM is utilized to recognize the face.

In conclusion, the proposed system based on DCT-PCASVM and DCT-LDA-SVM is an innovative solution for improving the accuracy of face recognition. Face recognition has significant applications, including enhancing payment security and efficiency. The Face Detection Model's reliability is critical to the performance of the face recognition system. Biometrics is an expanding field with numerous research works aimed at improving its capabilities.

Sr. No	Title	Publication Year	Approach (methodology)	Advantage	Disadvantage
1	Face Recognition-semi supervised classification	InTechOpen, 2016	-Image uploading	Easy to access the system.	Slow while uploading images
2	Secure Online Payment with Facial Recognition	IRJET, 2019	-Image Recognition -Pattern finding	allows integration and confidentiality	DOS attack can occur
3	Secured Payment System Using Face Recognition Technique	AIP Conference, 2020	-Pattern Finding -Evaluation	allows integration and confidentiality	high camera quality is needed
4	A Study on the Impact of Face Recognition Payment System Characteristics and Innovation Resistance	TURCOMAT, Chinese Computer and Mathematics Education, 2021	-Fast and secure payment methods	Convenient, Efficient, Accurate	Privacy concerns, potential for bias and inaccuracies
5	Implementation and performance of Face Recognition Payment System Securely Encrypted	Zhejiang University, 26 June 2022	-Reliable and trustworthy algorism	Efficient identity verification.	The risk of misuse or abuse of the technology.
6	Design and Implementation of Real Time Face Recognition System.	RTFRS, International Journal of CS, 2014	-Pattern Finding -Image uploading	used for various applications such as security systems, surveillance	does not provide evaluation of the system performance in terms of its scalability, robustness, or security
7	Factors Affecting the use of Facial-Recognition Payment.	IEEE Access, 2019	-Query section -Image Recognition	provides insights into the factors that affect the use of facial recognition	The study was conducted only in China, and the results may not be

				payment systems, which can be used to inform the design and implementation of such systems	generalizable to other countries or cultures
8	ICC Banking Commission Collected Opinions.	ICC International Chamber, 2016	-Image uploading	covers a wide range of topics related to international trade and finance, such as risk management, supply chain finance, trade finance, and financial regulation	based on the opinions and perspectives of the ICC Banking Commission members and may not be representative of the views of the wider industry or society.
9	The Payment System, Payments, Securities and Derivatives, and the Role of the Euro system	European Central Bank, 2010	-Query section - Security maintained	discusses the regulatory framework and the measures taken by the Euro system to promote the efficiency, safety, and reliability of payment systems.	does not provide empirical data or analysis to support the perspectives presented.
10	BioPay: A Secure Payment Gateway through Biometrics	Journal of Cybersecurity and information management, 2021	-Query section - Security maintained	provides a detailed description of the BioPay system and the biometric technologies used to authenticate users and secure transactions	does not discuss the potential ethical and privacy concerns associated with the use of biometric data for payment authentication
11	Face Recognition of Face Images with Hidden Parts Using Gabor Wavelets and PCA	Periodicals of Engineering and Natural Sciences	-Image Recognition -Image uploading	Used Hybrid Approach to remove the Masquerade attack	Complex and Advanced Correlation and DCT is used which returns the high space and time complexity.

12	Implementation of Facial Recognition in Society	Journal of Physics: Conference Series ,2020	-Image Recognition	risk management, supply chain finance, trade finance, and financial regulation	The risk of misuse or abuse of the technology.
13	Improving Face Recognition by Elman Neural Network using curvelet Transform and HSI Color Space.	Periodicals of Engineering and Natural Sciences, 2019	-Progress system -Data entry -Evaluation	provides insights into the factors that affect the use of facial recognition	Privacy concerns, potential for bias and inaccuracies
14	Secure Banking by Face Recognition Method	IRJET, 2021	-Evolution system	Convenient, Efficient, Accurate	DOS attack can occur
15	The Impact of Face Recognition Payment in the Economic	DESD 2021	-Query section -Pattern Finding	used for various applications such as security systems, surveillance	does not provide empirical data or analysis to support the perspectives presented.
16	Secure Online Payment with Facial Recognition Using MTCNN	International Journal of Applied Engineering Research , 2020	-Pattern Finding -Image uploading	The training of the MTCNN on our personal dataset of faces resulted in an accuracy of 80-85%	CNN needs to perform high computation which uses GPU for implementation.
17	Credit Card Transaction Based on Face Recognition Technology	Journal of Physics: Conference Series , 2019	-Image Recognition -Image uploading	The system is reliable and efficient mode of transaction process.	The comparison of the input image and the image stored in database should be fast and reliable enough.
18	Authentication of E-Payment using Face Recognition System	International Journal of Engineering Science and	-Fast and secure payment methods	user must have account in the bank which is registered	Spoofing of Image or masquerade as another person maybe possible and tries to

		Computing , 2019		on E-payment Gateway	gain an access to the system.
19	Face Recognition Systems: A survey	Sensors, 2020	-Query section - Security maintained	Used Hybrid Approach to remove the Masquerade attack	Complex and Advanced Correlation and DCT is used which returns the high space and time complexity.
20	A Robust Hybrid Biometric Face Recognition Payment System	(IJRTE), 2020	-Query section -Pattern Finding -Progress system	Face recognition in payment systems can ensure the security of the account, enhance payment efficiency and become faster and more convenient	face recognition methods can be sensitive to lighting, facial expressions, aging, face orientation, pose variation, and hidden areas of face images, making recognition difficult

Table 2.1 About Research papers

Chapter 3

Software Setup and Methodologies

Our software system is composed of many advanced technologies such as Machine learning, Cloud computing, and wireless networks and UX and UI. We are going to use UX tools such as Flutter and Dart developed by Google for beautiful user interface designing. Secured servers from amazon for data storing.

3.1 Hardware module

The Hardware module will consist of computers and laptops and cameras. This system of hardware components will collect the data and transmit it to the processing servers for further analysis and data storage.

Minimum Server Requirements:

- Processor speed 1.3 GHZ (Recommended)
- Memory: 1 GB RAM (Recommended)
- Hard Disk: 20 MB (Recommended)
- Ethernet or compatible network connection to internet
- 256 Kbps Network Bandwidth
- 1024 x 760 (Optimal) Video Resolutions

Minimum Client Requirements:

- Processor: Intel Pentium IV or Upgraded
- Monitor / Mobile Phone / Tablet / Laptop
- Internet Connectivity

3.1.1 Computers

Computers are essential components in the development and operation of online payment software, as they enable the software to process transactions, manage data, and provide secure connections between the payment gateway and the user's device. Additionally, computers facilitate the integration of various payment methods, such as credit cards, digital wallets, and bank transfers, into the software, making it more convenient and accessible for users. Furthermore, computers allow online payment software to automate various processes, such as billing, invoicing, and payment tracking, thereby reducing manual labor and increasing efficiency.

Figure 3.1 Normal laptop with basic hardware

3.1.2 Memory

Memory plays an important role in online payment software as it is responsible for the efficient storage and retrieval of data related to payment transactions. A sufficient amount of memory ensures that the software can handle a large number of transactions simultaneously without crashing or slowing down. It also enables the software to perform data-intensive tasks such as encryption and decryption of sensitive information, and processing of complex algorithms for fraud detection and prevention. In addition, memory also allows for faster access to frequently used data, reducing the response time of the software and enhancing the overall user experience.

Figure 3.2 SDD or HDD with 1 to 8 gb space

3.1.3 Power Supply

Power supply is crucial for the proper functioning of online payment software. Without a reliable power source, the system may crash or experience errors, leading to transaction failures, loss of data, or security breaches. A stable power supply ensures that the system is operational at all times, preventing interruptions and downtime that could affect transaction processing and customer satisfaction. Additionally, a backup power source, such as a generator or uninterruptible power supply (UPS), can provide additional protection against power outages and other disruptions.

Figure 3.3 55watt laptop charger

Figure 3.4 3470mAh battery Li_ion

3.2 Software Module

The software modules required for online facial recognition payment software can include:

- Face detection module: This module identifies the presence of a face in the input image or video and locates its position.
- Face alignment module: This module aligns the detected face in a standardized position to reduce variations caused by different angles and lighting conditions.
- Face recognition module: This module matches the aligned face with the stored template in the database to authenticate the user's identity.
- Payment processing module: This module handles the transaction process, including validating the user's account and processing the payment.
- Security module: This module ensures the security of the transaction data and protects against fraud and identity theft.
- User interface module: This module provides a user-friendly interface for users to interact with the software, including capturing the facial image and providing feedback on the transaction status.

- Database module: This module stores and retrieves the user's information and transaction records.

3.3 Architecture of the system

- Client-Server Architecture: This architecture involves dividing the system into two main components, the client-side and the server-side. The client-side is responsible for user interaction and capturing facial images, while the server-side is responsible for processing facial images, performing facial recognition, and handling the payment transaction. This architecture can provide scalability, security, and better resource management.

- Cloud-Based Architecture: This architecture involves hosting the system on a cloud infrastructure such as AWS, Google Cloud, or Azure. This can provide scalability, reliability, and easy access from anywhere. Facial recognition can be performed using pre-trained models provided by the cloud service or by developing custom models.

- Hybrid Architecture: This architecture combines two or more architectures, such as client-server or cloud-based and client-server. This can provide the benefits of both architectures, such as scalability, modularity, and reliability.

- Edge Computing Architecture: This architecture involves performing facial recognition and payment processing at the edge devices such as smartphones, tablets, or laptops. This can provide faster response times, reduced network latency, and better user experience. However, this architecture requires powerful devices with sufficient processing capabilities.

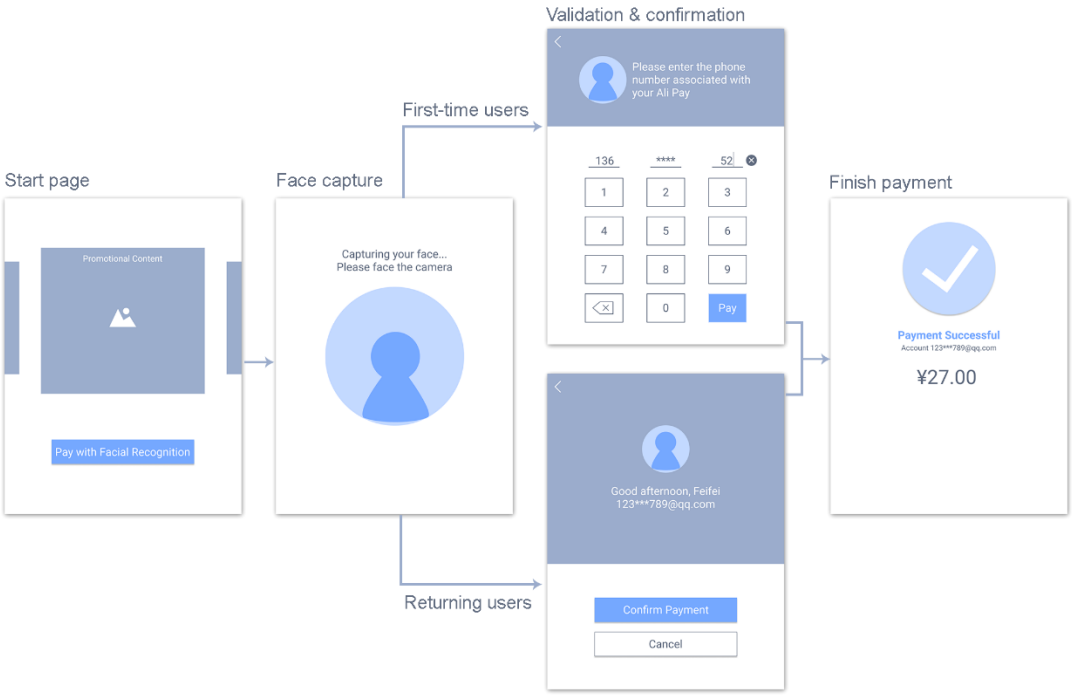


Figure 3.5 Start Page to Finish Page

3.4 Project Flow

The project flow for a face recognition online payment software can be broken down into several stages:

- Planning: In this stage, the objectives and requirements of the project are defined. The stakeholders involved in the project are identified, and a project plan is created.

- Design: In this stage, the system architecture, data flow, and user interface are designed. The database structure, user roles, and authentication mechanisms are also designed.

- Development: In this stage, the software is developed using the selected technology stack. The face recognition algorithm is integrated with the payment system. User testing is also performed to identify and fix bugs.

- Testing: In this stage, the developed software is tested for functionality, performance, security, and usability. The face recognition algorithm is tested using real-world scenarios.

- Deployment: In this stage, the software is deployed on a production server. The payment gateway and face recognition API are integrated, and the system is tested end-to-end to ensure that it is working correctly.

- Maintenance: In this stage, the software is maintained and updated as required. Bug fixes, security patches, and new features are added to keep the system up-to-date and secure.

Throughout the project, regular communication and collaboration with the stakeholders and users is critical to ensure that the software meets the business and user requirements.

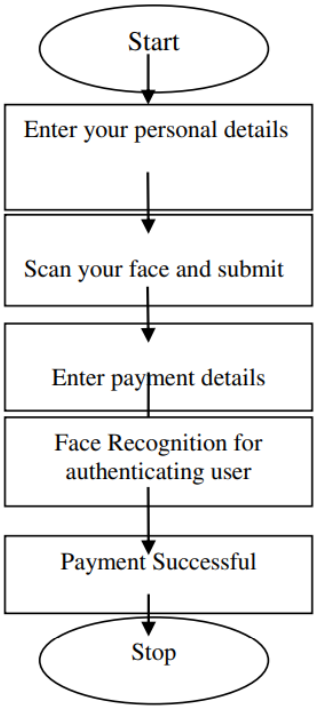


Figure 3.6 Flow of project diagram

3.4.1 Different Software Diagrams

Diagrams are an essential tool for designing and developing software, including an online face recognition payment software. Here are some reasons why diagrams are important:

- Visual Representation: Diagrams provide a visual representation of the software design and system architecture. This helps in understanding the complex relationships between different components of the software system, such as the payment gateway, the face recognition API, the database, and the user interface.

- Communication: Diagrams enable effective communication between team members, stakeholders, and clients. They help in conveying technical concepts and ideas in a simple and clear manner, making it easier for non-technical stakeholders to understand the system.

- Planning: Diagrams are useful for planning and organizing the software development process. They help in identifying the tasks, timelines, and dependencies between different phases of the project.

- Testing: Diagrams also help in testing and debugging the software system. They provide a visual representation of the expected behavior of the system, which can be compared to the actual behavior during testing.

- Documentation: Diagrams serve as a valuable source of documentation for the software system. They provide a reference for future updates, maintenance, and troubleshooting.

In summary, diagrams are a crucial tool for designing, developing, testing, and maintaining an online face recognition payment software system. They enable effective communication, planning, and documentation, helping to ensure the success of the project.

Use case Diagram

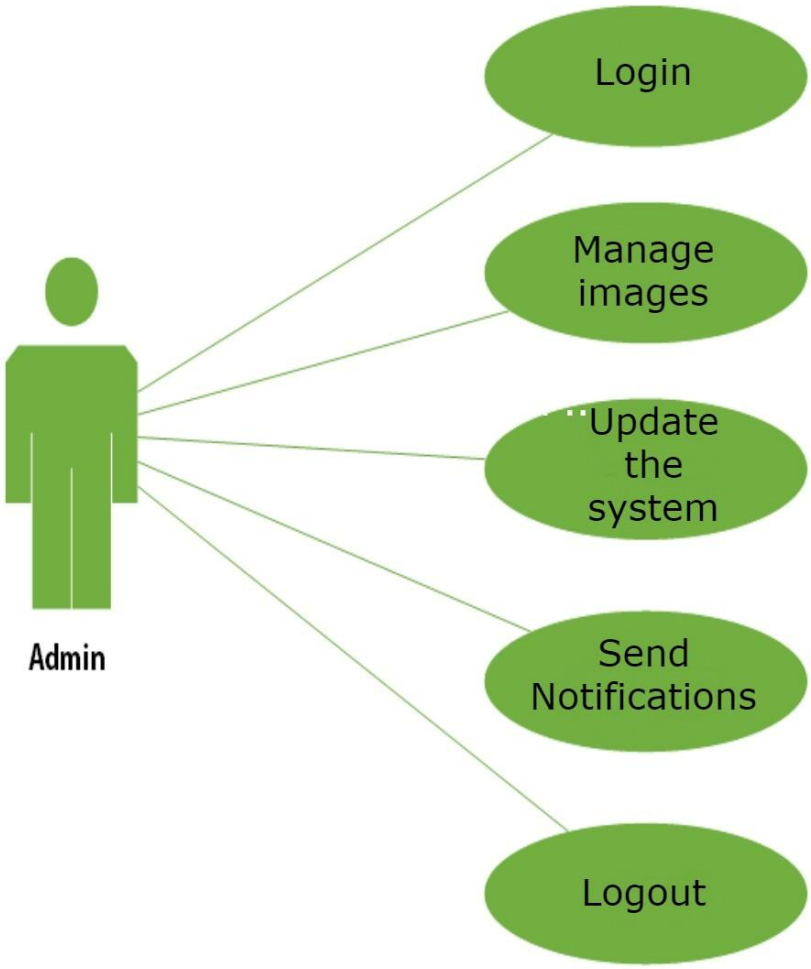


Figure 3.7 Use case diagram for Admin

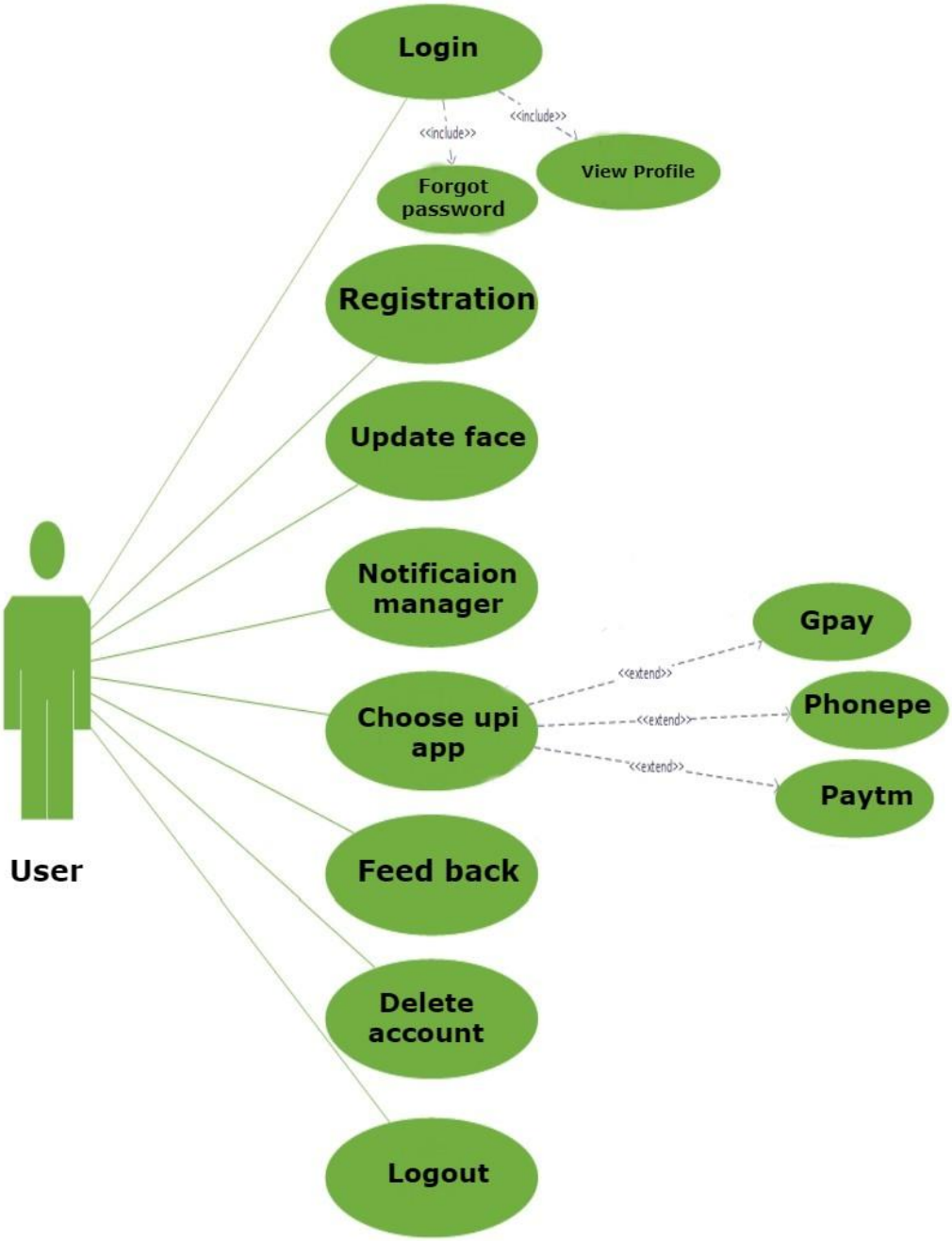


Figure 3.8 User use case diagram

Sequence diagram

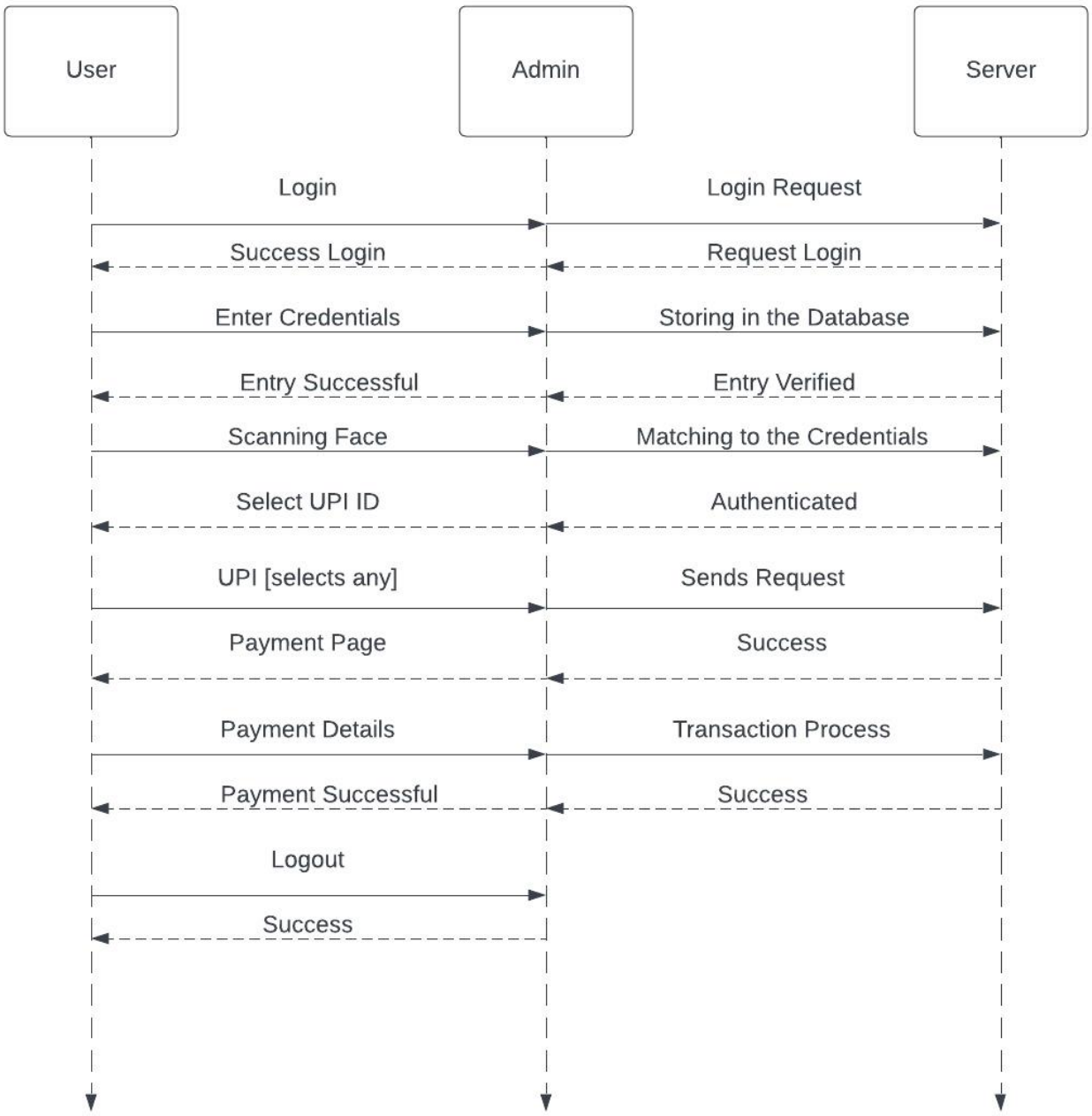
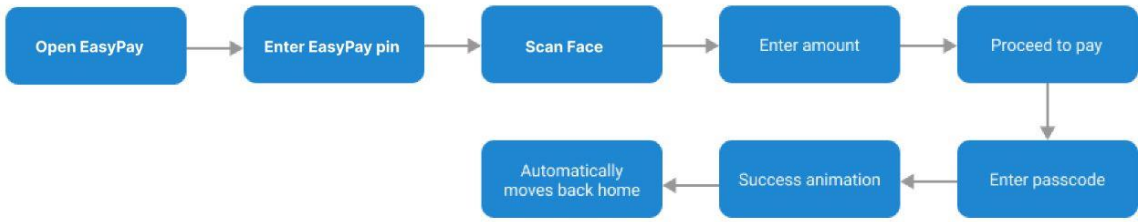


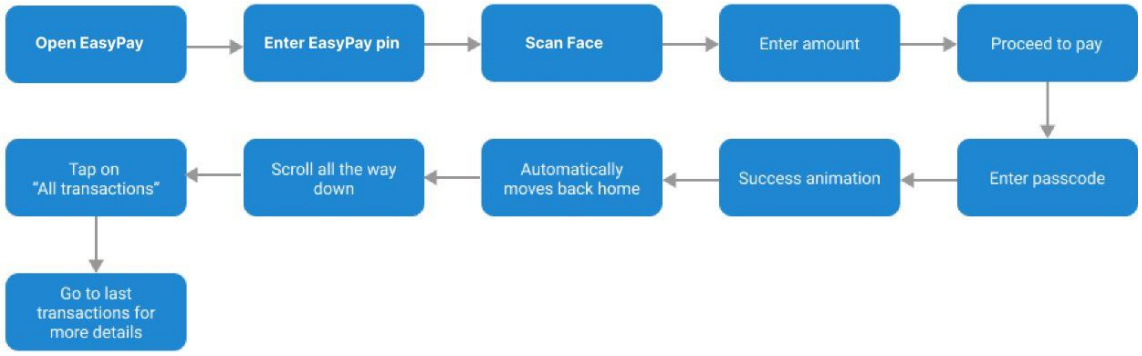
Figure 3.9 Sequence diagram of our software

Flow diagram

1. Successful payment flow



2. Flow that the users maybe following to fix the issue



3. Proposed flow

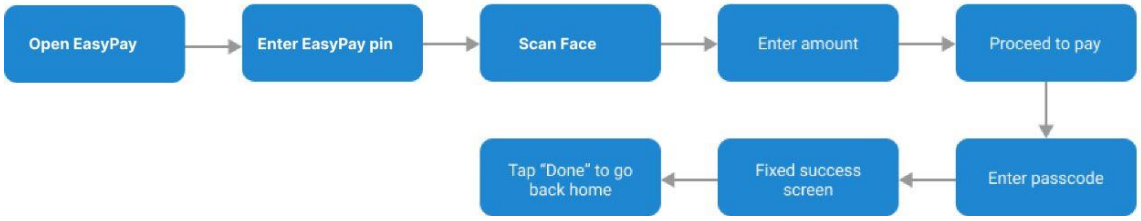


Figure 3.10 Flow of data in the application

Data Dictionary

Table Name: Person Details
Primary Key: Id
Foreign Key: User Id, Name, Profile Picture, Account Balance
References:

Column Name	Data Type	Size	Constraint	Description
Id	Integer	20	Primary Key	Id
User ID	Integer	30	Foreign Key	A unique identifier for each user of the app
Name	String	20	Foreign Key	The user's full name
Profile Picture	Image	30	Foreign Key	A picture of the user's face for verification purposes
Account Balance	Decimal	50	Foreign Key	The amount of money in the user's account
Payment History	String	50	Foreign Key	A record of the user's past payments
Transaction ID	Integer	30	Foreign Key	A unique identifier for each payment transaction
Payment Amount	Decimal	20	Foreign Key	The amount of money being paid
Recipient	String	20	Foreign Key	The name of the person or organization receiving the payment
Date	Date	10	Foreign Key	The date and time when the payment was made
Verification Status	Boolean	10	Foreign Key	A flag indicating whether the user's face was successfully verified for the payment
Payment Status	String	10	Foreign Key	A status indicating whether the payment was successful or not
Payment Method	String	20	Foreign Key	The method of payment used, such as credit card or bank transfer

Table 3.1 Person Details table in database

Table Name: Location Details
Primary Key: Id
Foreign Key: Location, Device , Currency , Payment Type
References:

Column Name	Data Type	Size	Constraint	Description
Id	Integer	20	Primary Key	Id
Location	String	20	Foreign Key	The location where the payment was made
Device	String	30	Foreign Key	The device used to make the payment, such as a smartphone or tablet
Currency	String	30	Foreign Key	The currency used for the payment
Merchant ID	Integer	20	Foreign Key	A unique identifier for the merchant or vendor receiving the payment
Merchant Name	String	20	Foreign Key	The name of the merchant or vendor
Payment Type	String	30	Foreign Key	The type of payment, such as online purchase or in-store payment
Refund Status	String	10	Foreign Key	A status indicating whether a refund has been issued for the payment
Refund Date	Date	10	Foreign Key	The date when a refund was issued, if applicable
Refund Amount	Decimal	10	Foreign Key	The amount of money refunded, if applicable

Table 3.2 Location Details table in database

3.5 Face Recognition Algorithm

Face recognition algorithm is a computer-based technology that identifies and verifies the identity of a person by analyzing and comparing patterns of facial features extracted from digital images or video frames.

There are several types of face recognition algorithms, but some of the most common techniques used for this purpose include:

- Eigenfaces: This algorithm uses principal component analysis (PCA) to extract facial features and create a set of representative "eigenfaces." It then compares the input image with these eigenfaces to determine the closest match.

- Fisherfaces: Similar to Eigenfaces, Fisherfaces also uses PCA to extract features. However, it then applies linear discriminant analysis (LDA) to improve the accuracy of the recognition by reducing the variance of the features and enhancing the separability between different classes of faces.

- Local Binary Patterns (LBP): This algorithm extracts features from an image by analyzing patterns of local textures and intensity changes. It then compares these features with a database of known faces to identify the person.

- Convolutional Neural Networks (CNNs): CNNs are a type of deep learning algorithm that can automatically learn and extract high-level features from facial images. They have shown state-of-the-art performance in face recognition tasks and are widely used in many applications.

Face recognition algorithms are used in various fields, including security systems, law enforcement, and social media. However, it is essential to consider ethical and privacy concerns when using these technologies, such as data protection and consent of the individuals whose images are being processed.

Pseudo code

```
# Load face images from a dataset
dataset = load_dataset()

# Preprocess face images
preprocessed_dataset = preprocess_dataset(dataset)

# Compute eigenfaces
eigenfaces = compute_eigenfaces(preprocessed_dataset)

# Project faces onto eigenfaces
projected_faces = project_faces(preprocessed_dataset, eigenfaces)

# Train a classifier
classifier = train_classifier(projected_faces)

# Load a test image
```

```
test_image = load_test_image()

# Preprocess the test image
preprocessed_test_image = preprocess_image(test_image)

# Project the test image onto eigenfaces
projected_test_image = project_image(preprocessed_test_image, eigenfaces)

# Classify the test image
predicted_class = classify_image(projected_test_image, classifier)

# Display the predicted class
display_result(predicted_class)
```

Work need to be complete in future

Currently, we are in the midst of developing a face recognition algorithm that aims to achieve high accuracy and efficiency. Our goal is to complete the coding phase of the algorithm and proceed with testing it under various scenarios in the upcoming semester. We will analyse the performance of the algorithm in different situations and fine-tune it to ensure its robustness and effectiveness.

Moreover, we plan to build a working module of our project that will demonstrate the overall functionality of the algorithm. By creating a user-friendly interface, we hope to make our algorithm accessible and easy to use for a wide range of users. Our team is dedicated to delivering a reliable and accurate prediction algorithm that meets the needs of our users. We will continue to work hard to achieve our goals and bring our project to fruition.

Our objective is to develop a face recognition payment software that can facilitate secure and convenient payment transactions for users. To achieve this, we aim to collect user data in a secure and efficient manner and store it on the server side. We will then use this data to continually improve the accuracy and effectiveness of our payment software.

In order to achieve this goal, we plan to integrate real-time data processing capabilities into our software. By harnessing the power of this valuable information, we can enhance the user experience and provide more accurate and reliable payment solutions.

At present, we are working on developing our payment software using publicly available datasets to train our model and optimize our algorithm. However, our long-term vision is to create an infrastructure that can generate and utilize data from our users to improve our payment software's performance. Our team is dedicated to creating a secure, user-friendly payment software that meets the needs of our clients and customers. We will continue to work diligently towards achieving our goals and providing the best payment solutions possible.

The following is the order that we use to develop our software model.

- Development of the User Interface: As you plan to use Flutter and Dart for your user interface, you will need to develop a user-friendly and intuitive interface for your software. This will require designing and implementing user interfaces that are consistent with your project definition and software engineering diagrams.

- Integration of Face Recognition Algorithm: You will need to integrate the face recognition algorithm developed using Python into your software. This will involve writing the necessary code to interface with the algorithm and using it to identify users in real time.

- Database Management: As you plan to store user data on a database, you will need to develop and implement a database management system that is secure and efficient. This will involve setting up the necessary database schema, designing and implementing the necessary queries, and ensuring that your database is properly optimized.

- Payment Integration: You will need to integrate your software with a payment gateway to enable users to make payments securely. This will require designing and implementing the necessary interfaces and working with a payment gateway provider to integrate their services into your software.

- Testing and Quality Assurance: Once your software has been developed, you will need to thoroughly test it to ensure that it is functioning as expected. This will involve designing and implementing test cases, debugging any issues that arise, and ensuring that your software meets the highest standards of quality and reliability.

- Deployment: Once testing is complete, you will need to deploy your software to production servers to make it available to users. This will involve setting up the necessary infrastructure and ensuring that your software is properly configured and optimized for production use.

Overall, developing a facial recognition online payment software is a complex and challenging task that requires a high level of expertise and attention to detail. However, by carefully planning and executing each of these tasks, you can create a software that is secure, reliable, and user-friendly, and that meets the needs of your users.

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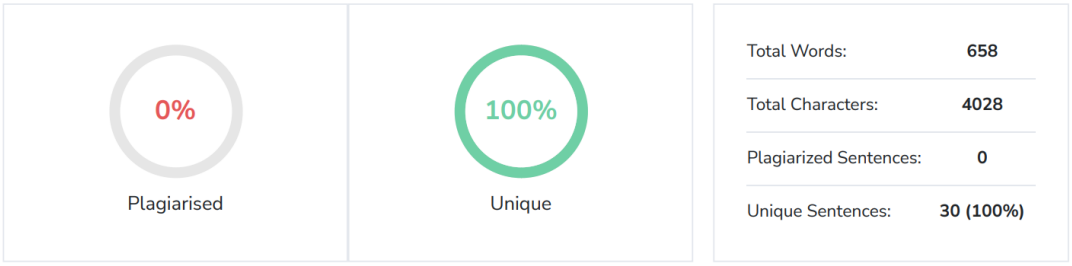
Plagiarism Report

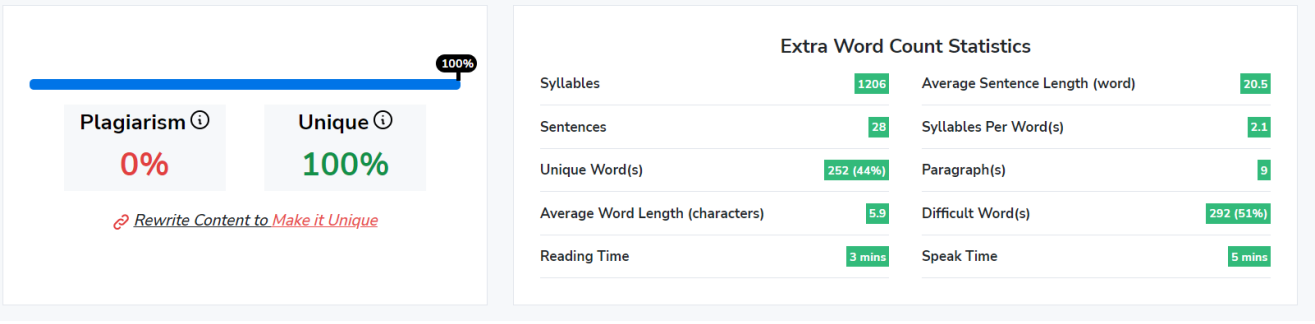
Plagiarism Scan Report

Report Generated on: Feb 25,2023

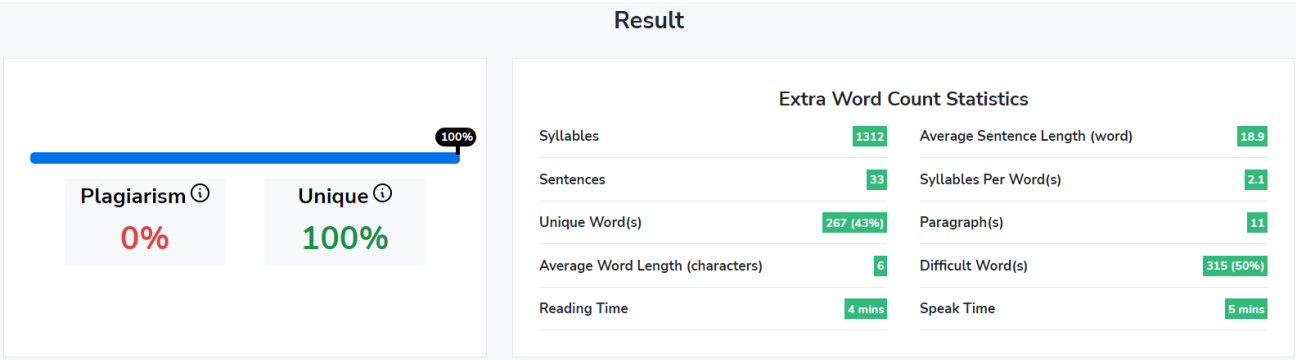


Content Checked for Plagiarism

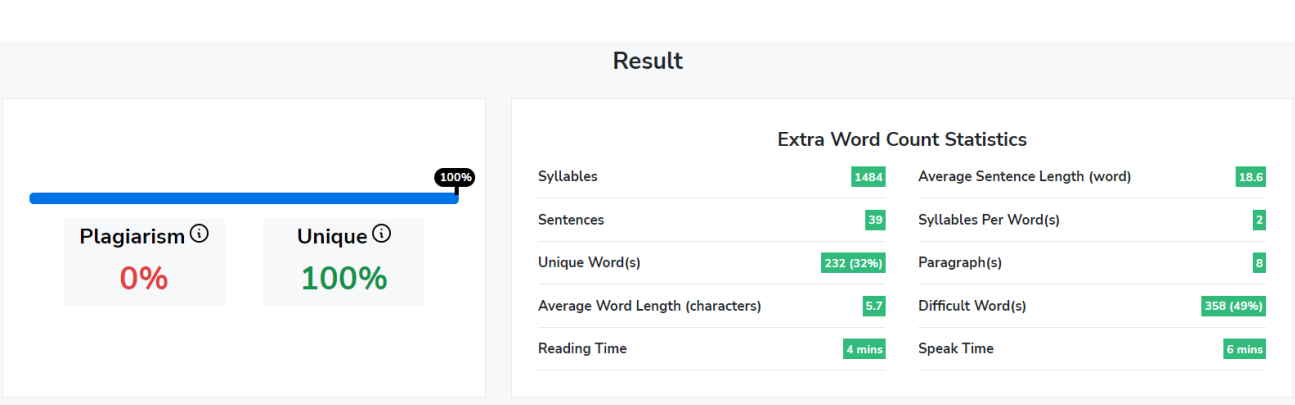
Result



Result



Result



Result

Plagiarism	Unique
0%	100%

Extra Word Count Statistics

Syllables	1304	Average Sentence Length (word)	18.3
Sentences	37	Syllables Per Word(s)	1.9
Unique Word(s)	235 (35%)	Paragraph(s)	13
Average Word Length (characters)	5.3	Difficult Word(s)	277 (41%)
Reading Time	4 mins	Speak Time	6 mins