

Enhanced Security Based on Face Detection in Payment Gateway

Submitted in partial fulfilment of the requirements for the award
of Bachelor of Engineering degree in Electronics and Communication
Engineering

By

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SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of PILLA SANDEEP (37130315) who carried out the project entitled " **Enhanced Security Based on Face Detection in Payment Gateway**" under the supervision of **Dr.M.R..Ebenazar Jebarani M.E.,Ph.D.**, from Dec 2020 to March 2021.

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ABSTRACT

To enhance the security of the transaction by giving 2 - step authentication i.e.. Face detection and proxy detection before entering the UPI pin in the transactions. It identifies even if a person tries to make a proxy transaction ,and prohibits from the process. We use Facenet Algorithm where embed 128 features point of each person face will be calculated with triplet loss function. Advantage of our proposed system is Proxy Detection will be implemented using image processing technique. This provided more secure to the system. To overcome the limitations and security holes we have proposed a 2 step authentication in transaction process. Advantage of our proposed system is Proxy Detection will be implemented using image processing technique. This provided more secure to the system. In the proposed system, Face Verification will be implemented using Face Net Deep Learning Algorithm to embed with 128 feature points of the face. Proxy Detection will be implemented using Support Vector Machine(SVM). Embed 128 features point of each person face will be calculated with triplet loss function. Facial features of every person will be classified using SVM. The face is checked with proxy and transaction will process and the Balance will be displayed

CONTENT

CHAPTER NO	TITLE	PAGE NO.
	ABSTRACT	v
	LIST OF FIGURES	ix
	LIST OF TABLES	x
	LIST OF ABBREVIATIONS	xi
1	INTRODUCTION	1
	MACHINE LEARNING	1
	DEEP LEARNING	2
2	LITERATURE SURVEY	3
	COMPARISION OF LITERATURE SURVEY	4
	EXISTING FACIAL RECOGNITION PROGRAM	10
3	EXISTING SYSTEM	14
	FACTORS AFFECTING THE USE OF FACIAL RECOGNITATION	15
	SECURITY	15
	VISIBILITY	16
	EXPECTED EFFORT	17
	SOCIAL IMAGE	18
	OPENESS	19
	MACHINE LEARNING	20
	MACHINE LEARNING DESCRIPTION	20
	TYPES OF MACHINE LEARNING	21
	STEPS IN MACHINE LEARNING	23
	PYTHON	25
	ABOUT PYTHON	26
	ANACONDA	27
	NUMPY	28
	PANDAS	29
	DATA COLLECTION	30
	PREPROCESSING	33
	FEATURE EXTRACTION AND FEATURE ENGINEERING	33
	FEATURE CLEANING	34
	TRANING DATASET	34
	TYPES OF MODELS IN MACHINE LEARNING	35

	SUPERVISED LEARNING	35
	UNSUPERVISED LEARNING	36
	SEMISUPERVISED LEARNING	36
	REINFORCEMENT LEARNING	37
	CLASSIFICATION	38
	NAIVE BAYES	39
	SUPPORT VECTOR MACHINE	40
	RANDOM FOREST	40
	NEURAL NETWORK	41
	MEASURING THE MODEL PERFORMANCE	41
	CONFUSION MATRICES	43
	ACCURACY	43
	PRECISION	43
	FEASIBILITY STUDY	44
	ECONOMIC FEASIBILITY	44
	TECHNICAL FEASIBILITY	45
	SOCIAL FEASIBILITY	45
	OPENCV	45
	REQUIRED SPECIFICATIONS	47
	DRAWBACKS IN EXISTING SYSTEM	47
4	PROPOSED SYSTEM	48
	COMPONENTS IN EXISTING SYSTEM	49
	DEEP LEARNING-FACE DETECTING AND RECOGNITION	49
	MACHINE LEARNING :SVM CLASSIFIER	50
	IMAGE PROCESSING-FRAUD DETECTOR	51
	ALGORITHM	57
	IMAGE PREPROCESSING:FACENET ALGORITHM	57
	TRIPLE LOSS	58
	TRIPLET SECTION	58
	ONE SHOT LEARNING	59
	CLASSIFICATION VS ONE SHOT LEARNING	60
5	RESULTS AND DISCUSSIONS	64
	OUTPUT MODULES	64
	DISCUSSIONS	72
		7
6	Conclusion and future scope	73

LIST OF FIGURES

FIGURE No.	TITLE	PAGENO.
1.1	FACENET ALGORITHM TRAINING PROCESS	2
3.1	AUGMENTATION OF DATASET	33
3.2	CLASSIFICATION AND REGRESSION	35
3.3	UNSUPERVISED LEARNING	36
3.4	SEMISUPERVISED LEARNING	37
3.5	REINFORCEMENT LEARNING	37
4.1	BLOCK DIAGRAM OF PROPOSED SYSTEM	49
4.2	FACE DETECTION AND AUTHENICATION PROCESS	50
4.3	IMAGE PREPROCESSING	51
4.4	ARCHITECTURE DIAGRAM	53
4.5	ACTIVITY DIAGRAM	54
4.6	CLOUD BLOCK DIAGRAM	55
4.7	SAMPLE DATABASE	55
4.8	ALGORITHMS	57
4.9	STANDARD CLASSIFICATION USING CNN	61
4.10	SIAMESE NEURAL NETWORK	62
5.1	MOBILE APPLICATION HOME PAGE	65
5.2	SIGN UP PAGE	66
5.3	APP DETECTING FACE IN CAMERA RANGE	67
5.4	VERIFYING THE DATA SET AND WAITING FOR PROCEED	68
5.5	VERIFIED MESSAGE AND FACE INFORMATION	69
5.6	PAYMENT SUCCESSFUL	70
5.7	DATABASE FOR APPROVING FACES	71

LIST OF TABLES

TABLE No.	TITLE	PAGENO
2.2	COMPARISON OF LITERATURE SURVEY	4
3.1	PREDICTED CLASS	41

LIST OF ABBREVIATIONS

NLP	Neuro-Linguistic Programming
MW	Merriam-Webster
PNI	Positive Negative Analysis
SA	Sentiment Analysis
SVM	Support Vector Machine
VE	Virtual Environment
PMD	Package Management an Deployment
CSV	Comma – Separated Values
AI	Artificial Intelligence
ML	Machine Learning
IDE	Integrated Development Environment
TP	True Positive
TN	True Negative
FP	False Positive
FN	False Negative
LDA	Latent Dirichlet Allocation
AUC	Area Under the Curve
ROC	Receiver Operating Characteristic Curve

CHAPTER 1

INTRODUCTION

Through the use of debit or credit cards, banks need infrastructure investment as well as large deposits. As a result, the bank must devise a low-cost infrastructure to address the problem. The effects of numerous recent technological advancements can be seen in various sectors such as education, government, and so on. To protect its capital, a bank must invest in expensive infrastructure. To deal with these problems, the bank must constantly think of fresh and innovative solutions. As a result, we've created biometric initiatives to address this problem. Cryptography can be used to encrypt data and transactions in a variety of ways. Biometric technology has many advantages, but it also has drawbacks. Biometric authentication has recently gained popularity in this area. Fingerprint, eye recognition, facial tracking, and iris technology are all examples of biometrics. Machine learning can be used to enforce these biometric security measures. Machine Learning is a data processing technique that automates systematic model structure. It's a form of computerised reasoning based on the idea that frameworks can learn from data, recognise examples, and make decisions with minimal human intervention.

Machine Learning

Machine Learning is a technology for data analysis that automatically structures models. The theory is that frameworks should learn from evidence, recognize examples and make decisions with minimal human involvement is a computerized reasoning. The iterative nature of machine learning is important because models can evolve with the introduction of new information. They use information from previous estimates to provide dependable, repeatable choices and outcomes.

Deep Learning

Deep learning is a subfield of machine learning that employs synthetic neural networks to enable algorithms based on the structure and properties of the brain. It's a feature that simulates the human mind's data processing and the development of decision-making styles. Deep learning has developed alongside the virtual era, resulting in a vast influx of data of all forms and from all corners of the globe. Figure 1.1 depicts a Deep Learning algorithm.

FACE NET ALGORITHM TRAINING PROCESS

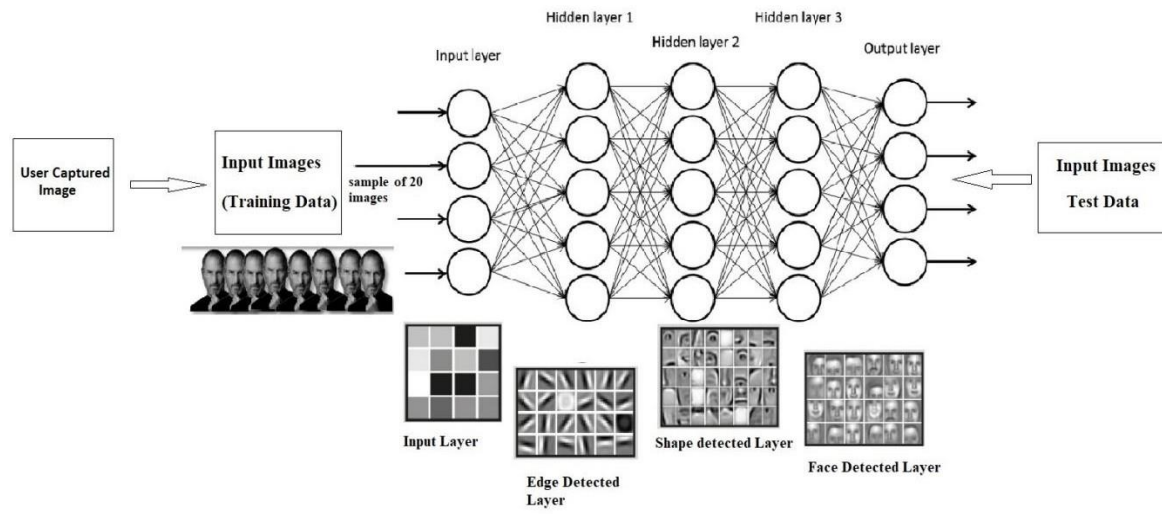


Fig 1.1 Facenet algorithm training process

CHAPTER 2

LITERATURE SURVEY

Several options for facial recognition applications have been implemented over the last decade. The methods and algorithms used in one piece of software may be vastly different from those used in another.

When facial recognition software extracts the components of the face, it uses the findings to try to find the name. Normalization, followed by facial recognition: Other algorithms are used to normalise fixed-face images. The words 'enter' and 'face' are synonymous in an equation. This is an innovative approach to facial recognition that is likely to gain widespread acceptance. To figure out who it is, you'll use a 3D scanner to pick out features of the face, such as the jawline, nostrils, and chin. are not hampered, and recognition from several perspectives is possible; additionally, recognition is made simpler with this approach. Researchers also created a new method for distinguishing offenders based on facial characteristics such as pores and skin texture analysis. After a normal skin scan, a statistical representation of the exact lines and spots can be obtained. An overview of the facial recognition systems that have been introduced for security purposes is given.

COMPARISON OF LITERATURE SURVEY

Title	Year	Description and Method	Future Scope
-------	------	------------------------	--------------

A Biometric based Payment System by using Payee and Payer Module.	2018	A module by which one payee module can communicate with the payer module using Bluetooth for money transfer from the payer's to the payee's bank is proposed and Cortex M3 is used here.	Various types of Biometric Authentication methods for mobile Phones have been reviewed in this paper. This helps in implementing our idea.
Face Authentication For Banking	2015	Biometric has the goal to avoid some frauds and to facilitate the authentication. Common authentication methods are used. The performance of biometric algorithms provided globally good results	There are benefits and more limitations of using biometric technologies for bank payment. Proxy detection is not implemented in face detection in this paper.

Real-Time Implementation Of Face Recognition System	2017	A hybrid face recognition algorithm by integrating (PCA) principle Component Analysis, (LDA) Linear Discriminant Analysis. Jacobi method is used to compute Eigenvector that are necessary for PCA and LDA algorithms.	Raspberry pi3 board is used for face detection. Accuracy rate is 90% but proxy detection is not implemented in this method that is a disadvantage
Implementation QR Code Biometric Authentication for Online Payment.	2019	Biometric face authentication encryption and decryption with 256 bit AES algorithm. The permissions transaction accuracy rate of 95% and time speed of 53.21 seconds per transaction	256 –AES algorithm for face detection is adouble authentication system. The accuracy rate was 95% .Proxy detection is not implemented in this paper.
Face Authentication For Banking	2008	The benefits and limitations of using biometric technologies for bank payment was discussed	This is the basic method of face authentication process. Accuraccy was

			very low .
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Neel Ramakant Borkar et al. [2017] developed a face Recognition that detects and recognises people based on their facial characteristics. Since the face is multidimensional, many mathematical calculations are needed. Face recognition technologies are widely used for recognition and are very important for surveillance, mug shot matching, law enforcement applications, user authentication, user access control, and other applications. Both of these applications include face recognition. Many methods have already been proposed, but their recognition capability is low and their false alarm rate is high. As a result, the primary aim of the research is to develop a more reliable and faster face recognition system. The Eigenvectors required by the PCA and LDA algorithms are calculated using the Jacobi method. The Face Recognition system will be built on an embedded system called the Raspberry Pi 3.

N ChitraKiran et al. [2017] developed an essential advancement made huge advancements in payment systems, which impacts everyone's standard of living. In the future, the most current payment schemes have both advantages and disadvantages. Contactless payment has received a lot of attention from retailers in order to provide a faster and more secure process. These are the problems that issuers face as a result of a faulty customer authentication procedure. As a result, a group of researchers created and maintains an efficient and dependable payment system. This paper describes a method and module for transferring funds from the payer's bank to the payee's bank through

Bluetooth communication between two payee modules. The significance of this approach is that it eliminates the need for physical cash while still acting as a payment and identification solution. The module's security is enhanced by the use of biometric authentication. Finally, the results indicate the existence of a secure payment system. Despite the fact that the digital payment system has been in use since the 1960s, digital cashless payments have become the standard with the advancement of technology and the evolution of e-commerce. As a result of the research community's tireless efforts, several electronic payment models have been developed. [2]. Despite major advancements in payment technology, market adoption remains low. A variety of factors contribute to the market success of mobile wallets. Another survey on digital consumer payments conducted in 2015 discovered that among current systems, 16% of people prefer digital payment, while 67 percent prefer cash; 59 percent of people accept debit cards, and 50% use credit cards. Contactless payment systems do not appear to be common, with only 5-6 percent of researchers citing their use..

B Hemery et al.[2008] developed a paper that investigates the benefits and disadvantages of face authentication as a biometric technology for banking applications. First, we'll go over some fundamental financial concepts. They propose a method to replace PIN code authentication with biometric data. The authentication of biometrics is then thoroughly clarified. They present a face recognition method that reveals itself to be a biometric solution candidate. In a real-world application, They will show the benefits and drawbacks of this approach. Several reports on biometric authentication have been released. The majority of the time, it is a matter of developing an algorithm that is mainly focused on image processing and pattern recognition methods. Before it can be used in a real-world transaction, many problems, such as security and material considerations, must be addressed. The aim of biometrics is to reduce

fraud and simplify authentication. Standard methods of authentication are used. Across the board, biometric algorithms generated excellent results. Using biometric technology for bank transfers has both benefits and drawbacks. For face detection, no proxy detection is used in this article

Agostinho Marques Ximenes et al.[2019] written a paper , According to the Indonesian Institute of Statistics, society's level is rising in 2019. Based on data, the bank conducted a group to simplify transaction payment in the market. The bank simply used a debit or credit card to complete the transaction, but banks need additional infrastructure investment, which is prohibitively expensive. As a result of this, the bank needs a new low-cost infrastructure solution. This software allows you to make online transactions. In this research, biometric encryption, or decryption transaction authorization, and QR Code Scan transaction permits are used to improve communication security and transaction details. The implementation tests of the Biometric Cloud Authentication Platform show that AES 256 agents can be used for face biometric encryption and decryption. To complete a transaction permit, scan the QR code. With a sample of 10 people, face verification transaction permits have a 95 percent accuracy rate, and the transaction process takes 53.21 seconds per transaction for a sample of 100 transactions. According to the Indonesian Institute of Statistics, society's level is rising in 2019.

As a result of this, the bank needs a new low-cost infrastructure solution. Advances in technology and human dependence on technology have permeated a wide range of fields, including industry, manufacturing, education, government, business, banking, and everyday life [2]. High-cost facilities, such as ATMs, scanner machines, and monthly administration fees, are needed to channel funds from the bank to the

public, which is prohibitively expensive for the poor. As a consequence, the bank must look for and apply solutions to these problems. Cryptography-based data and transaction protection methods, as well as biometric security techniques, also have flaws. In the other hand, using cryptographic methods with data interception flaws, data manipulation, data destruction, and data distribution. Modern biometric authentication techniques also have flaws in terms of counterfeiting biometric characteristics.

Existing facial recognition programs

FaceFirst is a smartphone and live-video surveillance facial recognition device that is completely automated, user-friendly, and turnkey. When a face is recognised, this programme produces an alert; this happens when the match of the input face with a face in the database is greater than a user-defined likelihood. FaceFirst has the advantage of being able to operate in low-resolution environments, allowing for real-world efficiency. Facefirst is a tech company that claims to be able to use machine vision to help banks monitor access to sensitive areas inside their buildings. Though access control is the most common application for FaceFirst in this industry, the company claims that the software can be used for other purposes as well. Customer identities are only some of the few examples that allow for security, send mobile warnings to the security staff and recognise key customers and guarantee that they are treated carefully. They may deduce from the model of FaceFirst machine learning that thousands of photos and videos of human faces were trained from a variety of viewpoints and lighting conditions.

The images and videos would then be categorised depending on whether the client has access to any of the bank's safe areas. Using these marked images, the machine learning algorithm will be trained to recognise the

sequences of 1s and 0s that appear as a person's face in live footage from a camera or an image. The camera would be linked to a terminal that would keep an eye on the lock on a protected area door.

The software could then be used by a customer to approach a security camera and try to look into it in order to gain access to the safe area. The algorithm in the programme would be able to recognise the user's face and decide if they are permitted to access any restricted bank areas. The system would then grant or deny access based on how their face is labelled in the system, if it is labelled at all:

MorphoTraks Face Comparison training will adhere to the guidelines developed by the Facial Identification Scientific Working Group and will be capable of handling facial assessment and facial identity. Biometrics, facial anatomy, dermatology, photo science, and photo processing will all be included, as well as pertinent criminal issues and court presentation. "We appreciate Dr. Spaun's contribution to MorphoTrak's unexpectedly growing facial recognition offering, as well as her talent as a trainer of face comparison techniques," said Celeste Thomasson, President and CEO of MorphoTrak. Dr. Spaun is a forensic problem-solving expert who has published several articles on guide assessment of human beings in photographs, developed training tools for forensic facial comparison, and served as the FISWG Training and Proficiency Subcommittee's inaugural Chair. they are ecstatic to be able to provide Dr. Spauns' expertise to our clients, associates, and the general public safety community."

Cross Match Technologies is a market leader in providing biometric identification management systems, applications, and supporting services to governments, law enforcement authorities, and other organisations. Facial recognition devices and other biometric constructs are available in optical, wired, and deskbound formats

Since the early 1970s, facial recognition has been associated with researchers in areas such as defence, psychology and photography. The facial recognition of Lin, Kelly and James has begun. Both examples of biometrical identification systems include facial recognition, fingerprint recognition and iris reconnaissance. Bhatia's formal name is Bhatia Bhat Facial-recognition devices use low-cost technologies to capture facial geometric features that concentrate on the most important features of the face. Many researchers have investigated various facets of facial recognition generation.

Wójcik *et al.* provide the facial recognition variables that have been standardised Many specialists and scholars have worked to improve the accuracy of the authentication or identification process. Renee Becerra and his team To increase accuracy, mixed biometrics, which are no longer fully identity verification biologies, may be applied to current facial-recognition procedures. anaesthesia According to as well as Augmented Reality, databases, multimedia, and database recovery.

In people's lives, nonstop face biometric development and nonstop biometric growth are beginning to converge.

Facial recognition can be used to generate revenue. Fei et al. created a facial recognition system. Merchants can upload images to the database, which they can then use to recognise the user's features using facial recognition and charge them. In China, for example, facial recognition is commonly accessible to business consumers. The following behaviours appear to be shown through facial recognition payment:

The facial-recognition age as non-intrusive and low-cost. Face recognition has many benefits over other payment systems. Each person's face plays a distinct role. In contrast, iris and fingerprint recognition necessitate additional hardware, while facial recognition necessitates no additional hardware because smart phones have cameras. In 2013, Bhatia conducted research on different forms of biometrics, writing, "Biometrics is an emerging era, and has been commonly used in forensics, safe entry, and jail surveillance," and weighing the benefits and drawbacks of various authentication technologies.

As a result, people are looking for a new means of protection. According to Parmar and Mehta, the human body is special and impossible to imitate, reproduce, or lose. Mobile phones and credit cards are no longer needed during the buying process. They just want to "check their face" in a shop to finish their order. One of the main benefits of biometric bills is their ease of use and versatility, which reduces the need for coins or credit cards in places such as retail and public transit while mobile Stickland meets all consumer needs."

CHAPTER 3

EXISTING SYSTEM

The Existing system consists of QR code Authentication and biometric Authentications. Existing system was implemented using face encryption and decryption ,finger prints and other bio metric authentications to avoid hackers while transaction. The Existing system which implement Face encryption uses Azure API Face verification. The Azure Face verification detects, recognize, and analyze human faces in images. Facial recognition software is important in many different scenarios, such as security, natural user interface, image content analysis and management, mobile apps, and robotics. The Face service provides several different facial analysis functions which are each outlined.

Factors Affecting the Use of Facial-Recognition Payment:

Security

Security way that the machine tactics personal records and ensures its confidentiality, integrity, authenticity, and non-replicability to make sure the safety and trustworthiness of the transaction Suh and Han . Many researchers have studied the protection of payment structures. Security is one of the maximum critical elements influencing the cause to apply of cellular pay; similarly, many scholars regard protection as the primary studies thing while studying cellular payment (Pham and Ho and use the TAM model to analyze purchaser's cause to apply of recent technology. Among them, the character of the brand new technology itself is one of the primary influencing factors. New technology additionally pose a few related risks, regarding privateness, non-public data, and the transaction itself, in addition growing the perceived hazard of mobile payment services Shah *et al.* . For this reason, safety and hazard notion are essential issues withinside the field of digital payment systems Ashrafi

and Ng and inhibit the cause to apply new mobile-payment tools. Thus, the notion of safety of the mobile payment system have to be managed Meharia so as for this kind of generation to be efficiently used Grassie . However, recently, purchasers had been aware about a few troubles withinside the use of IT technology handling the safety of identification, non-public records, payments, and different technical information. Many scholars have studied privateness safety Ku *et al.* . Security and privateness issues also are factors that have an effect on the adoption of mobile-payment provider Johnson *et al.* Consumers are involved about the leakage in their personal records and for this reason lessen their enthusiasm to be used Fogel Nehmad . Consumer issues approximately privateness breaches lessen their cause to apply. Therefore, it's miles an critical duty of traders to lessen purchasers' issues and enhance their privateness safety Ranganathan and Ganapathy. Privacy issues are an critical attention in a success facial-recognition payment implementation and uptake amongst purchasers Miltgen *et al.* . As with different new technology, privateness, safety, and on line identification control are regularly a supply of challenge to purchasers Deane *et al.*; Miltgen *et al.* .

Visibility

Visibility is described as the diploma of innovation that the corporation can see and the recognition of recent services or products via way of means of ability customers, if the brand new services or products have many customers Moore and Benbasat . Visibility is likewise described because the volume to which people use new improvements to serve others Russell *et al.* 2018. Johnson *et al.* mentioned that perceived ease of use, relative advantage, visibility, and perceived safety have an effect on the cause to undertake mobile-payment services. In different words, if we will see humans the use of new technology or services in our communities, to be able to act as social stress and definitely have an effect on the potential recognition of recent technology or offerings. Potential customers of recent technology might be suffering from the social environment and might be affected if many customers are around. The surrounding social environment can placed pressure on ability customers to simply accept

new technology or offerings. Yang and Choi 2001 mentioned that they use the technology acceptance model because the theoretical version of the impact of social impact at the acceptance of records structures. Their consequences confirmed that visibility stimulated the social impact of the audience, and diagnosed that the social impact changed into taken into consideration useful. Product visibility is a sub idea of immoderate intake or state intake, which takes place in a class or role of intake. Lee and Lee studied the connection among entertainment, availability and the social impact of mini-domestic pay via way of means of adopting the technology acceptance model. They factor out that visibility impacts social cognition, which in go back impacts how purchasers understand the usefulness of the product. Users who use digital fee strategies have observed that “innovation, applicability, universality, reliability and visibility” of digital fee strategies are critical using elements for using fee strategies.

Most strikingly, facial-recognition changed into right away visible as a effective way of shielding public Safety de Cormis . What’s extra, there also are many thrilling possibilities for organizations to apply facial-recognition to enhance the speed and comfort of interacting with clients and offer in reality personalised offerings de Cormis . Similarly, Yum China, which operates KFC and different fast-meals brands, has partnered with the mobile-fee corporation Alipay to develop the facial-popularity fee verification characteristic de Cormis.

Expected Effort

Expected attempt is described because the diploma to which humans don't forget it easy to use new information technology. That is, how intuitive and handy the records technology interface is, how easy it's miles to look and use, and the way to offer diverse handy assist capabilities are without delay associated with anticipated attempt. Many research which have stated those efforts, have had a great impact on the translation of cause to apply Chang *et al.*. Expected attempt is crucial withinside the introduction of a brand new technology. The adoption of a brand new technology may be limited or even fail while elements associated with ease

of use aren't taken into consideration via way of means of technology designers Orlikowski.

Davis *et al.* advised that Expected effort has a sturdy impact on user recognition of information generation. Expectations about performance, attempt, and social recognition definitely impact the cause to apply mobile-payment system. Koenig-Lewis *et al.* use the Unified Technology Acceptance and Use Theory (UTAUT) as a base, to increase the framework via way of means of combining variables consisting of perceived enjoyment, social impact, understanding, and perceived hazard. Expected attempt definitely affects expectancies approximately performance, and behavioral goal Tiago 2016. De Luna *et al.* used TAM to take a look at the elements that stimulated purchasers' acceptance of mobile-payment structures, and found they included perceived compatibility, perceived safety, non-public innovativeness, and character mobility. Abrahão *et al.* mentioned of their studies that expected attempt has a great and positive relationship with the cause to undertake mobile-payment system.

Social Image

Social image refers back to the volume to which a consumer thinks his or her state or photograph is advanced withinside the organizational society to which the consumer belongs Moore and Benbasat . Social photograph, actually is an detail of a perceived usefulness construct withinside the technology acceptance version TAM2, which changed into proposed via way of means of Venkatesh and Davis .

Jaradat and Faqih studied the primary impact factors in his studies. The consequences show that customers' adoption and use of mobile payment offerings may be expected in phrases of what they cause to do, that's significantly suffering from the subsequent factors: perceived usefulness, perceived ease of use, subjective norms, photograph, output quality, self-efficacy, perceived outside control and interestingness. In different words, social photograph impacts perceived ease of use and the cause to apply records generation in studies at the motivation for ongoing use of recent technology information offerings. In addition, the consequences

recommend that social impact may also play a position within the cause to apply cellular-fee, as is regular with preceding research suggesting that the social surroundings influences customers' opinions (Liebana-Cabanillas *et al.* 2019). Another observe, performed via way of means of Koenig-Lewis (2015) mentioned that social impact, understanding of generation, and perceived hazard had direct impact on purchasers' willingness to simply accept easy payments. In many financial situations, humans are involved now no longer handiest with their cloth achievements, however additionally with retaining a sure social photograph. Therefore, the point of interest of this observe is on the way to don't forget the perspectives of different contributors of society while the use of those services or products as new technology.

Openness (Openness to Experience)

Openness changed into first proposed via way of means of Costa and McCrae and described as curiosity, and an open thoughts about stories and values. Those with excessive openness opt to revel in new imagination and are extra receptive to new records Ziegler *et al.*. Openness refers back to the tendency of people to strive new matters and stories. Open people can be extra inclined to alternate and strive new technology. In our case observe, facial-popularity fee generation is a brand new generation. Consumer traits have an critical impact at the willingness to simply accept new technology and new products, and plenty of students have performed studies on diverse aspects (Lin *et al.* 2013).

Recently, with the improvement of records generation, new technology or new technology-associated services, diverse tries had been made to observe the position of character persona in behavioral and usage (Lin *et al.* 2013). Moore and McElroy observed that purchaser persona developments have a fantastic impact at the willingness to apply Facebook. Tlili *et al.* in "Role of persona in laptop primarily based totally learning" mentioned that purchaser conduct is stimulated via way of means of persona developments. Openness has a fantastic impact on perceived usefulness and perceived ease of use Khan *et al.* Mikson. Lee and Lyu studied non-public values as determinants of cause to apply self-provider

generation in retailing, the use of a value-mindset conduct version; they observed that non-public traits have a fantastic impact on cause to apply.

MACHINE LEARNING

Machine Learning Description

To gain knowledge, people must commit mistakes. If computers could learn from errors, then they could do things better. Of course, it's about learning; it's also about gaining a better understanding and applying knowledge. Patterns found in large volumes of data can be used to train computers in machine learning. It's possible that the trend predictor has seen before, and can apply what it's learned to new data. Growth in machine learning will continue at an astonishing pace over the next decade, and will be responsible for many of modern business and technological changes. . . So, it is a good time for all of us to learn machine learning for the new exciting field, so machine learning is disrupting the entire industries from agriculture to health care to finance multiple ways the business, the enterprises are getting disrupted.

Nor so, Machine learning is improving global business practices across marketing, human resources, e commerce we are seeing every day and also Machine learning powering emerging technologies like a self-driving cars of the future and we are parking about virtual reality and augmented reality and Machine learning is playing an important role and also as we observe in a enter prenatal areal every week, actually machine

learning startup servicing huge investments, so beneficial action is happening.

Pattern recognition is useful for making decisions or predictions, as well as for training computers. Practical machine learning is concerned with the result, while theoretical machine learning is concerned with the math and the algorithm.

It is very to write programs that solve problems like recognizing a face. We can easily extend this definition easily to our Artificial Intelligence systems. Machine learning is learning in neural networks will be very different to learning in rule-based systems.

It is the artwork and technology of giving computers the capacity to discover ways to make choices from data with out being explicitly programmed. The price of machine learning is handiest simply starting to expose itself. There is lots of information in the global nowadays generated not only through people, however additionally through computer systems, telephones and different devices. We're about to find out what the computer has discovered about all the good stuff we've introduced into its goods and services. Although it is difficult to show that knowledge has been obtained, it is not apparent that progress is being made in the context at all times. Facial recognition, detection, and advice-delivery systems are among the immediate applications of today's surveillance systems.

Products designed for specific purposes that have been shown to be particularly effective can be implemented in a variety of fields, including retinopathy and skin cancer, retail, transportation (in the form of self-parking and self-riding vehicles), and so on. Machine learning has been

around for a while, and until it was introduced, no one paid attention to it because it was considered novel.

Types of Machine Learning

So, every machine learning algorithm in a very broad way we can classify into three different categories one is the supervised learning wonder there is the unsupervised learning and it is reinforcement learning. So this supervised learning again we can classify into regression and the classification, So we see one by one what are the characteristic of individual category and we'll see about what is supervised learning what is unsupervised learning what are the different parameter associated with it what kind of problem individual category is trying to solve in tutor machine learning system reinforcement learning we'll see into the subsequent lecture. So, let us begin with the supervised learning.

So this is the supervised learning just concentrate on this very simple functional mapping from Y to X so what we do into supervised learning this is the our input data what X is our input data, so we supply huge amount of data into X we have a label associated with all individual records what we called as a Y and what is the problem in the supervised learning is our task is to predict this function , so you have been given this input data and a label in short the output data and your task is to find this predicted function f . Now let us try to understand with the help of a very simple example this is a very simple example of recreation that you fit the data into a regression algorithm and eventually you will get this model.

This model is nothing but this predicted function f . So, let us try to understand with a very simple example of this predicting the house price

state how this house price calculation problem can be solved with the help of regression. Let's try to concentrate on this is the house price is data so just see there are the two columns and each row is associated with a single record, so in the first column it is been written that what is the size of individual house and for this size what are the price associated with that house so there is a huge amount of data has been given for example I have seen some six data point here it is been read as a size of two thousand one hundred and four square foot of house. Let's try to see what is the classification those this is another kind of supervised learning algorithm in a machine learning system, so see in a regression what we have seen that all outputs are the continuous output, so this classification how it is different from the regression because overall it is another kind of supervised learning so it holds all properties of the supervised learning algorithm or the only difference in classification with the regression algorithms are this output values at the discrete value it has no continuous value.

So, there is a fixed amount of output value either ten or five or seven or nine or even thousand classes is also possible. So let's try to understand with the help of a very simple example just concentrate on this data this data uploaded onto a two-dimensional graph, so in earlier cases of whatever the output we have there was a continuous but here what this classification algorithm will try to find the boundary between this kind of data. So this class of data will lie into the one class and this class of data lies into the second class, so whenever we have been given suppose some new example so it will try to classify this and to this kind of group so there are only two output value associated in this class there are no continuous

value, so that is the only difference between the regression and to the class even so that's it for the supervised learning.

Steps in Machine Learning

But in order to train the model, we need to collect data to train on. We'll call these our features from now on colour and alcohol. Get some equipment to do our measurements, a spectrometer for measuring the colour and a hydrometer to measure the alcohol content. Once this equipment and then booze we got it all set up it's time for our first real step of machine learning gathering that data. In this case, the data we collect will be the colour and alcohol content of each drink. This will yield us a table of colour, alcohol content, and whether it's beer or wine. This will be our training data. So, a few hours of measurements later, we've gathered our training data and had a few drinks, perhaps. And now it's time for our next step of machine learning is data preparation. This is also a good time to do any pertinent visualization of your data, helping you see if there are any relevant relationships between different variables as well as show you if there are any data imbalances. For instances, if we collected way more data points about beer than wine, the model we train will be heavily biased towards guessing virtually everything. If a beer since it would be right most of the time.

We don't have to use the same data that the model was trained on for evaluation since then it would just be able to memorize the questions, just as you wouldn't want to use the questions from your math homework on the math exam. Sometimes the data we collected needs other forms of adjusting and manipulation things like duplication, normalization, error correction, and others. It would all happen at the data preparation step. In

this case, we don't have any further data preparation needs, so let's move on forward.

The next step in this workflow is choosing a model. There are many models that researchers and data scientists have created over the years. Some are very well suited for image data, others for sequences, such as text or music, some for numerical data, and others for text-based data. In this case, we have just two features: colour and alcohol percentage. Now we move on to what is often considered the bulk of machine learning training.

We'll use this data to incrementally improve our model's ability to predict whether a given drink is wine or beer. So, let's look at what that means more concretely for our data set. When we first start the training, it's like it drew a random line through the data. Then each step of the training progresses, the line moves step by step closer to the ideal separation of the wine and beer.

Once training is complete, it's time to see if the model is any good. Using evaluation, this is where that data set that we set aside earlier comes into play. Evaluation allows us to test our model against data that has never been used for training. This metric allows us to see how the model might perform against data that it has not yet seen. This is meant to be representative of how the model might perform in the real world.

Python

Python is an object-oriented high-level programming language and an interpreter programming language with dynamically typed variables. Its high-level built-in data structures, as well as dynamic typing and dynamic linking, make it suitable for Rapid Application Development, as well as use

as a scripting or glue language to link existing components. Python's plain, easy-to-understand syntax emphasises continuity, lowering the cost of software maintenance. Python allows for software modularity and code reuse by enabling the use of extensions and bundles. The Python parser and a wide standard library are widely distributable and usable in source or binary form for all major platforms. Python is common with programmers due to the improved productivity it provides. The edit-test-debug loop is incredibly quick since there is no compilation process. Python system debugging is straightforward: a malicious programme or incorrect feedback would never result in a segmentation error. Instead, when the interpreter discovers an error, it raises an exception. If this procedure fails to find the exception, the interpreter prints a stack trace. A source level debugger helps you to analyse local and global variables, test arbitrary expressions, set breakpoints, and walk through code one line at a time, among other things.

The debugger is written in Python, demonstrating the language's introspective capabilities. In the other hand, adding several print statements to the source code is often the quickest way to debug a programme: the brief edit-test-debug loop renders this simple approach quite efficient.

Python is a dynamic programming language that supports a variety of unique programming paradigms:

- ❖ Procedural programming
- ❖ Object orientated programming
- ❖ Functional programming Standard:

Python byte code is executed withinside the Python interpreter (much like Java) platform impartial code ➤ Extremely flexible language ➤ Website development, data analysis, server maintenance, numerical analysis,

➤ Syntax is clear, smooth to study and research (nearly pseudo code)
➤ Common language ➤ Intuitive object orientated programming ➤ Full modularity, hierarchical applications ➤ Comprehensive preferred library for plenty tasks ➤ Big community ➤ Simply extendable thru C/C++, wrapping of C/C++ libraries ➤ Focus: Programming speed

Anaconda

Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing (data technology, gadget gaining knowledge of applications, large-scale data processing, predictive analytics, etc.), that targets to simplify package deal control and deployment. Package versions are controlled through the package deal management system conda. The Anaconda distribution is utilized by over 12 million customers and consists of greater than 1400 famous data-science applications appropriate for Windows, Linux, and MacOS. Anaconda will permit you to create virtual environments and set up applications needed for data science and deep learning. With virtual environments you could set up unique package deal versions for a selected project or an academic with out stressful about version conflicts. Download Anaconda on your platform and select the Python 3.6 model: <https://www.anaconda.com/download>.

By downloading Anaconda, you get conda, Python, Jupyter Notebook and hundreds of other open source packages.

Conda is a package manager to manage virtual environment and install packages. Here are some helpful commands using conda:

#update conda in your default environment

“\$ conda upgrade conda

\$ conda upgrade --all

create a new environment with conda

\$ conda create -n [my-env-name]

\$ conda cerate -n [my-env-name] python=[python-version]

activate the environment you created

\$ source activate [my-env-name]

look the environment you created

\$ conda info

\$ conda list

install a package with conda and verify it's installed

\$ conda install numpy

\$ conda list

#look at the list of environments you currently have

\$ conda info -e

remove an environment

\$ condaenv remove --name [my-env-name]"

I highly recommend you download and print out the Anaconda cheatsheet here.

Condavs Pip install

You can use either conda or pip for installation in an virtual environment created with conda.Both open source package managers. Here are some differences:

conda install—installs any software package.

pip install—installs python packages

only and it's the different python package manager.

Numpy

NumPy is a scientifically calculated Python application. It is a library of Python, which includes a multidimensional array object, derived objects, and a variety of quick-array routines including the arithmetic, logical, shape handling, sorting, selecting, I/O, discerning Fourier transformations, simple linear algebra, basic statistical operations, random simulation and more. The package NumPy rotates around the object nd array. In order to be more exact, multiple operations are performed in compiled code that encapsulates a homogeneous data type n-dimensional array. There are some key differences between NumPy arrays and regular Python arrays: NumPy arrays have a fixed size when created, as opposed to Python lists (which can grow dynamically). When an array's size is modified, a new array is generated and the first is removed.

Components in a NumPy array can all have the same form of data and thus the same storage footprint. The difference is that arrays of objects (Pythons (NumPy included), which make arrays of different sizes, are used. NumPy arrays make it easier for vast amounts of data to carry out complex mathematical and other operations. This operations are normally performed quicker than with Python's built-in sequences and with fewer code. An ever-increasing number of Python-based science and mathematical packages use NumPy arrays; while Python-sequence data usually supports, before processing it they are converted to NumPy arrays and often generate NumPy arrays. In other words, the majority (if not all) of today's scientific/mathematical Python-based programs can be used easily by learning how to use the built-in sequence styles of Python, you need to be aware how to use NumPy arrays.

Pandas

Data interpretation is an important part of data analysis since data is not necessarily present in the preferred format. Various dispensations, such as cleaning, reforming, or combining, are needed before the effects are analysed. Python modules that can be used to process data easily include Numpy, Scipy, Cython, and Panda. Pandas are often constructed on top of Numpy. Pandas has a wide range of functions for processing various types of data. Working with Panda is often more effective, easy, and articulate than working with other instruments. Pandas merge Numpy's fast data processing with the versatile data modelling techniques of spreadsheets and relational databases. Finally, pandas integrates well with the matplotlib library, rendering it an effective data analysis tool.

Pandas has two very useful data models for analysing data: series and dataframe. The Series is a one-dimensional array that can hold a wide range of data types, including mixed data types. The row labels in a Sequence are referred to by the index. The keyword 'string' can be used to convert any array, tuple, or dictionary into a Series.

Pandas' most common data structure is the DataFrame. Notice that Series is for working with one-dimensional arrays, while DataFrame is for working with two-dimensional arrays. There are two types of indexes in DataFrame: column-index and row-index. The dictionary of equal-length lists, as seen below, is the most common way to generate a DataFrame. Furthermore, DataFrame is interpreted from both spreadsheets and text files, making it a crucial data structure in pandas.

DATA COLLECTION

The KomNET dataset contains over 39,600 facial photographs from mobile phone cameras, digital cameras, and social media. The aim is to practise, validate, and recognise faces using the CNN approach or another technique. Face recognition datasets are usually composed of photographs from a single source, such as a mobile phone [1,2], Facebook [3,4], or a digital camera [4,5]. The architecture of the facial recognition algorithm requires image evidence from different media source that is an obstacle to investigators, as the anticipated effects of facial recognition will not be an impediment.

Face photographs were captured using media from mobile phone cameras and digital cameras in the Computer Laboratory, Department of Electrical Engineering, State Polytechnics of Bali. There was no detected image file or pixel-sized frame, and the extracted files were in .jpg, .jpeg, or .png format. Face photographs were made with the frontal face facing the shutter. The other images, on the other hand, were sourced from Facebook's social media platform. This Facebook face image data analysis was carried out by collecting photographs from Facebook users. Every image was organised into three folders: which contains 20 face images, and evaluate, which contains four face images. The following folder is resize224×224, which features a uniformed face picture with a resolution of 224×224 pixels. The enhanced face images are stored in the last archive, which features ten types of image augmentation: average blur, emboss, flip, gamma contrast, gaussian blur, histogram equalisation, rotate, hue and saturation, sharpen, and sigmoid contrast. Table 1 shows the complete amount of data in the KomNET dataset. As can be seen in Table 1, KomNET contains a large

number of datasets. This dataset was compiled from three separate sources, with a total of 1200 face images obtained from each unit. Each face image is supplemented with ten different forms of augmentation, resulting in a total of 12000 face images and 39600 total face images. The original image was used in the dataset, which had not been enhanced. The picture comes in a variety of sizes. There are also augmented images with a resolution of 224 x 224 pixels. There are 10 augmentation as shown in fig 3.1, The facial images from three separate sources are doubled during the augmentation process. As a result, researchers will use KomNET's face picture for face recognition analysis.

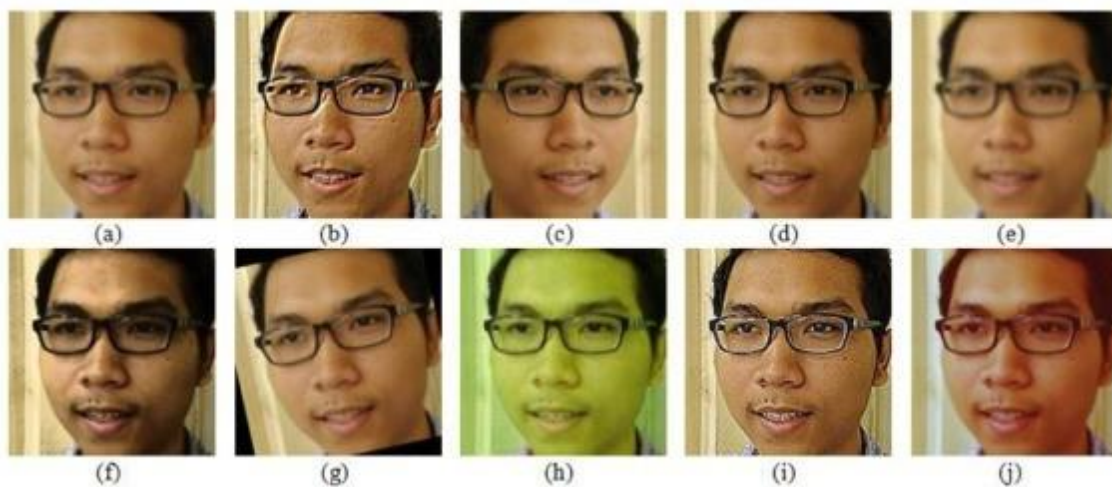


Fig 3.1 dataset feature extraction

DATA PREPROCESSING:

All of the raw input images were subjected to the preprocessing steps outlined below in order to turn them into clean copies that could be fed into a neural network machine learning model.

Feature Extraction and Feature Engineering:

The face recognition and device datasets had a lot of noise, and the recordings had a lot of repetitions. The data from the above datasets is used because the precision of the model trained on it is determined by the dataset. They were then sorted, and any duplicates were manually removed.

Feature cleaning:

The data cleaning was done manually in order to remove the corrupt images from the dataset. Finding these photos was a critical step in the process. Cleaning a corrupt image was a daunting task, as is well known, but thanks to our careful efforts, we were able to divide the work and clean the data archive.

This segment explains how to schedule data for pre-processing before training on it. To sort the list in lexicographical order, we first identify an alphanumerically ordered function name. Pre-processing is a function that accepts a folder as input, loads all of the files from the folder, and resizes the images using the SSDMNv2 model. After sorting the list alphanumerically, the images are converted into tensors. To speed up the calculation, the set is converted to a NumPy sequence. Following that, data

augmentation is used to increase the accuracy of the model after it has been conditioned.

3.6. TRAINING THE SYSTEM

Although there are several different machine learning algorithms, the most of which are implemented in the Scikit-learn Python library, the rest of those that you have to choose are self-service algorithms. Most supervised algorithms, however, don't accept sparse matrices, since they were extracted from their n-gram properties, and we need to go through the extra work of encoding these as features. It was amazing how well these classifiers, naïve Bayes, logistic regression, and support vector machine (SVM) worked. For cross validation, the Euclan coefficient was 0.1, which yields the best results for SVM.

Model Selection list possible ways done by machine learning

- i) Supervised learning
- ii) Unsupervised learning
- iii) Semi-supervised learning
- iv) Reinforcement learning

Supervised learning

The role of supervised learning is to find a series of input and output examples of a function based on training examples, estimating the optimal model parameters that will be able to relate to previously unnamed objects (test set). If the task is completed fully, we refer to it as artistic work. It is unordered classification if the set of values is finite.

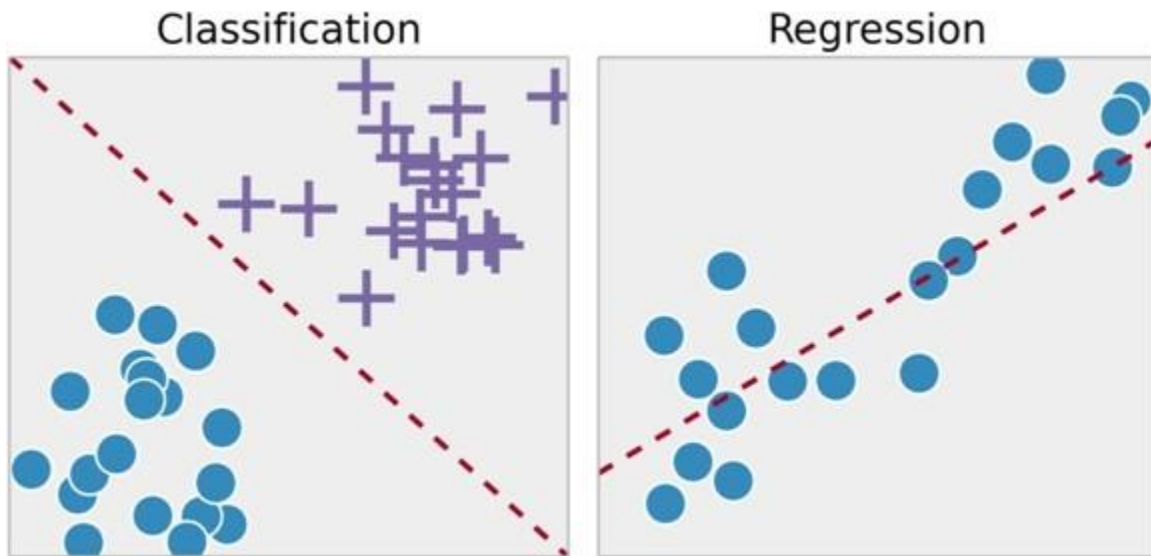


Fig 3.2 classification and regression

Unsupervised learning

We have less knowledge of unsupervised learning, particularly when it comes to artefacts, which is the case in this case. Where do we go from here? It is possible to notice a group of things in clusters and to categorise them. Anomalies come in a variety of shapes and sizes, and we assume that these are exceptions

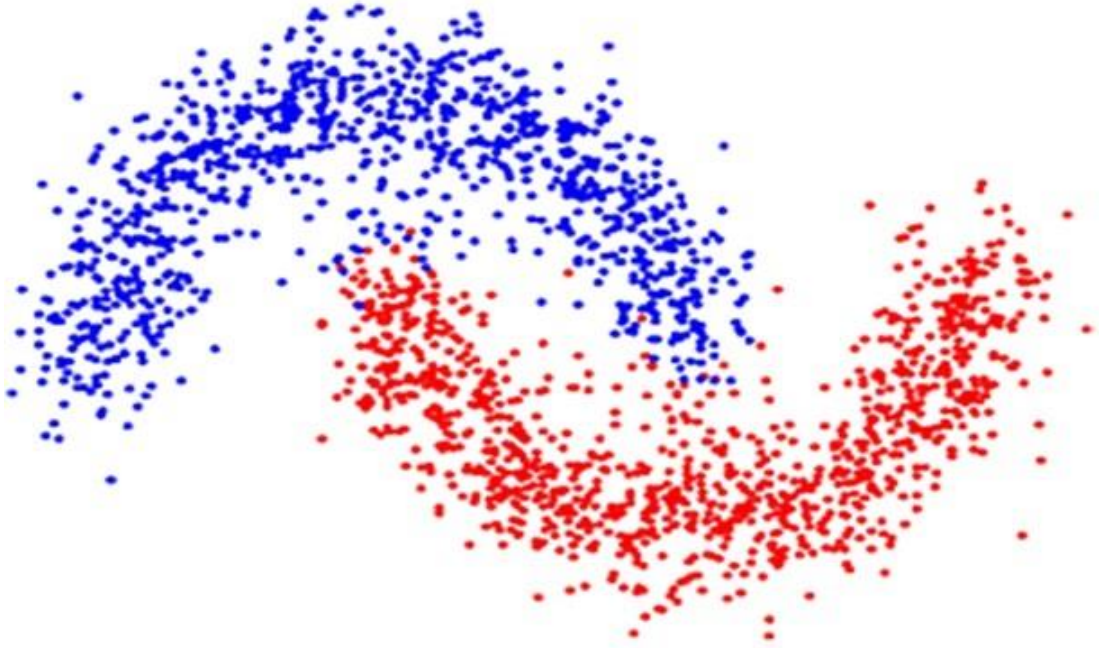


Fig 3.3 Unsupervised learning

Semi-supervised learning:

For the semi-supervised learning problems we discussed earlier, both labelled and unlabeled data are useful. This is a wonderful opportunity for those who cannot afford to rate their scores. The approach has allowed us to save on accuracy because we are able to use unlabeled data in the collection.

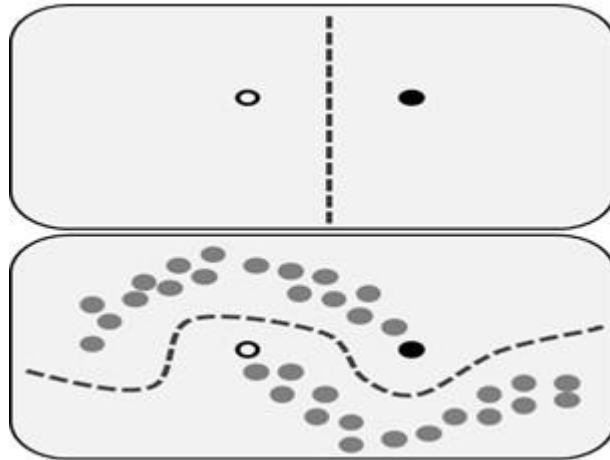


Fig 3.4 Semisupervised learning

Reinforcement learning

Since we don't have any labelled or unlabeled datasets, reinforcement learning is unlike any of our previous tasks. RL is a branch of machine learning that studies how software agents can behave in a given environment in order to maximise some metric of cumulative reward.

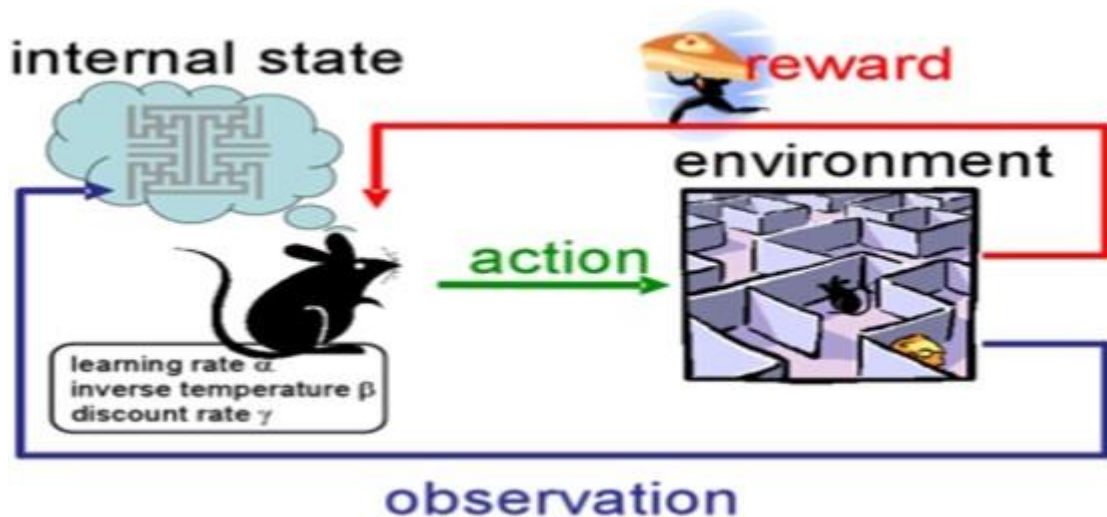


Fig 3.5 Reinforcement learning

Imagine, you're a robot in some strange place, you can perform the activities and get rewards from the environment for them. After each action

your behavior is getting more complex and clever, so you are training to behave the most effective way on each step. In biology, this is called adaptation to the natural environment.

CLASSIFICATION

Naive Bayes

Two assumptions underpin Naive Bayes. To begin, all features of an entrance that must be categorised are equally causative in the decision (equally important). Second, all attributes are statistically self-determining, which means that understanding the value of one attribute has little bearing on the values of other attributes, which is not always the case in practise. The Bayes rule is used to define an instance by applying it to each class provided the occurrence. For both of the two classes (fraudulent and legitimate), the following formulation is determined in the fraud detecting task and the higher likelihood is a class for which the event is expected.

Support Vector Machine

Support-vector machines (SVMs) are a kind of learning machine that is used for regression analysis and classification. An SVM produces a classifier which is not probable. (that is, a linear binary classifier with a non-probability function) using a set of training examples labelled with one of two labels. Different categories' examples are mapped in such a way that a clear distinction is placed between them. We project the new examples into the same space and make an inference based on their likelihood of being identified with the other side of the divide.

Since SVMs are linear, they can perform non-linear classifications using the "feature space mapping" process.

In the absence of labelled data, the only alternative is unsupervised learning, which is accomplished by clustering the data and then using an unsupervised approach to identify new data. Hava Siegel and Vladimir Vapnik developed one of the most widely used unlabeled dataset clustering approaches, support vector clustering, using the support vector machine learning approach.

Random Forest

Leo Breiman and Adele Cutler created an extension of the algorithm and trademarked the term "Random Forests" (as of 2019, owned by Minitab, Inc.). To create a set of decision trees with balanced variance, the extension combines Breiman's "bagging" concept with a random range of features, first proposed by Ho and later independently by Amit and Geman.

Neural Network

In modern terminology, a neural network is a cortical network or pathway, or an artificial neural grid of artificial neurons or nodes. A neural network may be biology-based (made up of real biological neurons) or artificial (created to solve artificial intelligence (AI) problems) (made up of artificial biological neurons). Weights form bio-neuronal interactions. A positive weight is assigned to excitatory connections, while a negative weight is assigned to inhibitory connections. Both inputs are given a weight before being added together.

Von Neumann computations, on the other hand, conduct processing that is much more analogous to biological networks than to artificial ones. Since it is almost impossible to predict all results, these networks are best suited for statistical modelling, adaptive control, and variable datasets. Inevitable connections may form when no specific connections are created between network elements as a result of the networker's experience.

Measuring the model performance Confusion Matrices

When you look at ROC (Receiver Operating Characteristic) and other metrics like it, you can see if the test was effective or not. A confusion matrix summarises how well a classifier performs on a specific set of test data, showing how much each category overlaps with other categories. All metrics except AUC can be quantified with the leftmost four parameters. As for the four factors, we can take a look at the following.

Table 3.1 predicted class

Predicated Class		
Actual Class	Class=yes	Class=no
Class=yes	True positive	False Negative
Class=no	False positive	True negative

The results that were correctly predicted and thus displayed in green are true positives and true negatives. We want to keep false positives and negatives to a minimum, so they're highlighted in red. These words are a little perplexing. So let's go over each word one by one and make sure we understand it fully. .

True Positives (TP) -

These are the correctly expected positive values, indicating that the real class value is yes and the predicted class value is indeed yes. For example, if the actual class value indicates that this passenger survived and the expected class also indicates that this passenger survived.

True Negatives (TN)

These are the expected values, which correctly equate to zero for the class. E.If the passenger did not survive, but the class prediction is the same, the passenger probably is dead. When you realise the expected class and actual results do not match, you get a false positive and a false negative.

False Positives (FP)

No and expected quality is yes. If the class status reads that this passenger didn't survive, it means that he is dead. If the statistics suggest this passenger will survive, he will still be alive.

False Negatives (FN)

When the lessons may have value, but the manner of delivery is awful. Conformity shows this passenger's survival and nonconformity tells you whether or not the passenger will die.

Once you grasp these four parameters, we can measure the four specific components of Precision, Precognition, Prefixes, and F1.

Accuracy

Accuracy is the easiest to understand as a connection to properly implemented foresight; it is a magnitude versus the total amount of knowledge required to arrive at a conclusion. We can have higher accuracy if we have a good model. If the data are unitless, accuracy is preferable; otherwise, you have asymmetrical datasets for positive and false-negative outcomes. As a result, you must appear at different performance parameters to determine how well your model performs. This approach has a zero.804, which means that our estimated result is roughly 80% accurate.

Accuracy = $\frac{TP+TN}{TP+FP+FN+TN}$

Precision

The value of the correctly predicted positive observations is regarded as accuracy in respect of the overall number of projected positive observations. The concern that this calculation answers is how many passengers had really survived that were branded. High accuracy has to do with the low false positive rate. We have an accuracy of 0.788, which is very good.

$$\text{Precision} = \text{TP} / (\text{TP} + \text{FP})$$

Recall(Sensitivity)

Remember that the magnitude relationship between correctly expected positive observations and all positive observations in the actual category is positive. The question is, how many of the passengers who actually survived were labelled? We have a 0.631 recall, which is excellent for this model since it is higher than 0.5.

$$\text{Recall} = \text{TP} / (\text{TP} + \text{FN})$$

F1 Score

The F1 score is the weighted median accuracy and reminder. This rating is also responsible for both false and false positives. It isn't so easy to grasp intuitively as precision, but F1 in some situations can be more useful than precision, particularly if the distribution in the group is unequal. When false positives and false negatives are priced similarly, accuracy is maximised. If the importance of false positives and false negatives is extremely different, it's preferable to look at both precision and recall. The F1 score in our case is 0.701.

$$\text{F1 Score} = 2 * (\text{Recall} * \text{Precision}) / (\text{Recall} + \text{Precision})$$

FEASIBILITY STUDY

The aim of a feasibility study is to get a sense of the problem's complexity as well as to solve it. The problem description was crystallised during the analysis, and aspects of the problem that should be included in the method were decided. As a result, benefits are calculated more precisely at this point. The following are the most important considerations:

- i) Economic feasibility
- ii) Technical feasibility
- iii) Social feasibility

3.12 .1 Economic feasibility

This study is undertaken to assess the economic impact of the scheme on the business. In the system's research and growth, the amount of money the organization must spend is minimal. The costs must be justified. This led to the construction of the infrastructure falling under the budget, making it easier to make much of the technology readily accessible. The only things to be bought were personalized items.

3.12 .2 Technical feasibility

This research is being conducted to assess the technological feasibility, or technical requirements, of the device. Any system that is developed should not put a significant strain on the available technical resources. As a result, the available technical resources would be placed under a lot of strain. As a result, the consumer will face high expectations. Since incorporating this system requires only slight to no changes, the existing system must have a low requirement.

.3 Social feasibility

The research is intended to assess the user's acceptance level of the system. This means that the user can learn how to use the device effectively. The consumer does not fear the interface, but see it as a necessity. For the acceptance of the method by customers are solely accountable the methods used to teaching and familiarizing the client with the system. His self-esteem needs to be strengthened in order to get constructive support that is welcomed because he is the end user of the scheme.

OpenCV

OpenCV is a vision and machine learning library for open source computer applications. OpenCV is intended to include a shared computer vision infrastructure and help to faster incorporate machine perception into consumer goods. Since the OpenCV program is BSD-licensed, it is easy to use and change the code for companies. There are over 2500 optimized algorithms in this library, including a wide variety of classic and advanced computer vision and learning algorithms for machines.

OpenCV has a user base of over 47 thousand people and over 18 million downloads. Businesses, research institutions, and federal departments all make extensive use of the library. The library is extensively used by many startups such as Applied Minds, Video Surf and Zeitera, along with popular companies such as Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda and Toyota. Collect street view photographs, detect interference in Israeli surveillance images, monitor mine equipment in China, assist Willow Garage's robots in navigation and pick-up, detect accidents in European pool, run immersive art in Spanish and New York, inspect pr labels It has C++, Java, Python and MATLAB interfaces that supports Windows, Linux, Android and Mac OS. OpenCV favors implementations where MMX and SSE are usable in real time. Currently there is a comprehensive CUDA and OpenCL gui. Approximately 500 algorithms are available which compose or endorse approximately ten times more functions. OpenCV has an interface template which fits easily to STL containers, and is written in C++.

REQUIREMENT SPECIFICATION

Hardware Requirements

Processor	:	Pentium Dual Core 2.3 GHz or higher
Hard Disk	:	250 GB or Higher
RAM	:	2 GB (Min)
Camera	:	15 mbps

Software Requirements

Operating System	:	Windows 7 or Higher
Languages used	:	Python(Pandas, Numpy,Sklearn)
Tools	:	Anaconda, JupyterNotebook and Spyder
Server	:	Flask 5000
IDE	:	Python(Front end),NLP(Back end)

Drawbacks in Existing System:

There are few limitations in the existing system. That is proxy detectors in face detection was not implemented, even if people show their photo image. It could able to recognize the face and completes the transaction. There is probability of allowing the photo face image and phone face image to complete the transaction. This will lead to serious fraud case of online payment.

CHAPTER 4

PROPOSED SYSTEM

To address the shortcomings and security gaps, we proposed a two-step verification mechanism in the transaction process. The use of image recognition techniques for proxy detection is a benefit of our proposed approach. As a consequence, the machine becomes more robust. Face Verification will be used in the proposed process by embedding with 128 attribute points of the face using the Face Net Deep Learning Algorithm. Proxies can be detected using Support Vector Machines (SVM). The triplet loss function will evaluate 128 feature points on each person's face. SVM may be used to categorise each individual's facial features. By implicitly mapping their inputs into high-dimensional feature spaces, the kernel trick enables SVMs to do non-linear classification effectively. The support-vector clustering algorithm uses support vector statistics provided by the support vector machines algorithm to categorise unlabeled data and verify the facial image. After the face is checked with a proxy, the account will be processed and the Balance shown.

Block Diagram:

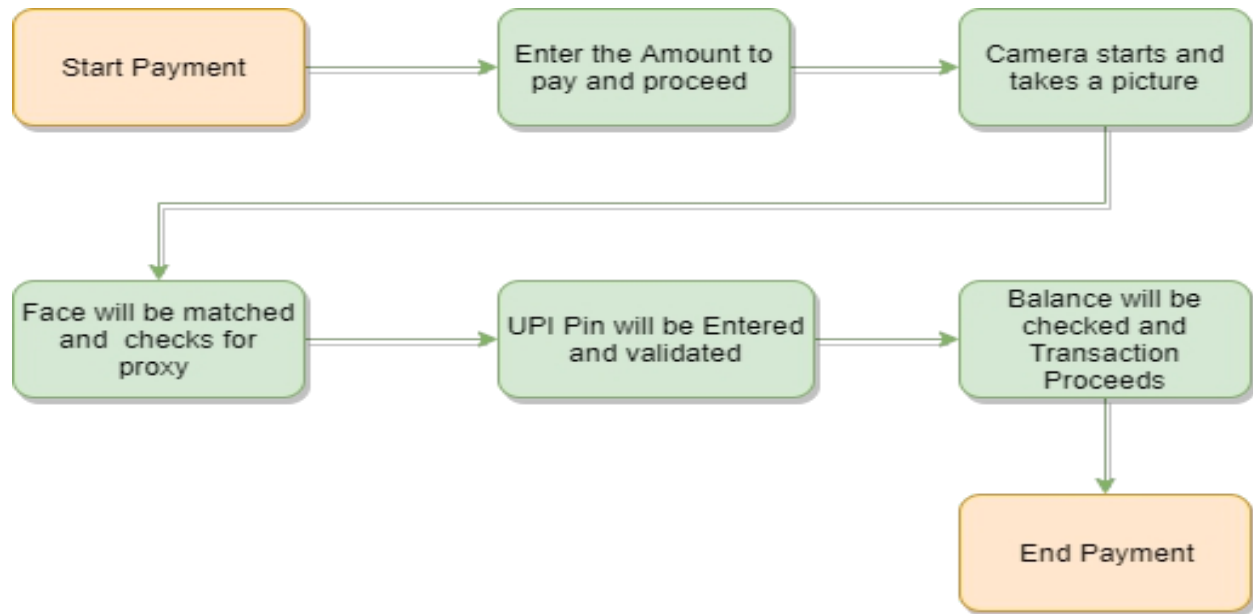


Fig:4.1 block diagram of proposed system

Components In Existing System:

1. Deep Learning-Face Detection and Recognition
2. Machine Learning:SVM-Classifer
3. Image Processing-Fraud Detector

Deep Learning-Face Detection and Recognition

FaceNet uses a deep convolutional neural network (CNN). The network is trained such that the squared L2 distance between the embeddings corresponds to face similarity. The images used for training are scaled, transformed and are tightly cropped around the face area. The main difference between Face Net and other techniques is that it learns the mapping from the images .It creates embeddings rather than using any bottleneck layer for recognition or verification tasks.

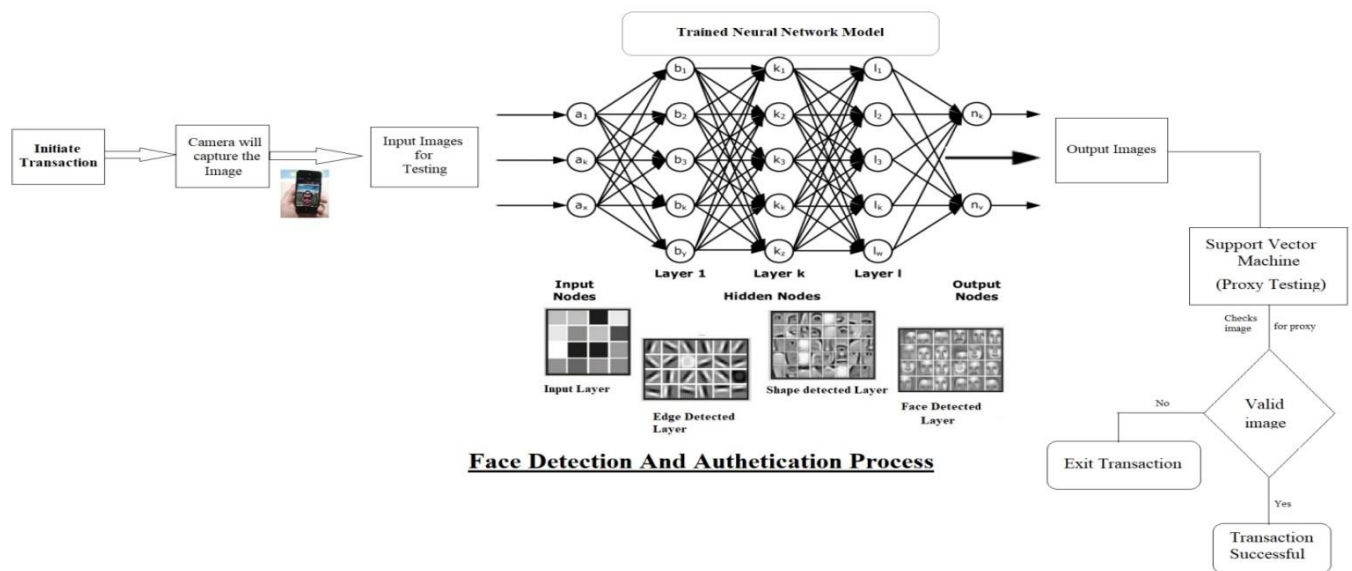


Fig:4.2 face detection and authentication process

Machine Learning:SVM-Classifier

A Support Vector Machine is based on multi-view face detection and recognition framework. Face detection is carried out by constructing several detectors, each of them in charge of one specific view. An important characteristic of this approach is that it can obtain a robust performance in a poorly constrained environment, especially for low resolution, large scale changes, and rotation in depth. A Support Vector Machine is a supervised classification technique that can actually get pretty complicated but is pretty intuitive at the most fundamental level.

Image Processing-Fraud Detector

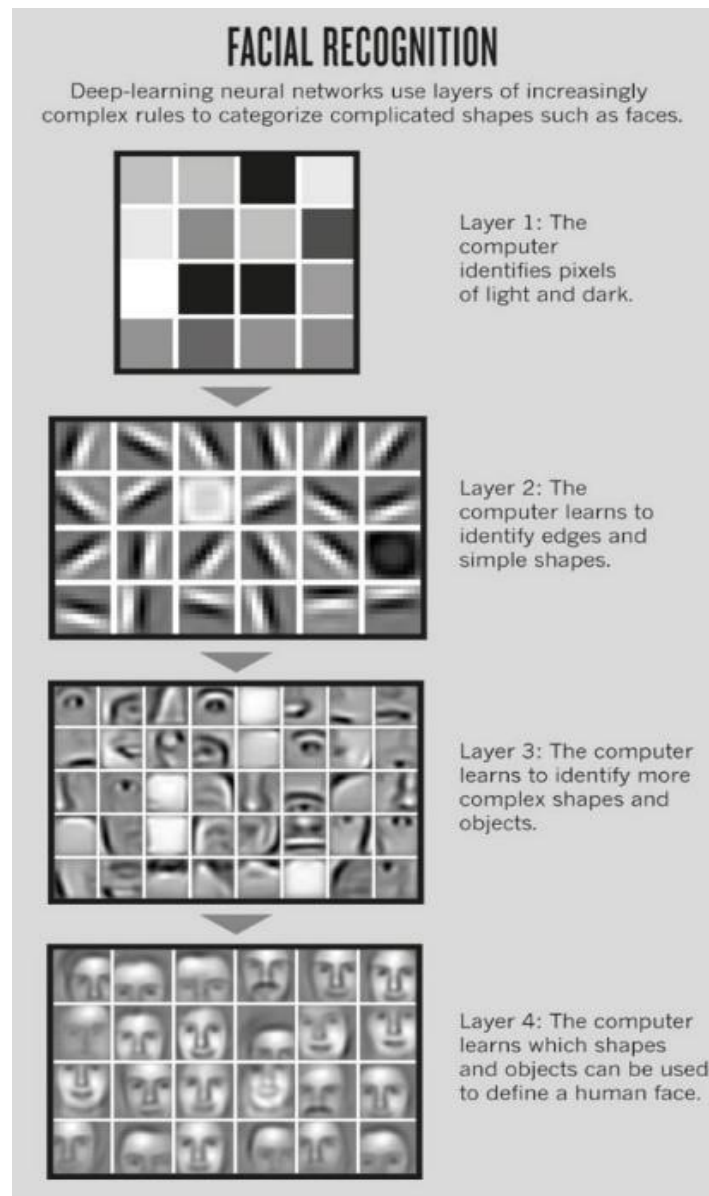
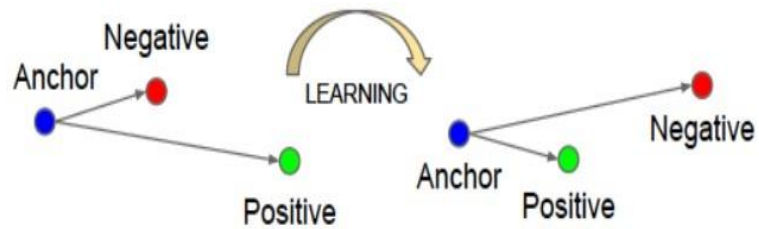


Fig:4.3 image preprocessing

We implement proxy detection with OpenCV by using Haar cascade scripts. According to our current tests, the files in the HaarCascade dataset are OpenCV models that are trained to identify an item of interest in a given picture. a needy need for high-quality images containing the object, with little data It is excellent at identifying a person and also checks their proxy.

Fraud identification in our project.



$$\sum_i^N \left[\|f(x_i^a) - f(x_i^p)\|_2^2 - \|f(x_i^a) - f(x_i^n)\|_2^2 + \alpha \right]_+$$

x_i -- It represents an image

$f(x_i)$ -- It represents the embedding of an image

α -- It represents the margin between positive and negative pairs

Fig 4.4 Architectural Diagram

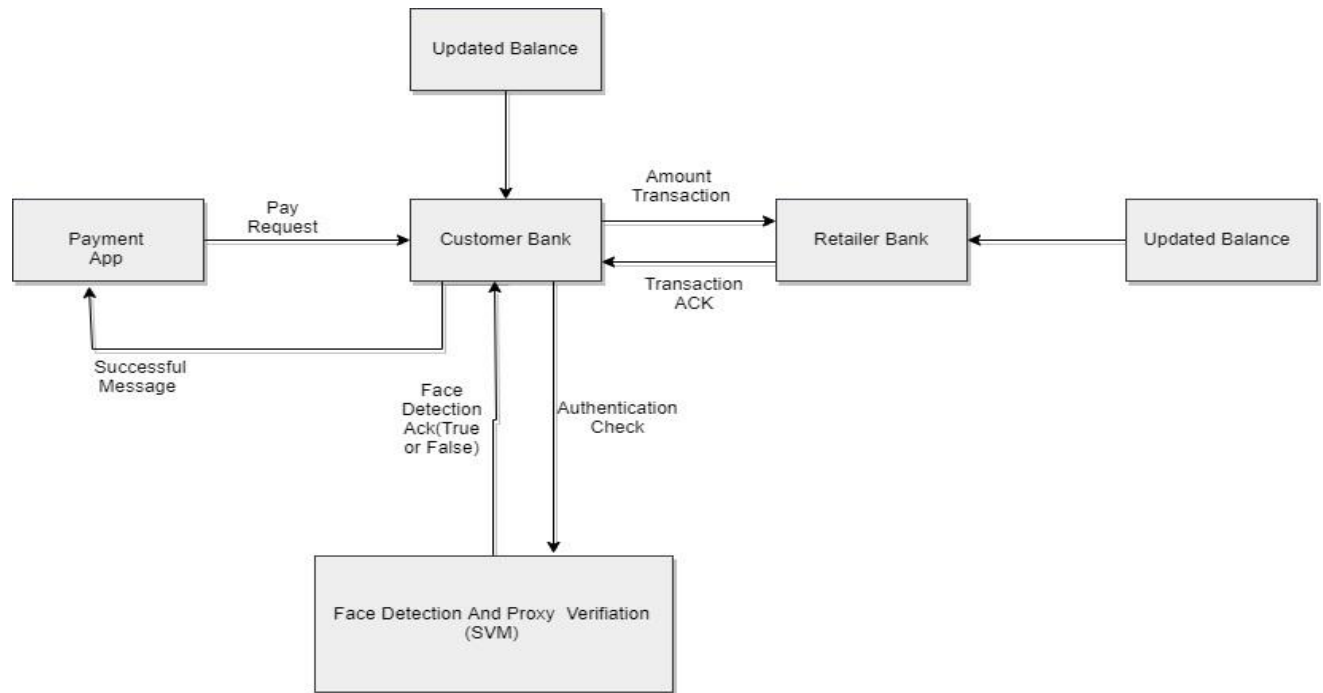


Fig:4.4 architecture diagram.

Fig 4.5 Activity diagram:

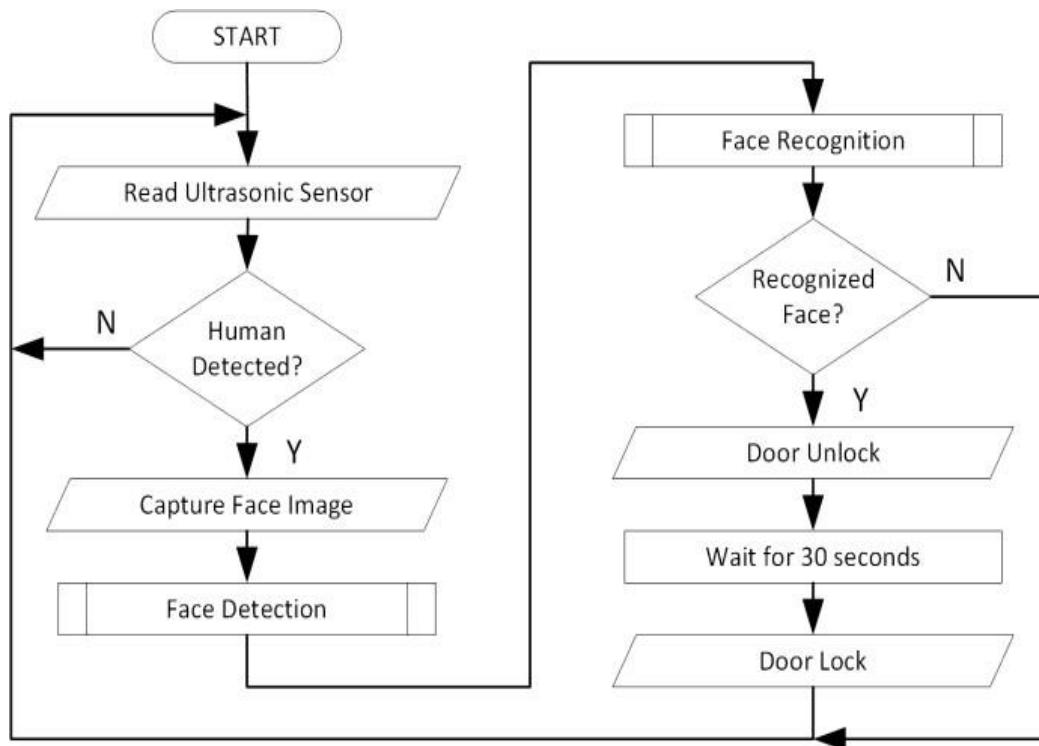


Fig 4.5 control flow

Fig 4.6 Cloud Block diagram

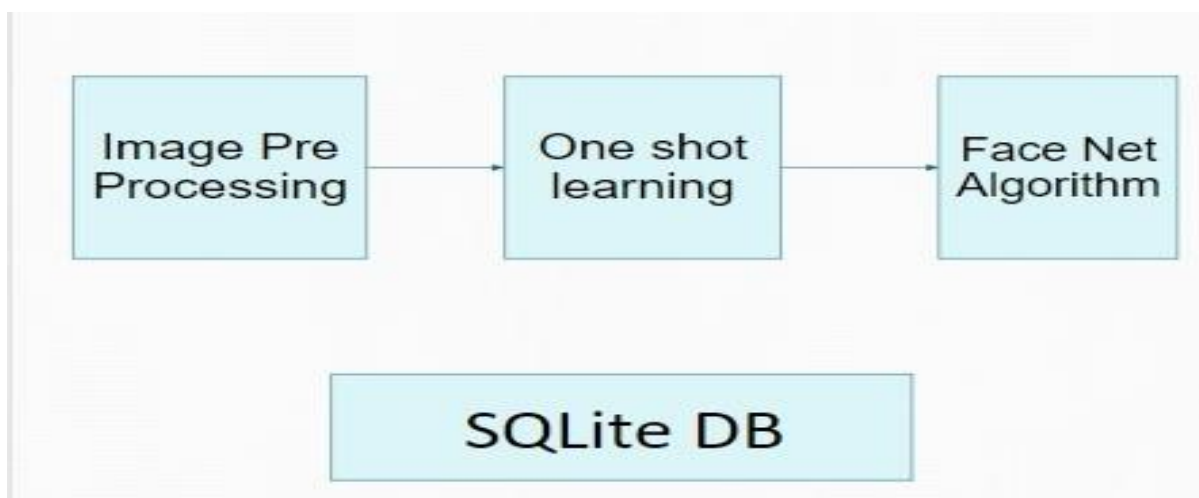


Fig:4.6 cloud block diagram.

Fig 4.7 Sample Input:

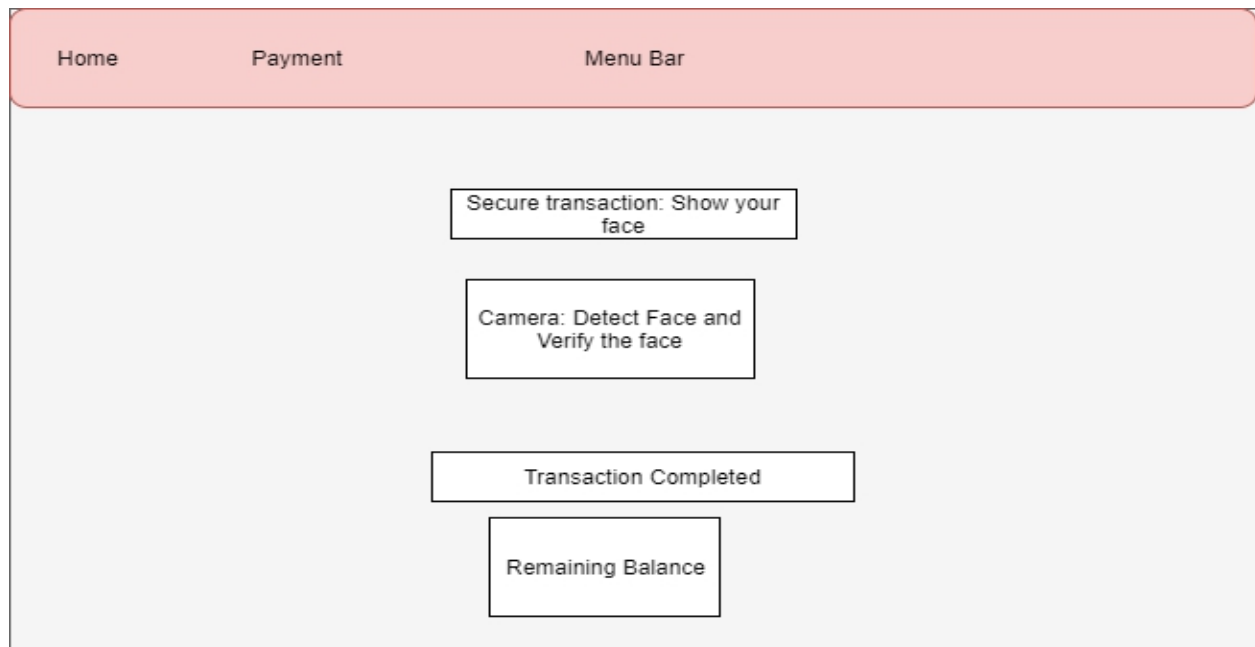


Fig:4.7 sample input

Fig 4.8 Sample Database:

Name of the Database	Attributes
Customer Bank Details	Customer ID Name Balance Mobile Number Updated Date
Retailer Bank Details	Customer ID Name Mobile Number Balance Updated Date
Face Enrolment	Customer face folder

Fig:4.8 sample data base

Algorithm

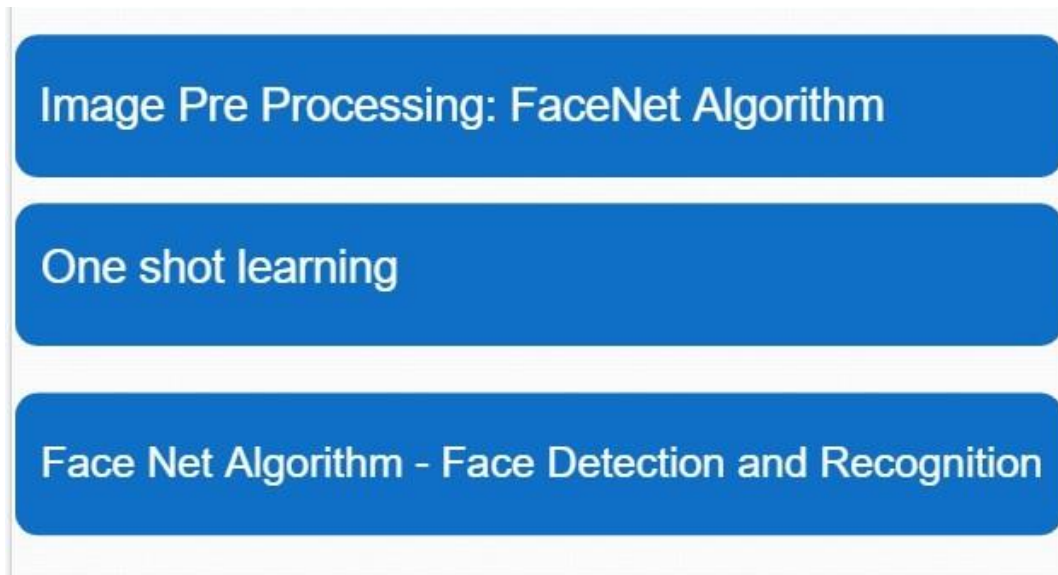
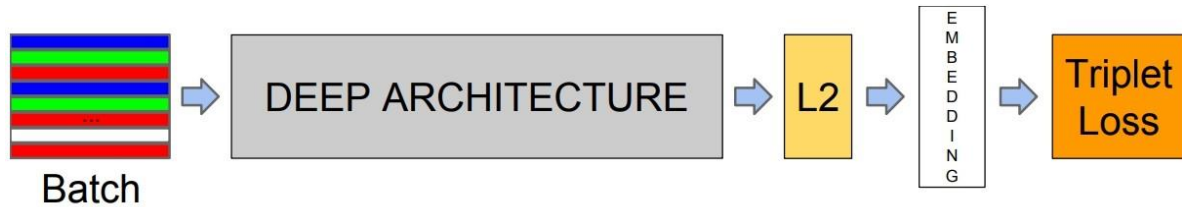


Fig:4.9 Algorithm

Image Pre Processing: FaceNet Algorithm :

FaceNet is the name of Google researchers' facial recognition scheme in the paper FaceNet: a single Face Recognition and Clustering Embedding published in 2015. In a number of benchmark face recognition bases, including Labeled face in the wild (LFW) and Youtube face databases, it has obtained state-of-the-art success.

They also suggested a way of generating high-quality image face mapping using in-depth learning architectures like ZF-Net and Inception. Then he trained the architecture with a system called triplet loss as a loss function. Let's dive deeper into the architecture.



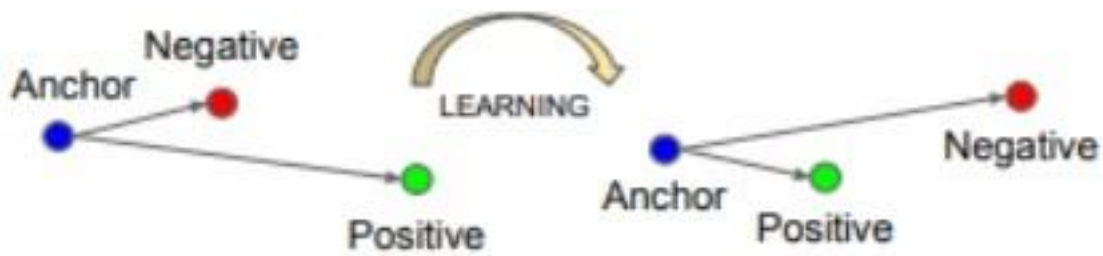
A major component of the architecture is end-to-end learning. Its middleware uses ZilogbyNet or Inception. This additional 1×1 convolutions are to cut down on the number of parameters as well as processing. This system uses deep learning to perform a linear two-layer normalisation L2 on the image $f(x)$. These embeddings were reduced by the same proportion until they were passed into the cost feature to measure the loss. The aim of this loss function is to have the squared distance between two images is nearly the same, regardless of pose or state. Triplet failure is implemented as a result of triplet digits rather than single digits. Triplet loss in our model establishes a margin between face features of identity.

Triplet loss:

An image's embedding is defined by $f(x)$, such as x . This embedding is a 128-dimensional vector that is normalised into positive and negative pairs.

Triplet selection :

To ensure quicker learning, we must take triplets that defy the equation above. Generate triplets based on previous checkpoints and calculate the minimum and maximum on a subset of data for each step.



One shot learning :

One shot learning is a classification task in which you take a large number of examples and apply a single rule to each one.

This classifies images encountered in face recognition, such as those with different facial expressions, accessories, and hair light, as well as those with specific faces and no hairstyles.

The method for one-shot face recognition employs a high-dimensional function called a face embedding, which is computed in a straightforward manner.

When learning novel concepts was needed for one-time applications, the Siamese network was used. FaceNet used the triplet loss feature after practising on a group of Siamese networks, which became the state-of-the-art in facial benchmarking competitions.

Synopsis

- One-shot learning is demonstrated by face recognition. A classification task in which several conclusions are required given one (or a few) examples of each class is known as one-shot learning.
- Siamese networks are a one-shot learning system that compares a learned function vector for proven and candidate instances.
- High-quality face embedding vectors can be taught using contrastive loss and later triplet loss functions, which form the basis of modern face recognition systems.

Classification vs One Shot Learning

We continue in layers as seen in Fig. 4. 10; the input image is used to generate a cumulative distribution of all groups (typically using a Softmax). For instance, if we want to classify a picture as a cat, a horse, or an elephant, it produces four possible classifications. Two points should be mentioned. When learning, you can use a large number of images for each class since each class needs an excessive number of them (cats, dogs, horses and elephants). Furthermore, training on only the four classes listed above is unlikely to yield any new pictures, such as "zebra." If we want our model to do better at zebra classification, we must first collect a huge sample of zebra images and then retrain it. There are other cases where we have a large amount of data for each type and it varies considerably. Data processing is unprofitable due to the cost of data collection and annual planning.

In the other hand, we only have one case for each class; moreover, a one-shot classification does not require us to be educated on any examples. That is right. That's exactly right. As a result, One Shot was born. Here's an example from real life: Let us try to explain this idea.

Assuming the company has ten employees, we will apply a general-purpose facial recognition system that will support our company in that sense (small numbers keep things simple). For a normal taxonomy, we might get something like this:

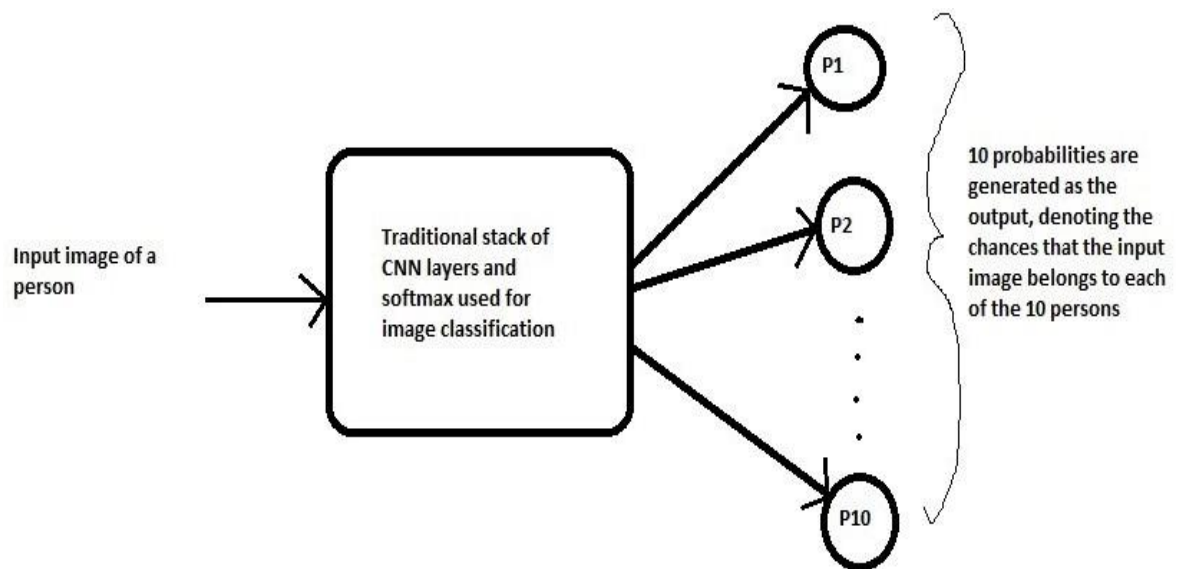


Fig:4.10 standard classification using cnn

Standard classification using CNN

Problems:

a) To teach such a machine, we'll need a large number of separate photos of each of the company's ten employees, which may or may not be possible. (Imagine doing this for tens of thousands of employees.)

b) What happens when a new employee joins or leaves the company? You'll have to go through the agony of data collection all over again, as well as retrain the whole model. This is almost impossible, particularly in large organisations with weekly turnover and hiring.

Now consider how we will approach this issue with a single shot classification that will assist us in overcoming any of the problems mentioned above:

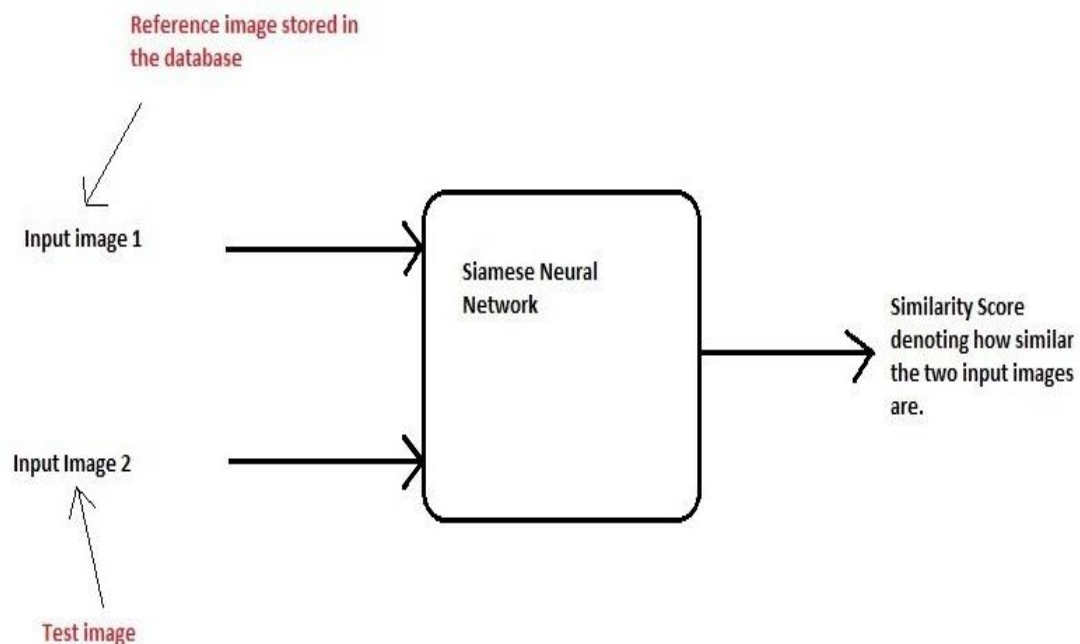


Fig:4.11 siamese neutral network
One Shot Classification

As shown in Fig 4.10 ,Instead of directly classifying an input(test) image to one of the 10 people in the organization, this network instead takes an extra reference image of the person as input and will produce a similarity score denoting the chances that the two input images belong to the same person. Typically the similarity score is squished between 0 and 1 using a sigmoid function; wherein 0 denotes no similarity and 1 denotes full similarity. Any number between 0 and 1 is interpreted accordingly.

Notice that this network is not learning to classify an image directly to any of the output classes. Rather, it is learning a similarity function, which takes two images as input and expresses how similar they are.

CHAPTER 5

RESULTS

Out modules:

We wrote this FACE NET application in dart which will run on flutter platform. Machine learning algorithms are written in python and are converted in dart files using starflut package. These samples are prototypes after integrating with the bank softwares they can be modified.

For the face recognition approval portal we are using python sql server database. After approving the payment will get processed further.

MODULE 1

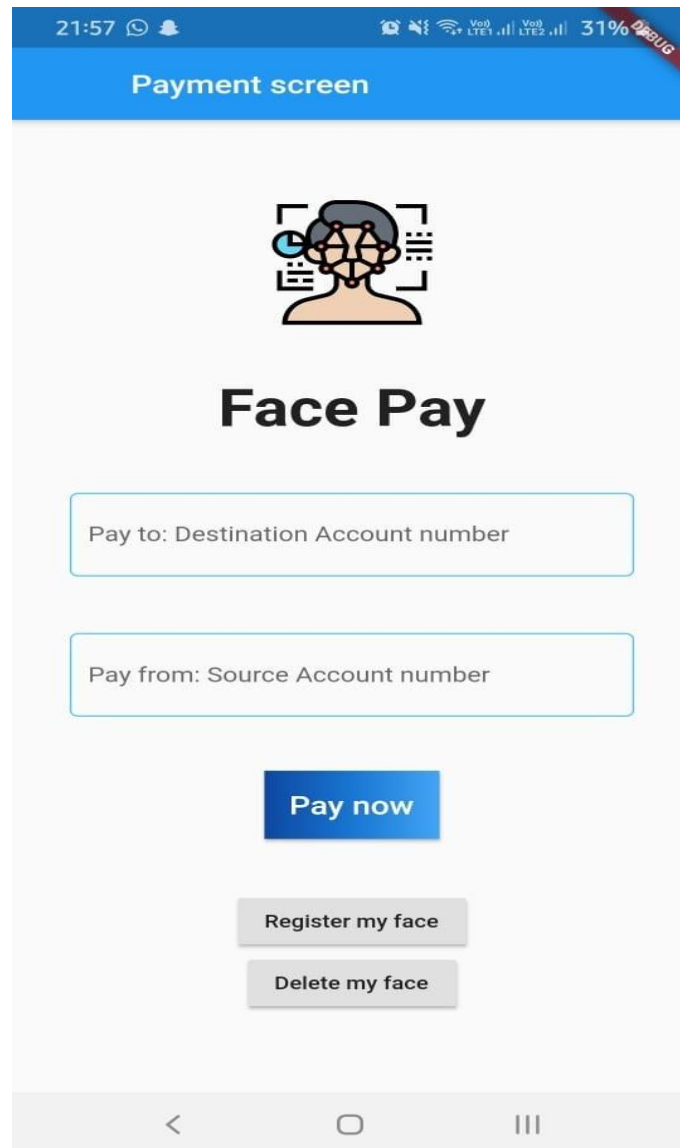


Fig:5.1 app home working screenshot

MODULE 2



Fig:5.2 While signing up in app and training the dataset and registering coustmer's face

MODULE 3



Fig:5.The face is detected in camera range. If the rectangle is green face detected is valid else invalid.

MODULE 4



Fig:5.4 Validation of coustmer face

MODULE 5

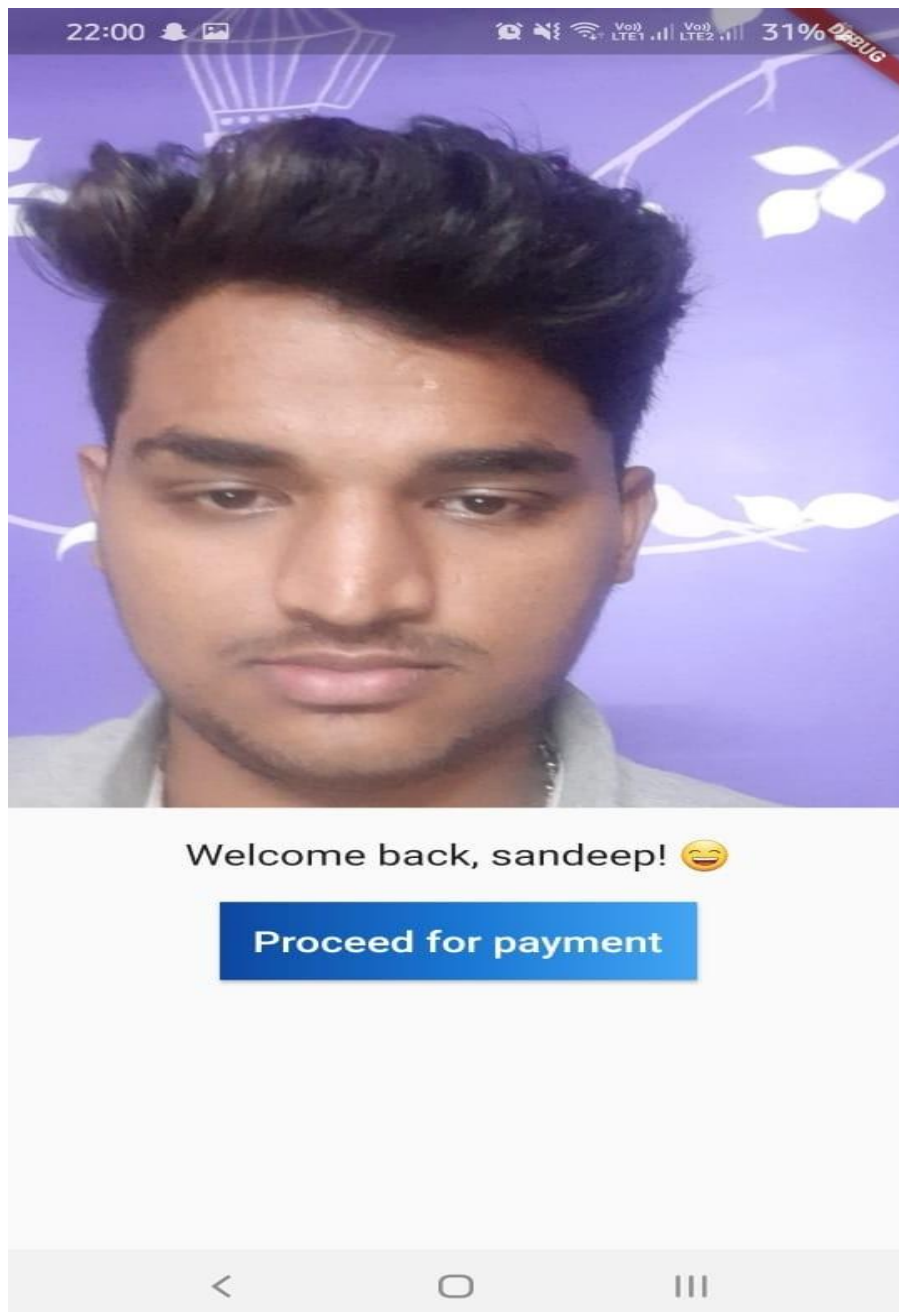


Fig:5.5 The face is detected and verified that it is in trained dataset

MODULE 6

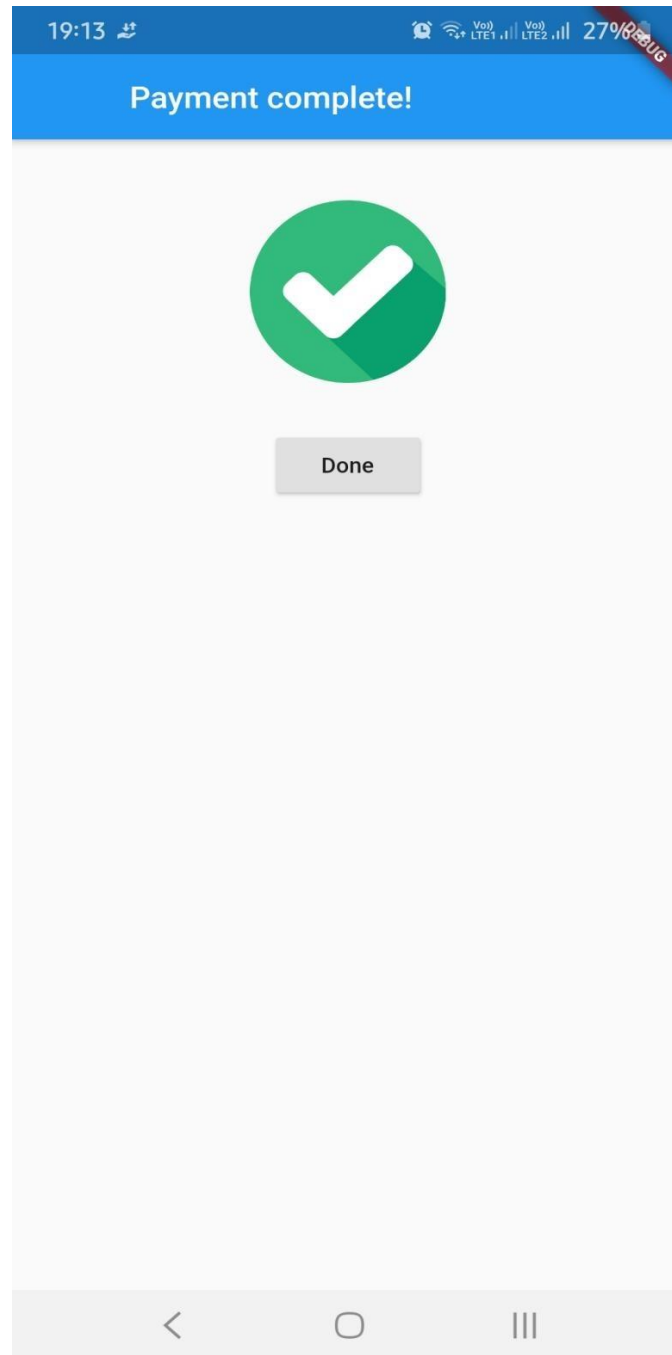


Fig:5.6 Payment is sucessfully done

MODULE 7

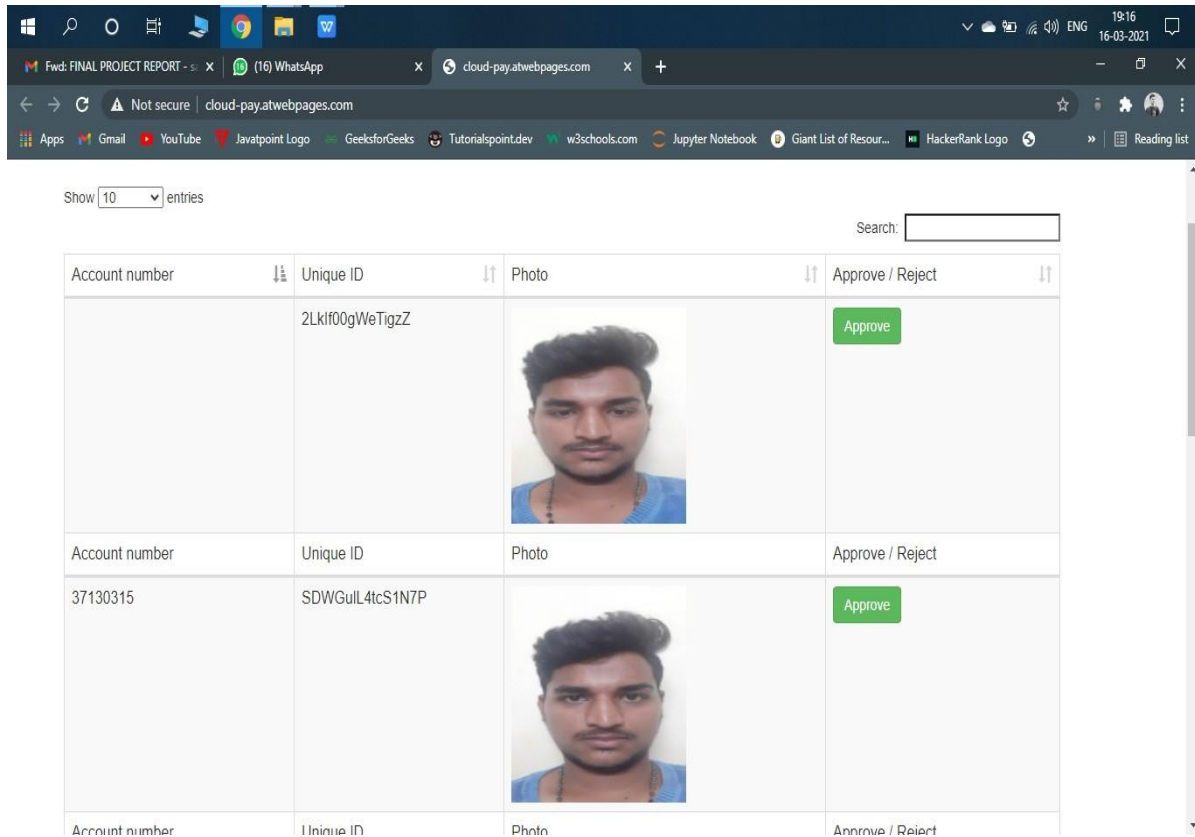


Fig:5.7 Face validation database using sqlite and flask modules in python

DISCUSSIONS:

All these output modules are screenshots of an facenet app .The application ui or theme of an app may vary with the operating system.Here we integrate this application with the upi service provider ,no manual data is given while transcation all input data is auto generated by the service provider.Database here acts like bank ,in this project we manually approve faces where as in real life applications this job is done by the bank or service providers of this app.

ADVANTAGES

- Only with live face payment will be completed.
- No need to share the OTP for friends and family.
- Proxy Detector is included, if showing any photo in front the prediction system, it automatically detect the proxy and placement will not be completed.
- Secure payment is established.

DISADVANTAGES

- Lighting may be the disadvantage of the system.
- Implementation in the real time, to change entire process maybe difficult.
- Training time may take longer for the large dataset.

CHAPTER 6

CONCLUSIONS AND FUTURE SCOPE

In this research, build an authentication for payment online is a mobile application authentication with biometric to perform permission transactions. Transaction permission uses some data such as Face recognizes or verification. The applied QR Biometric authentication for payment online concept is a 256-bit AES algorithm used for face biometric encryption and decryption. In order to counterfeit biometric face data. The transaction licenses used are QR Code and face authentication cards, face data has deviated in the cloud server so that it is easy to control and manage. Mobile apps authentication is built using the Android operating system with a minimum of API Level 22 lollipop. From the whole of the research on this thesis, it was concluded that there are 2 main processes in implementation, namely, registration and transaction.

Mobile transaction permissions are implemented for merchant transactions and running online access. Authentication permission transactions using 2 times authentication, namely (1) with QR Code (2) face verification. Biometric face authentication encryption and decryption with 256 bit AES algorithm. The application was built with android mobile with a permissions transaction accuracy rate of 95% and a time speed of 53.21 seconds per transaction. The future work will be improving the security system and combined with blockchain technology for saving data in a secure and encrypted way and ensure that transactions can never be altered.

In the present work, the person has to get to the counter, and show the face at the computer or gadget which has already the stored data base.

There can be further improvements to the present work. We suggest that as soon as an item is picked from the shopping mall, the item payment should be automatically made at the mall exit. At the exit the face should be verified and payment of the bill made automatically.

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