

A Face Recognition Method In Machine Learning (ML) For Enhancing Security In Smart Home

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Abstract — The study explores with Machine learning (ML), which is a type of neural network (AI) that empowers software programmers to start increasing prediction without being done with full to make this happen Exterior door security is of paramount importance and has become the cornerstone for the best and fastest security or sufficient to choose a feeling of protection to property owners, and together with technological innovations, especially in the Communication area, which tends to make emerging innovations in locking doors or windows have picked up a lot, including such locking doors and windows with faces and the others. Face - recognition technologies have also been developed and used for residential door locking mechanisms, and they are a basic and easy-to-use technology that detects the features of homeowners quite well. The advancement of facial recognition has resulted in one of the computer vision algorithms that is simple to build and has a high accuracy in recognising faces, and it has been widely utilised. When consumers review or exposure to new goods, does this have an instant influence on your suggestion system or does it take time, How do suggestions evolve as consumers interact more with the platform, many different of each sort of recommendation system in order to have a more detailed of their capabilities.

Keywords—Machine learning, Automatic Assistance, Data Acquisition, Data processing, Algorithm, Data Management, Interpretation, statistics, probabilities, data wrangling, imputation, supervised learning, classification, regression, clustering.

I. INTRODUCTION

Among other things, in object classification systems In this survey, data is collected using the CNN Mobilenet

biometric technology, which is installed in a waiting area locking mechanism, by collecting 742 biometric information on the face of the landlord using a system that is used to prepare algorithms, and the results are quite precise, with the correctness being approximately 97 percent, and that is quite high when compared to every other studies. In conclude, the CNN Alexnet technique can conduct highly good face recognition software and can be installed on an IoT device, notably the Raspberry Pi[1].

Machine learning and intelligent systems are used in a variety of systems today, from spam mails to self-driving cars to ethical decision-making aids. While algorithmic innovations have greatly aided this change, it would not have been possible without data, which is now regularly obtained on a big scale from people. Developing improved methods for intelligently managing the now-ubiquitous data-gathering systems is a critical next step. Machine learning is at the core of many of the world's most successful companies, including Face book, Google, and Umber. Machine learning has now become a critical competitive differentiator for many firms. Displays the statistics and probability in ML. [2]

II. OBJECTIVE

The research aimed to fulfill the following objectives:

- To explain the machine learning
- To study machine learning with a face recognition method
- To study obstacles in machine learning
- To study method used in a face recognition method in enhancing security in smart home

- To study machine learning advantages and disadvantages
- To study how this system works and how been managed by organization
- To study strategies and utilities in machine learning for face recognition
- To study testing and comparison in face recognition method in smart home .

III. METHODOLOGY

To address the security demands of families or workplaces, there are options in both traditional technology and biometric technology. Some traditional security methods, such as those that use keys, passphrase, Identification card, and/or RFID visa and mastercard, can sometimes be unreliable if the items used for admittance are stolen or lost. Such security measures have disadvantages when access is stolen by people who can not afford authority to get access, as well as when daily activities, including school, force someone to leave the facility vacant. As a result, unless the house is guarded or securely locked, it is vulnerable to break-ins and theft. Consumers today have more comfort in a variety of sectors because to advances in information technology and communication. The smart house, often known as the home automation, is a modern rising technology that users.

IV. MACHINE LEARNING (ML)

Deep learning (ML) is a subfield of ai (AI) that allows software developers to enhance generalisation ability without explicitly programming it. [3]

A developed system is a property that includes equipment, lighting, heating, air conditioning, a TV, internet, speaker system, media amusement, security, and video systems that can communicate with each other and be controlled directly by a schedule. Biometric systems are fast evolving, notably for home automation purposes such as verification and identification, and may be accessed over the internet or telephone. Biometrics contain characteristics that cannot be lost, remembered, or manipulated, and their existence in people vary between persons and other humans, assuring their uniqueness. Biometrics as verification is exceptionally good in the journal since the face is indeed a physiologic aspect that is simpler to distinguish between people, hence face analysis is one of the fingerprinting technology that has been developed. [4]

Convolutional Neural Networks contain three core architectures: convolutional fields, filtered shared weight, and pooling for spatial dimension reduction. Convolution, often known simply filtration, is a matrices that performs filters. The filtering method appears to involve two matrices: the input value columns and the core matrix. Numerous stages of the Deep Neural Network, notably the Recurrent Neural Network, Pooling Layer, and Fully Connected Layer, serve to carry out the filters established during the training phase. [5]

V. MACHINE LEARNING WITH STRATEGY AND UTILITY

This study describes an intelligent strategy to dealing with diverse and large-scale data sets using algorithms to provide genuine suggestions for prospective clients. The Collaborative Signal processing (CF) method is one of the

most often used RS strategies for generating suggestions. We suggested a unique CF recommendation technique that employs opinion-based analysis to generate a hotel features via identification. We use an amalgamation of regular expressions, syntactic analysis, and disambiguation as detailed deets for tailored referral, the proposed method suggests hotels based on attributes and guest type profiling. The developed system does have the ability to manage data points using big data, and it also has the ability to handle unstructured data. [6].

Facial recognition is used in the public and private sectors for a variety of purposes, from physical security to private business. However, it is unclear how users will translate these new tools in terms of benefits, risks and conveniences. Deep Siamese networks have recently been used as a peer competition to further expand the class gap. Although these networks may increase image accuracy in advance, the lack of early target data needs to result in more images being calculated for each stimulus potential, which is negligent in many research applications around the world. . In recent years, real-time voice recognition technology has been widely used in the field of intelligent sound equipment, mind control and adjustment as the first cross-cutting technology in the field of intelligence. Since clearance as a drawing tool has the advantages of a measuring instrument, energy consumption and R&D value, it has become a fire carrier with perfect speech skills.

What is the utility of machine learning? Machine learning is at the core of many of the world's most successful companies, including Face book, Google, and Umber. Machine learning has now become a critical competitive differentiator for many firms. There are several techniques to developing recommender systems. Some employ formulaic approaches, while others use more modeling-centric approaches, such as collaborative filtering, content-based, and so on. The complexity of each of these techniques varies, but intricacy does not imply "excellent" performance. Obvious solutions and implementations frequently produce the best outcomes. for example, have employed simple algorithmic implementations of recommender to push content on their platforms. an intuitive and academic overview of the recommender system , as well as how to construct a few alternative versions on a sample created dataset

We next develop a formal approach for dynamically selecting the next sample to label or repackage by learner autonomy to allow for relabeling, a technique we term re-active education, and we create new re-active learning algorithms that beat experiential learning baselines. Finally, we skip the noisy situation and look at how to acquire balanced classification models in domains with varied skew by examining a scenario in which employees can not only label but also generate samples with different distributions. We create algorithms that can dynamically flip between two states. [7]

VI. FACE RECOGNITION METHOD IN MACHINE LEARNING

This system includes a camera to recognise faces and an electromechanical door lock to allow admission to the room. Using the Haar spiral classifier algorithm incorporated in OpenCV, each human recognised by that of the webcam will also be evaluated for compliance with the

system's database. If the customer has access privileges, the hydraulic door lock will unlock and the user will be able to enter the room. [8] In this work, the Haar classification algorithm built in OpenCV can recognise multiple recorded images. Another project is the creation of facial recognition technology for use in smart things encryption methods. A webcam is used to programme and execute the notion. The communication between the webcam and the computer through cable and wifi. We'll utilise deep learning to deal with recognition in a very basic manner.

Other research journals have focused on developing a door domestic spying system that uses the Raspberry Pi as a processor and the open source OpenCV as anything other than a face reader, where its study scans confronts that have already been uploaded through into database, which therefore matches the portraits acquired by the webcam, or a facial expression reader, where this research project scans faces that have already been uploaded into in the database, which further matches the photographs procured by the webcam.[9] where the accuracy assessment accurate test table three times yields a success percentage of following this simple percent, nearly 73 percent, and primary and lower secondary percent In another experiment, an automatic door system that used facial recognition software as a key to unlock doors was created

This tool makes use of the fisherface method. The three essential steps of facial recognition are face detection, PCA interpretation, and FLD computation. While the measurement results of something like the system's effectiveness are 80%, as well in other research is an endeavour to create aid to maintain security in critical places [10]

The Extraction of features algorithm was used to recognise people, while the Viola-Jones approach was employed to detect faces. The results of the tests were recorded, and we achieved 95 percent recognition accuracy under fluorescent lighting circumstances.

	Content based method	Rules of association	Discriptors of items
<i>Knowledge Representation</i>	Terms And Keywords Related To	Rules Of Association	Semi related Item And Terms
<i>Learning</i>	Casual Text	Learning By Inductive Means	Computing Confidence
<i>Recommendation</i>	Searching Items With Related Terms	Getting Outcomes With High Value	In Search Of Items With The Highest Correlation Factors

VII. TESTING AND COMPARISON

Testing will be conducted by having provided input in the form of five house owners along with five faces of non-homeowners or community members who have now been examined in morning circumstances from declarations to

09.00, noon 5.30 to 14.00, mid morning 15.00 to 17.00, as well as late evening 19.00 to 12:30 a.m. with distances of 0.5 m, 1 meter long, and 1.5 meters wide, respectively, and the proximity from the front door.[11]

A. Homeowner Evaluation

Home owner testing using the built-in system.

B. Tester is not a resident or a neighbour.

The semi test is performed under the same settings as the home owner test, namely in the morning, noon, evening, and night.

C. Testing for Latency

The time it takes for such system to perform a face reading is used to calculate latency; the process starts because when equipment is in sleep and continue until the solenoid triggers and the door opens and closes.[12]

The test was repeated multiple times, multiple times for householders and 10 times for semi, with the average reading taking 5.90 seconds, D. Compared to Other Studies Following a review in earlier publications, notably in research Laboratories Cambridgeshire face information, the training algorithm using 400 negative photographs providesdataset in this research, and this study investigates the correctness of this technique using simulated results utilising this collection of data. When the precision value is increased, the same test produces better results..[13]

VIII. OBSTACLES IN DESIGNING AND IMPLEMENTATION OF MACHINE LEARNING

Major Challenges for Machine Learning Professionals

Extraction of features from textual reviews some of the challenges are listed below.

1. Inadequate Data Quality

Data's importance in the procedures cannot be overstated. The quality of data is critical in improving output. As a result, we must implement the concept of information preparation, something that includes the removal of anomalies and the deletion of superfluous characteristics is brought out absolutely perfectly.

2. Under fitting of Training Data-

This process occurs when data would be unable to create a realistic link between input and output variables... To address this matter: Increase your training time.

- Increase the model's complexity.
- Increase the number of characteristics in the data
- Reduce the number of regular parameters
- Increasing the model's training time

Training Data over fitting-Over fitting occurs when a machine learning model is trained with a large quantity of data and its performance suffers as a result. We can address this issue by doing the following:[14]

- Interpret the data with both the highest precision
- Utilize the data augmentation approach.

- a. *Machine Learning is a Complicated Process* - There is a higher risk of error, making learning more difficult. It includes research method of analysis, data favoritism correction, classification algorithm, complicated math equations, and much more. Another critical issue for pattern recognition experts is the complexity of the technique.
- b. *Inadequate Training Data* - The classification algorithm's critical duty is to preprocess the framework so that the output is accurate. Predictions will be erroneous or overly biased if the classification model is reduced.
- c. *Implementation Timeliness* - Computer vision techniques are extremely efficient at producing accurate result, but they take a long time to do so. Slow programmers, data congested roads, and excessive requirements usually necessitate a substantial amount of time to achieve the desired results. Monitoring and maintenance are required to achieve the best results.[15]

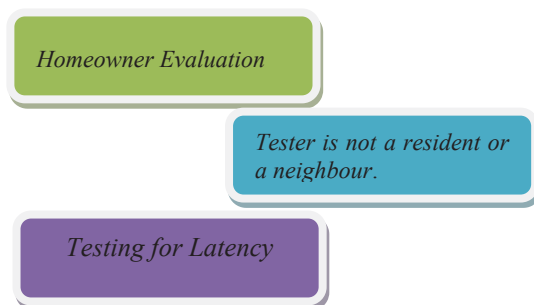


Fig. 1. Testing and comparison in face recognition method using machine learning

IX. METHODS IN MACHINE LEARNING

In this study, we propose an image recognition procedure for opening a garage door that really can substitute the process of security systems and used an auxiliary input or Smart cards, with the data analysis stages split into three parts, such as the segments of collecting data from homebuyers, relevant information in the training phase, and the image recognition methodology using Raspberry Pi. In this journal, we construct the face-recognition process that used the CNN approach, which will be placed on a mini-computer, especially the micro - controller, which will operate as a microprocessor to autonomously lock and open the front door, which is controlled by the homeowner's face..[15]

The result of face recognition in smart home shown in table 2:-

Period	Face	Distance 1m		Distance 2m	
		Success	Fail	Success	Fail
Noon	8	4	4	5	3
Morning	8	5	3	6	2
Night	8	5	3	4	4

1. Model of Instruction

Because of the limited processing of that with the Raspberry Pi, your training procedure may be carried out on such a desktop computer with Intel Processor cores 8500 Processor specifications and 8GB 4 gb of ram RAM, where such a training phase would also build a modeling that would also be utilized to assess the face. In the training stages, the CNN Alexnet technique with convolutional processes and two pooled processes, along with softmax with too many iterations over Twenty times with the results, are employed..[17]

2. Data Collection from Homeowners

The data collection stages are carried out manually, specifically by using a programme designed to gather facial data from every building owner group of 5 people, where the data collected is 1100 data, which is then segmented 1040 for classification model and 60 data is used for verification during training by trying to shift 10- 15 degrees of articulations..

3. Implementing the System

This prototypes will be built by connecting the modified Single Camera as a camera to find out the actual appearance of the house towards the Raspberry Pi board +, which would be linked using WLAN and part of the identification procedure.[18]

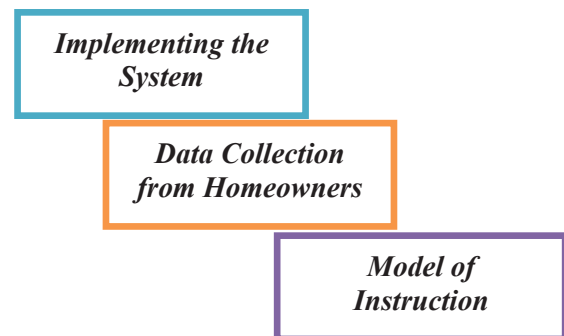


Fig. 2. Things to remember while testing and comparing a face recognition method in machine learning

Additionally, machine learning and data analysis have improved a wide range of industries, including diagnosis of diseases, data display and procedures, knowledge production, and so on. Such approaches have already been used in the fields of Smartphone apps, computer equipment, online websites, cyber security, and so on. Today, extensive data is dominating across numerous fields, and getting interferences and important knowledge from data has emerged as the most recent paradigm of scientific research as well.[16]

X. MACHINE LEARNING ADVANTAGES AND DISADVANTAGES IN FACE RECOGNITION IN SMART HOME

Machine learning, like the two sides of a coin, has its highs and lows. And in this article, we'll delve a bit further to examine both the advantages and disadvantages of this remarkable idea We build a facial recognition system in this paper.

the benefits and drawbacks of various strategies in a literature review. It aids technique among several as per our requirements of the application and, to some degree, solves present challenges for real-time applications. We reach 96.8 percent accuracy in real-time situations with many variables and seamless settings, and we quantify performance with the Multi-task Multilevel Advanced Understanding approach.[17]

- Using svds, calculate the similarity between items and users.
- Make item recommendations based on the user's id.
- Data migration from the generating new data function or download the CSV file from this location..
- To find the 50 most similar books, use a content-based model (cosine similarity).

Based on prior instances, a new method must be devised to prevent house burglary as theft caused by inadequate of security in the lock or padlock. As a consequence, the notion of a facial recognition-based door security development using the deep neural networks technique was established; naturally, it is more secure than locks. This technique is similar to an automatic electronic lock. This method is intended to reduce the incidence of theft in residences where people regularly left their homes.[18]

- Personal Finance and Banking Fraud Prevention
- There are several personal assistant functions available, Google Assistant and Amazon Alex.
- Make a control limits with readers as both the index, books as both the column, and ratings as the values.

valuable contribution to something like a new field of expertise about the application of accurate facial recognition software to residential doorway locking systems. As a response, this study attempted to create an authentication technology that might be used on residential doors.[19].

One FaceNet imagery study of the Siamese nervous system is used for facial recognition and Gaussian hybrid structure and piercing of MFCC components is used for verification of speech. Preliminary processing is performed on an image captured by the user's voice. As the results are presented, the lowest face recognition distance and the highest speaker recognition mark are specified. With these restrictions, the user is excluded or unrecognized as a member in the data. For small files, the planning structure works better than government structures that require large data for training. Additionally, the model not only recognizes the facial recognition of the face, but also recognizes the face mask. For those wearing a mask, the eyes and nose should be clearly visible.

With the advancement of technology and the Internet of Things, smart homes have developed rapidly in recent years. At the same time, in-depth research also leads to success. Applying in-depth training to smart homes can improve user usage and increase security. In this dissertation is the use of the Neural Convolutional Network model, which is a Comprehensive Learning Method, in the field of recognizing human faces in natural phenomena. It is embedded as images printed and delivered and sent to the server. An enhanced VGG network structure was created within the server, which was used to receive the protocol.

This sophisticated internal system can reduce the inventory of art objects and improve visual accuracy.

The embedded platforms have the advantages of fast operation, low power consumption, small volume and scalability. As an embedded platform, a system for purchasing and creating video images will be developed. But embedded platforms may not work well for heavy work drawings. To solve this problem, we made the image very active through a cloud server. The combination of cloud platforms and servers can meet the needs of external monitoring devices that require high performance and low cost.

CONCLUSION

The study was conducted at three different distances, namely 1.565metres, 2 metre, and 0.545 metres, and at four varying periods, namely in the daytime, afternoon, late night, or night, where there has been an error 2 - 3 times, specifically at a distance of 500 metres where there was heightened illumination on the surrounding of the standing position. This study used an approach to increase face recognition accuracy, which could also reach 97.5 percent. Furthermore, when contrasted to the commercial OpenCV technique, which uses the identical database and assessment phases, our study performs somewhat better, yielding an accuracy of relative to previous percent, whereas the prior research produced an accuracy of 95 percent. Optimization of the face data augmentation method is one area of future study.

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