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Face recognition based banking system using machine learning

Mr. K. C. Mohanraj

Assistant. Professor of Computer Science and Engineering, K.S. Rangasamy College of Technology, Tiruchengode – 637 215, Namakkal District, TamilNadu, India

Corresponding author email: mohanraj@ksrct.ac.in

S. Ramya

Students of Computer Science and Engineering, K.S. Rangasamy College of Technology, Tiruchengode – 637 215, Namakkal District, TamilNadu, India

R. Sandhiya

Students of Computer Science and Engineering, K.S. Rangasamy College of Technology, Tiruchengode – 637 215, Namakkal District, TamilNadu, India

Abstract---The main ideal of this design is to recognize human face and extracting corresponding bank details to bank account users. It helps people to know about their regular transactions and it saves more time in banks. Face is the pivotal part of the human body that uniquely identifies a person. Using the face characteristics as biometric, the face recognition system can be enforced. The most demanding task in all banks is facing unwanted crowds for simple conditions. In traditional banking system, the bank users are called out by the bank employee commemorative wise to know the details of bank users. By enter the name or account number of the user they come to know about the full details of corresponding user. It takes further time for both users and workers. This model integrates a camera that captures an input image, an algorithm for detecting face from an input image, encoding and identifying the face, delivering the banking details directly to the bank users.

Keywords---VGG16 algorithm, feature extraction, face recognition, machine learning, convolutional neural network.

Introduction

Face recognition is a part of biometric identification that extracts the facial features of a face, and also stores it as a unique face to uniquely recognize a

person. Face recognition consists of two way, in first step faces are detected in the image and also these detected faces are compared with the database for verification. Face recognition technology is better than other biometric based recognition methodologies like finger- print, palm- print, iris because of its non-contact process. Banking system using face recognition is a procedure of recognizing bank users by using face biostatistics based on the high definition monitoring and other computer technologies. This design proposes a machine learning algorithm that's vgg16 algorithm to recognize face with high level accuracy. VGG16 is used in many deep learning image classification techniques and is popular due to its ease of implementation. The system uses face detection, feature extraction and face recognition that helps to maintain the automated banking system. In face detection the algorithm highlights the persons face in the image. This design allows user to perform banking operations like checking on account balance, and transferring money.

Objectives

- The main ideal of this design is to make the banking management system effective, time saving, simple and easy.
- Instead of using the conventional styles, this proposed system aims to develop an automated system that provides the bank user information by using facial recognition technology.
- Capable to recognize the face of an individual accurately based on the face database.

Related Works

S.NO	SUMMARY OF THE PAPER	TECHNIQUE USED	METHODS/ ALGORITHM
[1]	It focuses on enforcing a Face Detection and Face Recognition method, the proposed system using applicable algorithms which are apt for using various differences like different hair style, eyes and lips angle, different beard style, make- up and accessories and with and without specs.	Machine Learning	Viola-Jones, PCA and SIFT
[2]	Using smart secure systems for door lock and unlocking came popular currently. This system provides either a facial recognition security character or a keypad is delivered to enter the pass code to unlock the door.	Machine Learning	LBPH
[3]	This presents an OpenFace face recognition library that bridges this accuracy gap. It shows that OpenFace provides near-human accuracy on the LFW benchmark and present a new classification benchmark for mobile	Internet of Things	DeepFace, FaceNet

	scripts. This is intended for non-experts interested in using OpenFace.		
[4]	It proposes a deep- learning- based automated facial recognition system that employs face recognition to firstly perceive the presence of an authorized person, in order to grant the individual access to secure banking surroundings. A neural network- based face recognition is introduced, where apre-trained neural network is applied to guide the system.	Deep Learning	Convolutional Neural network
[5]	It focuses on face recognition for human faces are employed through Viola Jones algorithm for face identification, LBPH in favor of feature extraction, Euclidean distance classifier is for face recognition.	Machine Learning	LBPH, Viola Jones

Proposed Methodology

The facial recognition technology can be used in banks through a camera that detects and recognizes the faces of the users. Once the face of the user is matched with the stored image, also the needed details will be delivered to corresponding user. Then we can ignore the unwanted crowd for simple essentials. The bank user isn't need to ask bank worker help to know their transaction details.

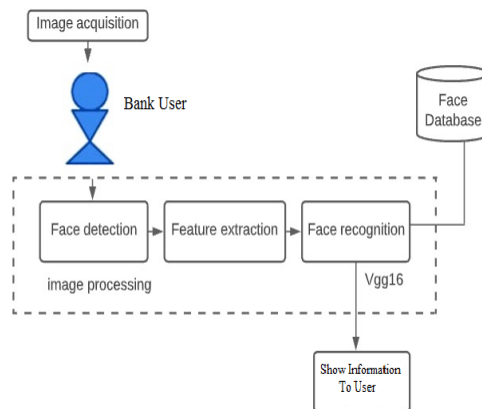


Figure 1: Block diagram for Face Recognition based Banking System using VGG16 algorithm

Using vgg16 algorithm the features are extracted from the face like as 8000 encodings and the encodings are stored in the dataset. In face recognition, the extracted features of current image is compared with the stored features in dataset. However, also it will extracting corresponding bank details to bank account users, If the face is matched.

Face Detection

Face detection is the capability to identify the person's faces within the digital images. This system identifies the human face present in an image. We need to define a general structure of a face to determine certain picture contains a face(or several). Human faces have the same features similar as eyes, nose, forehead, mouth, and chin. Thus, the ideal of face detection is to find the location and size of the face in an image. The located face is also used by the facial recognition algorithm.

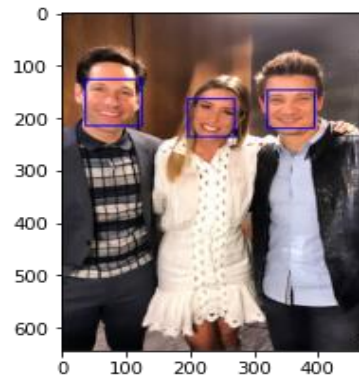


Figure 2: Face detection

Feature Extraction

In this phase, we're extracting the features from the detected face. Facial feature extraction is the process of extracting face element features like eyes, nose, mouth, etc from human face image. We can get the face encoding values from face in image. This approach should return 8000 values per face from image using VGG16 face recognition algorithm.

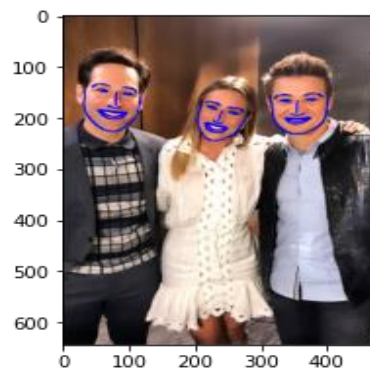


Figure 3: Feature extraction

Face Recognition

Face Recognition is being able to uniquely identify and confirm a person's face by comparing and analyzing a biometrics person's face. A face recognition system is an operation that's used for identifying or verifying a person from a digital image. The face is recognized, if its face embedding nearly matches any other face embedding in the database.

Model: "vggface_resnet50"			
Layer (type)	Output Shape	Param #	Connected to
input_1 (InputLayer)	[None, 224, 224, 3 @ 0]	0	[]
conv1/7x7_s2 (Conv2D)	(None, 112, 112, 64 @ 0)	9408	['input_1[0][0]']
conv1/7x7_s2/bn (Batch Normalization)	(None, 112, 112, 64 @ 0)	256	['conv1/7x7_s2[0][0]']
activation (Activation)	(None, 112, 112, 64 @ 0)	0	['conv1/7x7_s2/bn[0][0]']
max_pooling2d (MaxPooling2D)	(None, 55, 55, 64 @ 0)	0	['activation[0][0]']
conv2_1/3x3_reduce (Conv2D)	(None, 55, 55, 64 @ 0)	4096	['max_pooling2d[0][0]']
conv2_1/3x3_reduce/bn (Batch Normalization)	(None, 55, 55, 64 @ 0)	256	['conv2_1/3x3_reduce[0][0]']
activation_1 (Activation)	(None, 55, 55, 64 @ 0)	0	['conv2_1/3x3_reduce/bn[0][0]']
conv2_1/3x3 (Conv2D)	(None, 55, 55, 64 @ 0)	36864	['activation_1[0][0]']
activation_46 (Activation)	(None, 7, 7, 512 @ 0)	0	['conv5_3/3x3_reduce/bn[0][0]']
conv5_3/3x3 (Conv2D)	(None, 7, 7, 512 @ 0)	2359296	['activation_46[0][0]']
conv5_3/3x3/bn (Batch Normalization)	(None, 7, 7, 512 @ 0)	2048	['conv5_3/3x3[0][0]']
activation_47 (Activation)	(None, 7, 7, 512 @ 0)	0	['conv5_3/3x3/bn[0][0]']
conv5_3/1x1_increase (Conv2D)	(None, 7, 7, 2048 @ 0)	1048576	['activation_47[0][0]']
conv5_3/1x1_increase/bn (Batch Normalization)	(None, 7, 7, 2048 @ 0)	8192	['conv5_3/1x1_increase[0][0]']
add_15 (Add)	(None, 7, 7, 2048 @ 0)	0	['conv5_3/1x1_increase/bn[0][0]', 'activation_45[0][0]']
activation_48 (Activation)	(None, 7, 7, 2048 @ 0)	0	['add_15[0][0]']
avg_pool (AveragePooling2D)	(None, 1, 1, 2048 @ 0)	0	['activation_48[0][0]']
flatten (*flatten)	(None, 2048 @ 0)	0	['avg_pool[0][0]']
classifier (Dense)	(None, 8631 @ 0)	17684919	['flatten[0][0]']
Total params: 41,246,071			
Trainable params: 41,192,951			
Non-trainable params: 53,120			

Providing Information

The database of all the users in the bank server is stored and when the face of the individual user matches with one of the faces stored in the database also the information is fetched. It'll be shown to corresponding user such as user name, email id, bank name, account number and balance amount. The user can transfer money from their account.

Algorithm

VGG16 (Visual Geometry Group)

VGG16 is a simple and extensively used Convolutional Neural Network(CNN) Architecture used for ImageNet, a large visual database design used in visual object recognition software exploration. ' VGG ' is the abbreviation for Visual Geometry Group, which is a group of experimenters at the University of Oxford who developed this framework, and ' 16 ' implies that this framework has 16 layers. We can extract 8000 encoding from a face using vgg16 algorithm.

VGG16 is used in numerous deep learning image classification methodologies and is popular due to its ease of accomplishment. VGG16 is massively used in

learning applications due to the advantage that it has. VGG16 is a CNN Architecture, which was used to win the ImageNet Large Scale Visual Recognition Challenge(ILSVRC) in 2014. It's still one of the stylish vision framework to date.

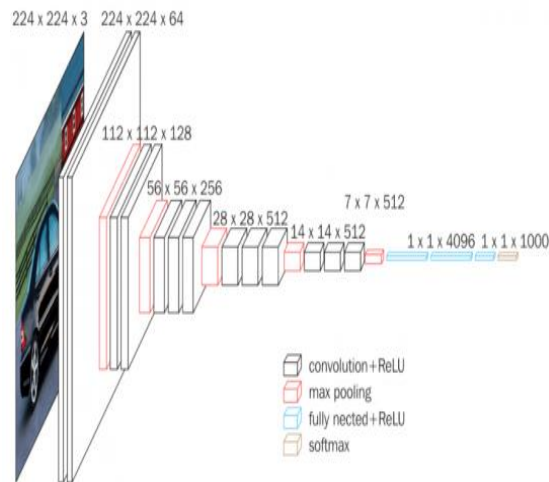


Figure 4: VGG16 architecture

During training, the input to the friaries is a fixed- size 224 x 224 RGB image. deducting the mean RGB value computed on the training set from each pixel is the onlypre-processing done then. The image is passed through a stack of convolutional(conv.) layers, where clarifiers with a very small receptive field 3×3 (which is the lowest size to capture the notion of left/ right, up/ down, center and has the same effective receptive field as one 7×7), is used. It's deeper, has othernon-linearities, and has fewest parameters. In one of the configurations, 1×1 convolution filters, which can be seen as a direct transformation of the input channels(followed bynon-linearity), are also applied. The convolution stride and the spatial padding of conv. layer input is fixed to 1 pixel for 3×3 convolutional layers, which ensures that the spatial resolution is saved after convolution. Five max- pooling layers, which follow some of the convolutional layers, helps in spatial pooling.

There are three Fully- Connected(FC) layers that follow a heap of convolutional layers(these have different depths in different infrastructures) the first two have 4096 channels each, the third performs 1000- way ILSVRC classification and therefore contains 1000 channels(one for each class). The final layer is the soft-max layer. The configuration of the completely connected layers is the same in all networks.

Result

In our trial, we have used images with different color variations, black/ white and various background. The dataset contains images with resolutions of 1280 x 720 pixels. The testing set contains variety of background and the sample images used are real world images. The exactness the trial of detecting and recognizing faces is compared with other being methodologies. Using the VGG16 alone is

having exactness lower than all the other styles compared. The proposed system of in which OpenCV and vgg16 used for detection and also recognition gives better results than other compared styles.

This design developed banking deals using facial recognition namely, transfer amounts, card details,etc. once facial identity is matched also transaction will finished otherwise it will display “ person not recognized ”. After completing transaction we can view the balance amount from the account. Using vgg16 algorithm the features are extracted from the face like as 8000 encodings and the encodings are stored in the dataset. In face recognition, the extracted features of current image is compared with the stored features in dataset. However, also it will extracting corresponding bank details to bank account users, If the face is matched.

In this design main focus is safety our money and our transaction. We are using VGG16 algorithm for face recognition. Capture module deals with the configuration performs the real- time video capture. Face Detection module analyses each captured frame and extracts valid faces from each frame. Face Identification deals with face recognition and verification of the detected face.

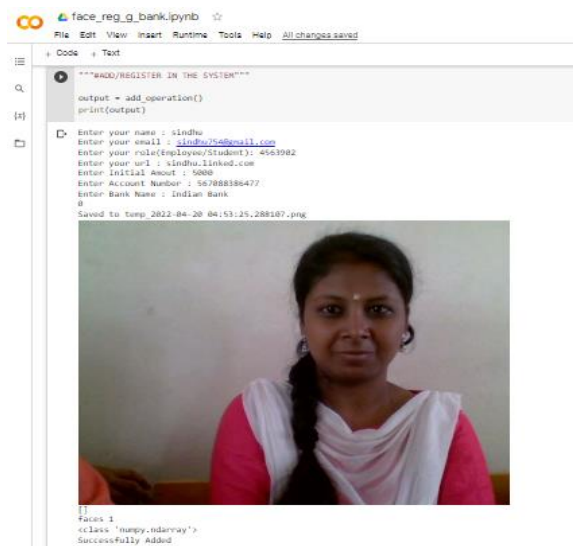


Figure 5: Register face

```

"""#TRANSFER MONEY"""

output = check_operation()
if(len(output) == 6):
    print(output[0])
    print("Name : ", output[1])
    print("Email ID : ", output[2])
    #print("Balance Amount: ", output[3])
    print("Bank Name: ", output[5])
    print("Acc Number: ", output[4])
else:
    print(output)

```

Enter account number : 4675859494949
Enter amount to transfer : 3000
Saved to check_2022-04-20 04:56:41.107351.png

Figure 6: Transfer amount

```

[ ]

```



```

result_output: [0.17259522]
Person Found ('sindhu', 'sindhu754@gmail.com', '4563902', 'sindhu.linked.com', b'\x00\x00')
Person Matched
Name : sindhu
Email ID : sindhu754@gmail.com
Balance Amount: 2000
Bank Name: Indian Bank
Acc Number: 567088386477

```

Figure 7: Providing bank details

```

[ ] """#CHECK DETAILS"""

output = balance_operation()
if(len(output) == 6):
    print(output[0])
    print("Name : ", output[1])
    print("Email ID : ", output[2])
    print("Balance Amount: ", output[3])
    print("Bank Name: ", output[5])
    print("Acc Number: ", output[4])
else:
    print(output)

```

Saved to check_2022-04-20 04:57:41.790028.png



```

result_output: [0.17240403]
Person Found ('sindhu', 'sindhu754@gmail.com', '4563902', 'sindhu.linked.com', b'\x00\x00')
Person Matched
Name : sindhu
Email ID : sindhu754@gmail.com
Balance Amount: 2000
Bank Name: Indian Bank
Acc Number: 567088386477

```

Figure 8: Check balance amount

Conclusion

We proposed VGG16 for face recognition and face detection using the web camera. This paper presented an effective methodology for administering face recognition. Hence, the proposed system allows detection and recognition of faces in controlled surroundings. As machine learning is really important today, there are multiple areas where this work can be expanded. This paper will concentrate on expanding the current scheme to enhance the usability and security. As facial recognition methodology seems more challenging as compared to other biometrics, thus more effective algorithm can be developed. We also need to discuss the approach of camera planning based on the result of the position estimation in order to enhance face detection effectiveness. In coming work, we need to add the history of user transaction details. we discussed about the operation of face recognition in payments and banking systems. In real- time, VGG16 algorithm recognize faces with high exactness. also, the proposed method is the features are extracted from a detected face and the face recognized by using vgg16 algorithm. If the recognized face matches with one of the faces stored in the database also it will deliver corresponding bank details to the bank account user with high position of accuracy and lower time consumption. We will be getting the Proposed VGG16 algorithm as the best output result.

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