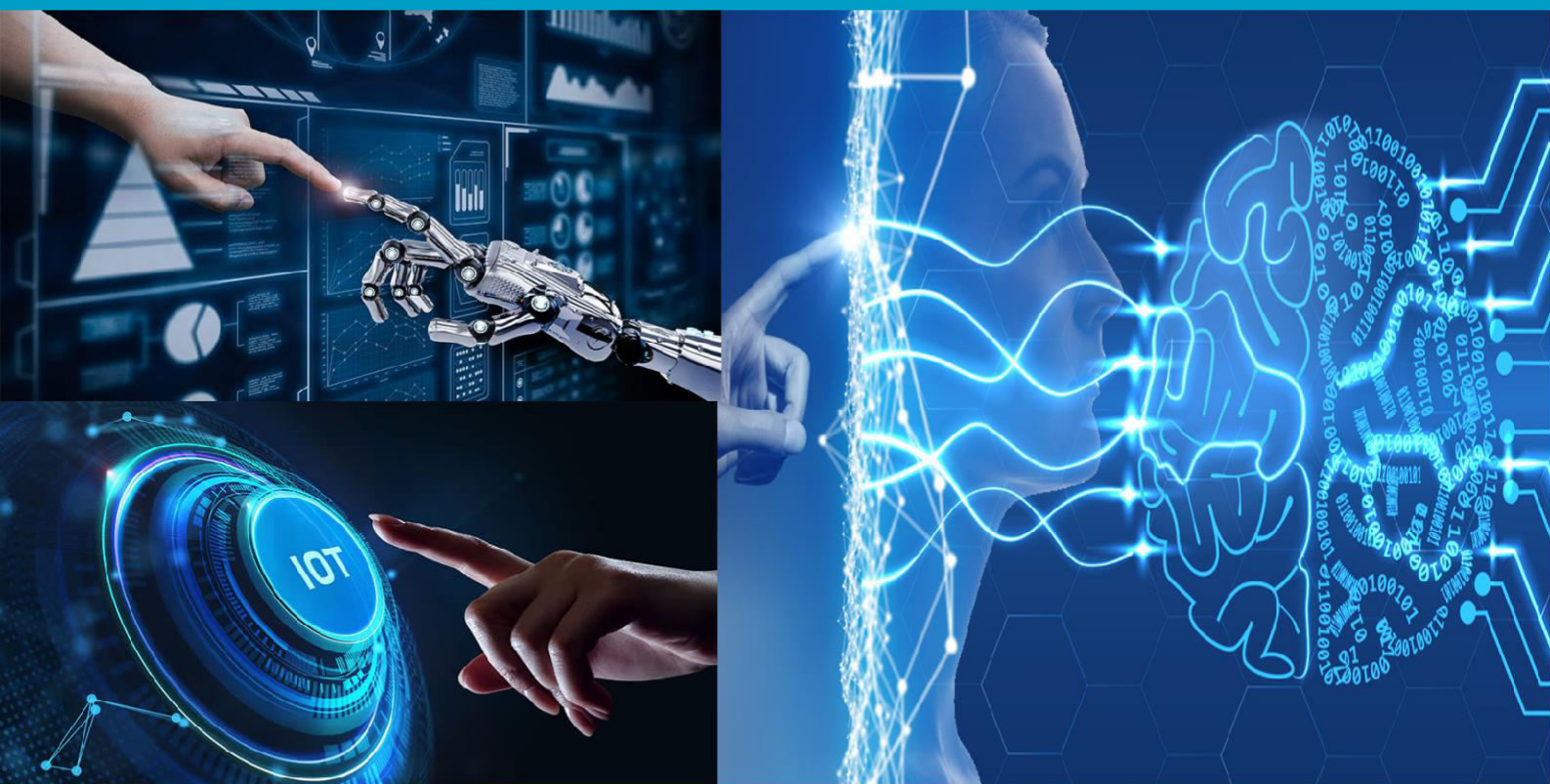




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Face Ticket Exam Hall Authentication System Using Face Biometrics

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ABSTRACT: During examinations, Authentication has always been the major challenge. The method of authenticating a student for an examination has an obvious problem such as presentation of fake clearance card, impersonation and so on and the unethical manner associated with the examination is a grim issue that requires the stakeholders in academic area to seek for alternative means of authenticating student for examination, because the manual paper-based clearance process is fundamentally flawed. Hall ticket and identity cards are normally used in the examination system for fraud detection. Existing examination system mainly deals with document image analysis techniques and biometric system in identification, recognition and classification of the candidate. Generally, fraud is detected by using document image analysis whereas the proposed model is focus on the image/video for analysis. In this project a deep learning model is made to develop automated face detection and recognition for detecting impersonation of candidate in examination system. Automated face detection and recognition system using convolutional neural network can further be used in Hall Number, Seating Allocation, identity verification and attendance monitoring in examination system. The proposed deep learning model comprises of two steps: enrolment and authentication. To validate the proposed framework, we used a custom DeepFake dataset collected on our own.

KEYWORDS: Face Ticket, Exam Hall Authentication, Face Biometrics, Biometric Authentication, Face Recognition, Attendance Tracking, Exam Security, Fraud Prevention, Impersonation Detection, Digital Identity

I. INTRODUCTION

Education as a planned undertaking, at a personal level on a small scale or institutional level on a large scale, aims at making student capable of becoming active, responsible, productive, and caring members of society. They are made be acquainted with the various practices of the society by imparting the relevant skills and ideas. Education encourages the students to analyses and evaluate their experiences, to doubt, to question, to investigate – in other words, to be inquisitive and to think independently and acquire proficiency. Exams and tests are a great way to assess what the students have learned with regards to particular subjects. Exams will show what part of the lesson each student seems to have taken the most interest in and has remembered. With every pupil being so individual, exams are also a great way for teachers to find out more about the students themselves. The test environment comes with added stress, which allows teachers to work out how their students argue and how they think individually by their works, which is a great attribute for them to keep in mind for future class activities.

II. PROPOSED SYSTEM

Face detection and recognition system for identity verification and attendance monitoring in the examination system. Fraud with respect to hall tickets and designs an automated system for impersonation or cross checking hall tickets using image processing techniques. The major problems occur in examination systems are malpractices. The fundamental Problem identified is the absence of a credible identity verification system for offline and also for online examination system. The solution for this problem is an examination system designed based face detection and verification technology incorporating the security strength of examination and the accuracy. Impersonation is nothing but to pretend to be for purposes of fraud or to assume the character or appearances of especially fraudulently, which is one of the main problems to be addressed in our project. Secondly in case of impersonation is detected whether the

candidate is authenticated or not. If the person is authenticated his attendance also recorded. The message has to be sent to the exam in-charge by using alarm whether the candidate is authenticated or not. Deep learning in the form of Convolutional Neural Networks (CNNs) to perform the face recognition.

III. SYSTEM OVERVIEW

CNNs are a category of Neural Networks that have proven very effective in areas such as image recognition and classification. CNNs are a type of feed-forward neural networks made up of many layers. CNNs consist of filters or kernels or neurons that have learnable weights or parameters and biases. Each filter takes some inputs, performs convolution and optionally follows it with a non-linearity. A typical CNN architecture can be seen as shown in Fig.3.3. The structure of CNN contains Convolutional, pooling, Rectified Linear Unit (ReLU), and Fully Connected layers.

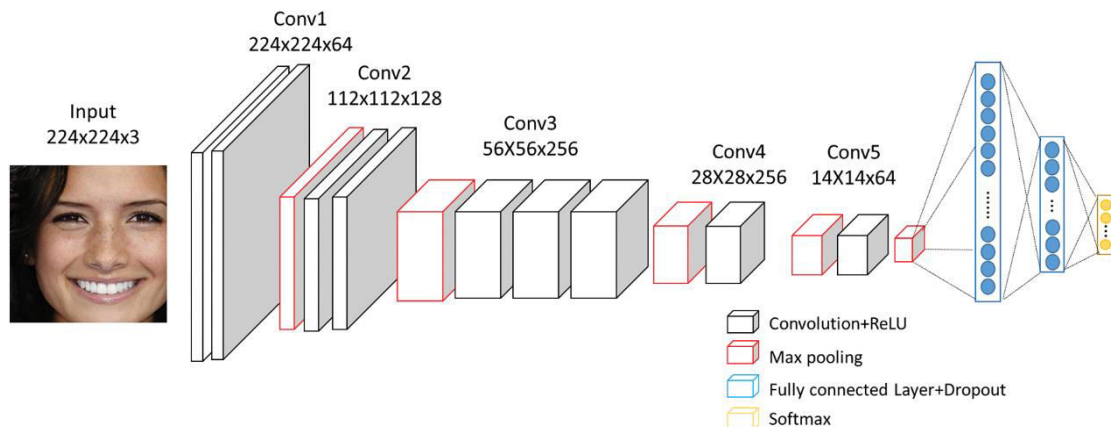


Figure 3.3. DCNN

A. Convolutional Layer: Convolutional layer performs the core building block of a Convolutional Network that does most of the computational heavy lifting. The primary purpose of Convolution layer is to extract features from the input data which is an image. Convolution preserves the spatial relationship between pixels by learning image features using small squares of input image. The input image is convoluted by employing a set of learnable neurons. This produces a feature map or activation map in the output image and after that the feature maps are fed as input data to the next convolutional layer.

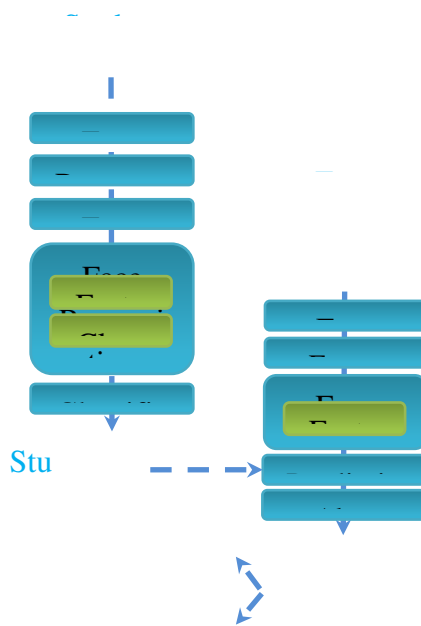
B. Pooling Layer: Pooling layer reduces the dimensionality of each activation map but continues to have the most important information. The input images are divided into a set of non-overlapping rectangles. Each region is down-sampled by a non-linear operation such as average or maximum. This layer achieves better generalization, faster convergence, robust to translation and distortion and is usually placed between convolutional layers.

C. ReLU Layer: ReLU is a non-linear operation and includes units employing the rectifier. It is an element wise operation that means it is applied per pixel and reconstitutes all negative values in the feature map by zero. In order to understand how the ReLU operates, we assume that there is a neuron input given as x and from that the rectifier is defined as $f(x) = \max(0, x)$ in the literature for neural networks.

D. Fully Connected Layer: Fully Connected Layer (FCL) term refers to that every filter in the previous layer is connected to every filter in the next layer. The output from the convolutional, pooling, and ReLU layers are embodiments of high-level features of the input image. The goal of employing the FCL is to employ these features for classifying the input image into various classes based on the training dataset. FCL is regarded as final pooling layer feeding the features to a classifier that uses Softmax activation function. The sum of output probabilities from the Fully Connected Layer is 1. This is ensured by using the Softmax as the activation function. The Softmax function takes a vector of arbitrary real-valued scores and squashes it to a vector of values between zero and one that sum to one.

IV. SYSTEM DESIGN

System Architecture



V. SYSTEM IMPLEMENTATION

The COVID-19 vaccines are essential, lifesaving commodities in the current pandemic and ensuring equitable & indiscriminate access to the vaccines for all is of paramount importance. Millions of vulnerable people are at risk of missing out on COVID-19 vaccines as India uses its national digital identity for registration. However, deploying Aadhaar-based FRT for the verification process, deprives the citizens who do not possess or have not linked their Aadhaar cards to the CoWin portal or the on-site register, of the vital vaccines,” it said.

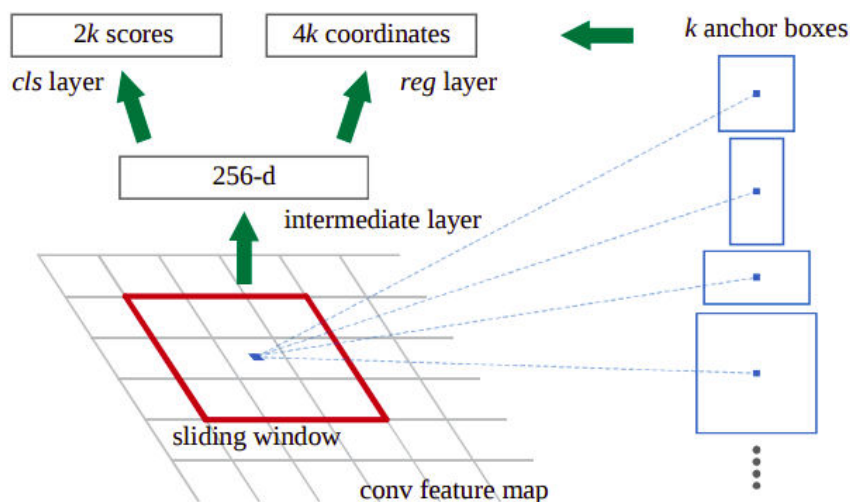
Module Description

1. Face Recognition – Training Phase

Therefore, in this module, Region Proposal Network (RPN) generates RoIs by sliding windows on the feature map through anchors with different scales and different aspect ratios. Face detection and segmentation method based on improved RPN. RPN is used to generate RoIs, and RoI Align faithfully preserves the exact spatial locations. These are responsible for providing a predefined set of bounding boxes of different sizes and ratios that are going to be used for reference when first predicting object locations for the RPN.

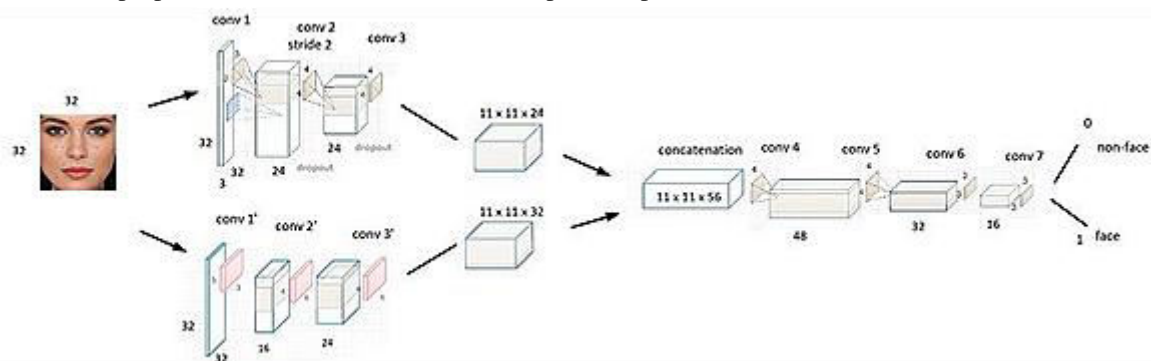
2. RPN

A **Region Proposal Network**, or **RPN**, is a fully convolutional network that simultaneously predicts object bounds and objectness scores at each position. The RPN is trained end-to-end to generate high-quality region proposals. It works on the feature map (output of CNN), and each feature (point) of this map is called Anchor Point. For each anchor point, we place 9 anchor boxes (the combinations of different sizes and ratios) over the image. These anchor boxes are centered at the point in the image which is corresponding to the anchor point of the feature map.



3. Face Classification

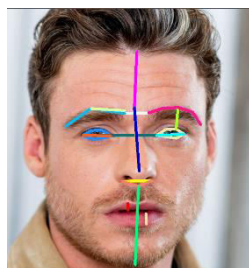
DCNN algorithms were created to automatically detect and reject improper face images during the enrolment process. This will ensure proper enrolment and therefore the best possible performance



The CNN creates feature maps by summing up the convolved grid of a vector-valued input to the kernel with a bank of filters to a given layer. Then a non-linear rectified linear unit (ReLU) is used for computing the activations of the convolved feature maps. The new feature map obtained from the ReLU is normalized using local response normalization (LRN). The output from the normalization is further computed with the use of a spatial pooling strategy (maximum or average pooling). Then, the use of dropout regularization scheme is used to initialize some unused weights to zero and this activity most often takes place within the fully connected layers before the classification layer. Finally, the use of softmax activation function is used for classifying image labels within the fully connected layer.

4. Feature Extraction

After the face detection, face image is given as input to the feature extraction module to find the key features that will be used for classification. With each pose, the facial information including eyes, nose and mouth is automatically extracted and is then used to calculate the effects of the variation using its relation to the frontal face templates.



5. Performance Analysis

The important points involved with the performance metrics are discussed based on the context of this project:

True Positive (TP): There is a Face, and the algorithms detect student name.

False Positive (FP): There is no Face, but the algorithms detect as student and display name.

False Negative (FN): There is a Face, but the algorithms do not detect student and name.

True Negative (TN): There is no Face, and nothing is being detected.

	True (relevant)	False (not relevant)
Positive (retrieved)	TP	FP
Negative (not retrieved)	TN	FN

Fig. 8.1. Parameter Definition

• Accuracy

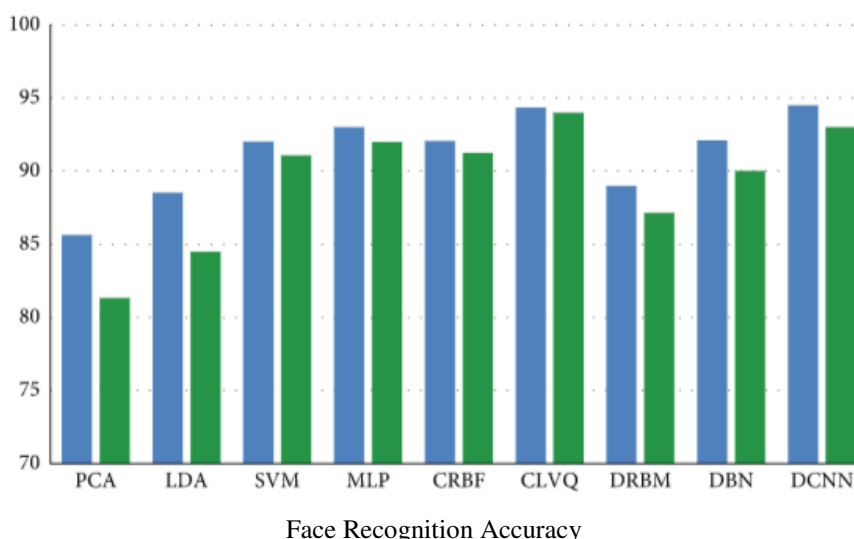
Accuracy is a measure that tells whether a model/algorithm is being trained correctly and how it performs. In the context of this thesis, accuracy tells how well it is performing in detecting Face in ATM Machine. Accuracy is calculated using the following formula.

$$\text{Accuracy} = (TP + TN) / (TP + TN + FP + FN)$$

Accuracy: 0.9984025559105432

VI. EXPERIMENTAL RESULTS

A comparative evaluation based on the accuracy of the proposed face recognition Deep Convolutional Neural Network (DCNN) system, compared to Support Vector Machine (SVM), Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), as statistical approach, Multi-Layer Perceptron (MLP), Combined Radial Basis Function (CRBF), as neural network approach, Deep Restricted Boltzmann Machine (DRBM), Deep Belief Neural Nets (DBNN). The results show that the proposed DCNN achieves higher accuracy compared to other approaches.



VII. CONCLUSION

Traditionally student's attendance in exam hall were taken manually by professor and it has to consume too much time of students as well as professor. A facial recognition system is a technology capable of matching a human face from a digital image or a video frame against a database of faces, typically employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image. In the proposed system, we have developed face recognition system ready to be implemented for the purpose of live examinee authentication with minimal human interaction to verify the candidate using Convolutional Neural Network. This System represent an analysis of different technologies which are used for taking attendance system. Further it can be replaced by fully



computerized system. This system can be implemented for better results regarding the management of attendance during exam. This system will save time; decrease the amount of work the administration has to do. The proposed classifier performance evaluation was presented as a confusion matrix, in terms of sensitivity, specificity, precision, accuracy, and F1score. Results indicated that the proposed classifier has achieved higher recognition accuracy than ten other classifiers of the state of art.

VIII. FUTURE ENHANCEMENT

For the future, we will proceed to enhance the proposed classifier performance to be able to handle the spoof attacks problem that may be occurred by fake subjects. Also, we can apply this technique to vote anywhere in India.

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