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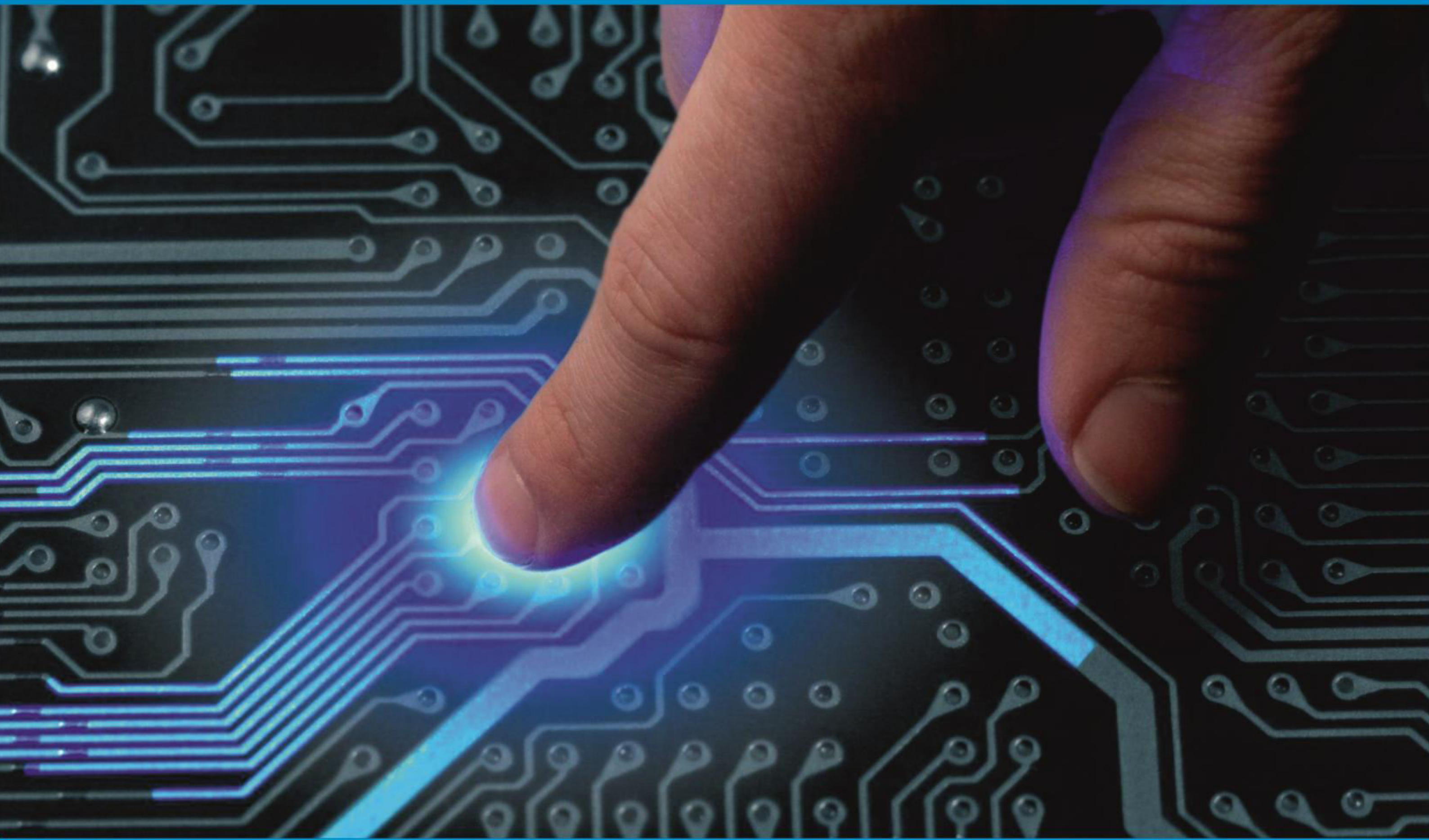

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Attendance Management with Face Detection using Deep Learning

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ABSTRACT: Deep Neural Networks (DNNs) have become the industry standard for machine learning techniques. DNNs have excelled in a range of tasks, including voice recognition; face identification, and picture categorization. Nearly all of the best performing techniques on the Labeled Faces in the Real Time dataset employed convolutional neural networks (CNNs). In this study, we recommend smart face identification and recognition using deep learning, and we update each student's system's attendance data in accordance with the outcomes of that technique. The system works using machine learning algorithms for face recognition and deep learning algorithms for object identification. The proposed system is effectively accurate thanks to the two separate algorithms.

KEYWORDS: Deep Neural Networks, Convolutional neural networks, Polynomial Time, Hyper Text Transfer Protocol, Uniform Datagram Protocol, Transmission Control Protocol

I. INTRODUCTION

Nevertheless, this issue is likewise quite challenging, and it has only been in recent years that good outcomes have been attained. In truth, this challenge is often broken down into smaller ones to make it simpler to handle. The key ones to be broken down are face detection in a picture and face recognition itself. While waiting, other tasks might be completed, such as formalizing faces or drawing out additional qualities from them. Numerous algorithms and methods have been used, including Eigen faces or Active Shape models. However, Deep Learning (DL), particularly Convolutional Neural Networks, is the one that is now most popular and producing the most outstanding results (CNN). After examining the current state of the art, we chose to concentrate our study on these approaches since they are presently producing outcomes of excellent quality.

We present an intelligent attendance system that uses face recognition. It also collected face images from cameras, used deep learning to recognize faces, and dealt with the face recognition algorithm to update the current attendance.

II. LITERATURE SURVEY

In [1] with the aid of face detection and recognition technologies, an automated attendance tracking system has been developed to update the attendance records of the students by verifying their actual presence in the classroom. Face recognition functions similarly to object recognition in the context of imaging and computer vision. Two popular models for feature extraction in face recognition algorithms are PCA and LDA, which are used to extract low-dimensional and more discriminating characteristics from faces. This paper's objective is to give an independent, comparative analysis of three cutting-edge appearance-based feature extraction techniques (PCA, LDA, and hybrid approach) under absolutely equal processing and algorithm execution settings.

According to [2] the system employs Gabor filters, KNN, CNN, SVM, and generative adversarial networks in addition to Haar classifiers. Attending reports will be created and maintained in excel format after face recognition. The system is tested under a variety of circumstances, including lighting, head motions, and changes in the pupil's distance from the cameras. The total complexity and accuracy are determined after rigorous testing. The proposed method was shown to be a reliable and effective tool for collecting attendance in a classroom without taking up any time or requiring human labour. The technology created is affordable and requires little installation.

According to [3] on the creation of a computerized attendance system that manages the class database and records student attendance by using facial recognition techniques. The technology aims to be implemented in every classroom so that it can intelligently track student attendance and replace the current method.

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According to [4] a deep cascaded multi-task system that maximizes their performance by taking use of their natural correlation. We gathered 100 films with around 18265 pictures from our device and used this dataset using the procedure and other systems that were suggested. On our dataset, the educated model was tested and compared to the Haar cascade model. In comparison to previous methods for identifying the face and eye in a picture, our suggested approach outperforms them by achieving a 98% accuracy rate. Additionally, this article includes a study of several techniques for tabulating faces and eyes in films.

According to [5] The methods for facial recognition are researched. Face identification and cropping are the initial steps in any face recognition system, therefore we compared MultiTask Convolutional Neural Networks (MTCNN) to traditional Viola-Jones face detection in terms of detection accuracy and processing speed. The final classifier created may match a face captured by an internet camera with a picture from a certain database. We also investigated strengthening standalone facial recognition by including a spoof detection technique to ensure that the system does not respond to every means of getting around it, such as displaying a picture of an authorized person on a phone's screen.
According to [6] to conduct face presentation attack detection (PAD) on multi-channel pictures utilizing anomaly detection based on convolutional neural networks. The ability to discriminate between various assault modes is greatly enhanced by multi-channel pictures, and the generalization performance is ensured by an anomaly detection-based approach. With the use of the large multi-channel presentation attack (WMCA) dataset, we assess the effectiveness of our techniques.

According to [7] a thorough and efficient method for performing person identification, social distance violation detection, face detection, and face mask classification utilizing object detection, clustering, and a binary classifier powered by a Convolution Neural Network (CNN). On surveillance video datasets, YOLOv3, Density-based spatial clustering of applications using noise (DBSCAN), Dual Shot Face Detector (DSFD), and MobileNetV2 based binary classifier have been used. Additionally, this research compares several face detection and face mask classification methods. In order to make up for the absence of dataset in the community, a technique for labelling video datasets is finally presented along with the labelled video dataset, which is utilized to evaluate the system.

For the Covid-19 Surveillance System, Face Mask Detection and Temperature Scanning [8]. The proposed concept is a prototype for temperature monitoring and mask identification. To detect the body's current temperature, the first technique employs a temperature sensor. The second approach seeks to provide individuals a protection system to ward against COVID-19. Additional testing on 50 different photo datasets was used to assess how well the suggested technique performed. For ten random tests, we experimented with different training and testing percentages.

COVID-19 Challenges: Advances in Sensor Technology and IoT Framework [9]. The COVID-19 scenario hasn't allowed us enough time to think through the best solutions for a variety of demands, therefore researchers from all across the world have stepped up and started working on solutions. There has never been such an urgent and pressing demand for academics to provide solutions in the history of creation. Ease of use, reliability and resilience, accuracy, acceptability by users and authorities, extended device longevity, and cost affordability are some of the main issues that must be resolved in order to succeed. The utilization of modern improvements in sensor technology, wireless communication, or Internet of Things (IoT) systems to solve COVID-19 concerns is covered in this chapter.

Robust Face Mask Detection on IoT Devices Using Deep Learning [10]using deep learning for face mask detection on IoT devices on mobile GPU-powered IoT devices like the NVIDIA Jetson TX2 and NVIDIA Jetson Nano, four convolutional neural networks—MobileNet V2, Inception V3, VGG 16, & ResNet 50—have been constructed and are being tested for face mask detection. The experimental results demonstrate that these deep learning models are robust to fluctuating availability of training data, both in terms of quantity and quality.

III. PROPOSED METHODOLOGY

Figure 1 depicts the system architecture, which focuses on optimization techniques for face identification administration, with a focus on public methods. The system uses the camera to recognize the student's face and saves it to the hard drive. The DCNN framework runs the training module and stores individual features in the training database using feature extraction and feature selection techniques. To recognize objects by detecting the face in a given input videos and capturing the frame. The test feature maps the complete training dataset and generates a similarity weight for each item, then recommends the real student id based on the weight system. The attendance for each student is immediately updated based on the specified id.

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A. Architecture

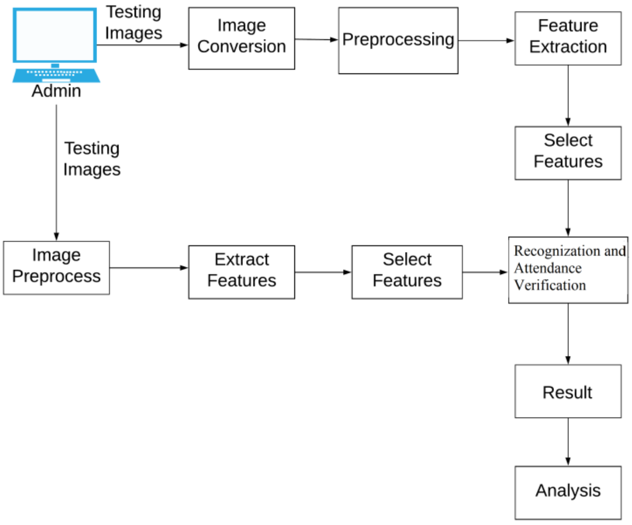

Figure 1. System Architecture

The above figure demonstrates a system architecture and overall execution in detail. In below section we discuss each step of the execution;

- System first detects the student face using camera and store into hard drive.
- The DCNN framework executes training module using feature extraction as well as feature selection technique and store individual feature into the tainting database.
- To detect the face from given input image and capture the frame for object recognition.
- The test feature has map with entire training dataset and generate the similarity weight for each object, and according to achieved weight system recommend the actual student id.
- Based on given id system automatically update the attendance for respective student.

B. Algorithms

DCNN

Input: Various test examples are included in the test dataset. Train dataset that is created during the training phase, TestDBLits Threshold Th, TrainDBLits.

Output: HashMap < classlabel, SimilarityWeight > all instances which weight violates the threshold score.

Step 1: For each testing records as given below equation

$$testFeature(k) = \sum_{m=1}^{n} (\text{[Testing\_featureSet[A[i] ... . A[n]]} \leftarrow \text{TestDBLits})$$

Step 2: Create feature vector from $testFeature(m)$ using below function.

$$\text{Testing\_Extracted\_FeatureSetx [t.......n]} = \sum_{x=1}^{n} (\text{t}) \leftarrow testFeature \text{ (k)}$$

Extracted_FeatureSetx[t] holds the extracted feature of each instance for testing dataset.

Step 3: For each train instances as using below function

$$trainFeature(l) = \sum_{m=1}^{n} \left(\begin{matrix} [\text{Training}_{\text{featureSet[A[i]........A[n]]}} \\ \leftarrow \text{TrainDBList} \end{matrix} \right)$$

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Step 4: Generate new feature vector from$trainFeature(m)$ using below function

$$\text{Training\_Extracted\_FeatureSet\_Y[t......n]} = \sum_{x=1}^{n}(t) \leftarrow TrainFeature\ (l)$$

Extracted_FeatureSet_Y[t] holds the extracted feature of each instance for training dataset.

Step 5: Assess each test record using the whole training dataset now.

$$weight = calcSim\ (\text{FeatureSetx} \,||\, \sum_{i=1}^{n} \text{FeatureSety[y]})$$

Step 6: Return Weight

C. Mathematical Model

A system is represented by five distinct stages, each of which has its own independent system of dependencies S = (Q, ∑, δ, q_0, F) where −

- **Q** a limited number of states.
- ∑ is a limited collection of symbols known as the alphabet.
- **Δ** is the function of transition where δ : Q × ∑ → Q
- $\mathbf{q_0}$ is the starting point for processing any input ($q_0 \in Q$).
- **F** is a set of final state/states of Q (F ⊆ Q).

Q = initial transactional data with student face
∑= {feature extraction, feature selection technique, store individual feature}

Δ = detect the face all validation process

q0 = Initial transaction T[0]

F = {training dataset, testing dataset}

State =According to achieved weight system recommend the actual student id.
1: if all id system automatically updates the attendance for respective student
0: if The ID system automatically updates attendance that is not for the respective student

IV. RESULT AND DISCUSSIONS

The graph of system classification is below. The diagrams demonstrate how the system divides the total inputs into distinct situations. The proposed technique uses a Deep CNN combination that yields excellent outcomes.

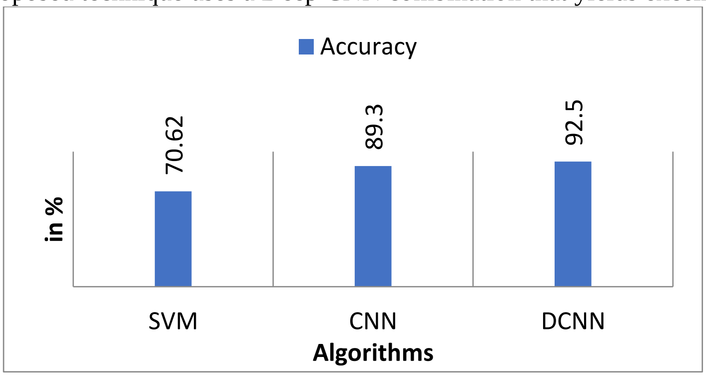

Figure 2: Face detection and classification accuracy.

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Deep CNN obtains higher accuracy over machine learning-based SVM and deep learning-based CNN classification algorithms in the entire experimental analysis. The SVM achieves 72.75% accuracy, and SNN gives around 90% accuracy, while Deep CNN achieves 95.5% detection accuracy for heptageniids as well as real-time dataset also.

V. CONCLUSIONS

Our objective was to develop a full-Face Recognition system that could function with any picture and was continually improving. This improvement had to be self-contained, and it had to be able to detect and integrate new individuals. Furthermore, time constraints were a concern since this recognition had to be done near real-time as feasible. Face recognition is challenging to solve, particularly outside of controlled settings. In reality, there have been several failed attempts throughout history. Apart from differences in expression, lighting, and facial hair across photos of the same face, determine what makes a face identifiable. As a result, our goal at the outset of this project was to utilize some of the current research rather than starting from scratch. This would enable us to speed up the procedure while also increasing the likelihood of obtaining high-quality findings. Using different machine learning and deep learning techniques, extract variously simulated as well as some real-time characteristics and automatic attendance the student faces.

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