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VIRTUAL CLASSROOM: FACE RECOGNITION ATTENDANCE SYSTEM FOR VIRTUAL CLASSROOM USING DEEP LEARNING

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Abstract:

The COVID-19 pandemic outbreak has resulted in an unprecedented crisis across the globe. The pandemic created an enormous demand for innovative technologies to solve crisis-specific problems in different sectors of society. In the case of the education sector and allied learning technologies, significant issues have emerged while substituting face-to-face learning with online virtual learning. Several countries have closed educational institutions temporarily to alleviate the COVID-19 spread. The conclusion of instructive establishments constrained the instructors across the globe to widely utilize web based gathering stages. The virtual classrooms created by online meeting platforms are adopted as the only alternative for face – to - face interaction in physical classrooms. In such manner, understudies' participation the board in virtual classes is a significant test experienced by the educators. Understudy participation is a proportion of their commitment to a course, which has an immediate relationship with their dynamic learning. However, during virtual learning, it is exceptionally challenging to keep track of the attendance of students. Calling students' names in virtual classrooms to take attendance is both trivial and time-consuming. In this manner, in the scenery of the COVID-19 pandemic and the broad utilization of virtual gathering stages, there is an emergency explicit prompt need to foster a legitimate global positioning framework to screen understudies' participation and commitment during virtual learning. In this project, we are addressing the pandemic-induced crucial necessity by introducing a novel approach. In order to realize a highly efficient and robust attendance management system for virtual learning, we introduce the Random Interval Query and Face Recognition Attendance Management System (hereafter, AI Present). To the best of our knowledge no such automated system has been proposed so far for tracking students' attendance and ensuring their engagement during virtual learning.

Key Words: COVID-19, Deep Learning, Random Interval Query, Face Recognition, Attendance, DCNN

Introduction:

Overview:

A virtual homeroom is a web based educating and learning climate where educators and understudies can introduce course materials, draw in and communicate with different individuals from the virtual class, and work in gathers together. The vital differentiation of a virtual study hall is that it happens in a live, simultaneous setting. Online coursework can include the review of pre-recorded, nonconcurrent material, however virtual study hall settings include live collaboration among educators and members. Virtual homerooms and distance learning, as substitute innovation driven learning techniques, have been developing at a sensible speed. Virtual homerooms have been explicitly being used by all areas, including essential and advanced education as well as corporate learning.

Existing System:

Zoom, Google Meet, Microsoft Teams, and Cisco Webex Meetings are utilized to make virtual homerooms. Manual participation calling, self-revealing participation frameworks (utilizing apparatuses like Google structures), video calling understudies, short tests or surveys, questions and conversations by choosing arbitrary understudies, and planned tasks. In the case of physical classrooms, biometric-based attendance monitoring systems are essentially based on face, fingerprint, and iris recognition technologies Facial recognition is a technology that is capable of recognizing a person based on their face. It utilizes AI calculations which find, catch, store and examinations facial highlights to coordinate them with pictures of people in a prior data set. Early methodologies basically centered around extricating various kinds of hand-made highlights with area specialists in PC vision and preparing successful classifiers for discovery with customary AI calculations.

Support Vector Machine (SVM):

Support Vector Machines (SVM) are a well-known preparing instrument which can be utilized to create a model in light of a few classes of information, and afterward recognize them. For the fundamental two-class order issue, the objective of a SVM is to isolate the two classes by a capacity initiated from accessible models. On account of facial acknowledgment, a class addresses an interesting face, and the SVM endeavors to find what best isolates the different element vectors of one of a kind face from those of another remarkable face.

Neural Network (NN):

Brain Network has kept on utilizing design acknowledgment and arrangement. Kohonen was quick to show that a neuron organization could be utilized to perceive adjusted and standardized faces. There are techniques, which perform include extraction utilizing brain organizations. There are numerous techniques, which joined with devices like PCA or LCA and make a mixture classifier for face acknowledgment. These resemble Feed Forward Neural Network with extra predisposition, Self-Organizing Maps with PCA, and Convolutional Neural Networks with multi-facet discernment, and so on. These can expand the productivity of the models.

K-Nearest Neighbors:

One of the fundamental arrangement calculations in AI is known to be the k-NN calculation. In AI, the k-NN calculation is viewed as a very much checked sort of learning. It is regularly utilized in the arranging of related components in looking applications. By building a vector portrayal of articles and afterward estimating them utilizing proper distance measurements, the similitudes between the not set in stone.

Proposed System:

Proposed System of the project introduces the novel feature of randomness in an AI-based face recognition system to effectively track and manage students' attendance and engagement in virtual classrooms. Enhances the efficacy of the attendance management in virtual classrooms by integrating two ancillary modalities students' real-time response to CAPTCHAs, Concept QA and UIN (Unique Identification Number) queries. Monitors students' attendance and engagement during virtual learning without affecting their focus on learning. Proposed two ancillary modalities - verifying students' responses to Subjects and UIN (Unique Identification) queries at random intervals of time. Fosters an easy to understand participation recording framework for educators that can naturally record understudies' participation and produce participation reports for virtual study halls. Deep learning in the form of Convolutional Neural Networks (CNNs) to perform the face recognition.

DCNN:

CNNs are a class of Neural Networks that have demonstrated exceptionally viable in regions like picture acknowledgment and order. CNNs are a kind of feed-forward brain networks comprised of many layers. CNNs comprise of channels or pieces or neurons that have learnable loads or boundaries and predispositions. Each channel takes a few information sources, performs convolution and alternatively follows it with a non-linearity. A commonplace CNN design should be visible. The structure of CNN contains Convolutional, pooling, Rectified Linear Unit (ReLU), and Fully Connected layers.

- Convolutional Layer: Convolutional layer plays out the center structure block of a Convolutional Network that does a large portion of the computational hard work. The basic role of Convolution layer is to separate elements from the information which is a picture. Convolution protects the spatial connection between pixels by learning picture highlights utilizing little squares of information picture. The info picture is tangled by utilizing a bunch of learnable neurons. This creates a component guide or enactment map in the result picture and after that the element maps are taken care of as information to the following convolutional layer.
- ReLU Layer: ReLU is a non-direct activity and incorporates units utilizing the rectifier. A component wise activity implies it is applied per pixel and reconstitutes all bad qualities in the element map by nothing. In order to understand how the ReLU operates, we assume that there is a neuron input given as x Pooling layer reduces the dimensionality of each activation map but continues to have the most important information. The info pictures are isolated into a bunch of non-covering square shapes. Every locale is down-examined by a non-direct activity like normal or greatest. This layer accomplishes better speculation, quicker union, strong to interpretation and mutilation and is normally positioned between convolutional layers.and from that the rectifier is characterized as $f(x)= \max(0, x)$ in the writing for brain organizations.
- Fully Connected Layer: Completely Connected Layer (FCL) term alludes to that each channel in the past layer is associated with each channel in the following layer. The output from the convolutional, pooling, and ReLU layers are embodiments of high-level features of the input image. The objective of utilizing the FCL is to utilize these elements for characterizing the information picture into different classes in view of the preparation dataset. FCL is viewed as last pooling layer taking care of the highlights to a classifier that utilizes SoftMax initiation work. The amount of result probabilities from the Fully Connected Layer is 1. This is guaranteed by involving the SoftMax as the initiation work. The SoftMax work takes a vector of inconsistent genuine esteemed scores and squashes it to a vector of values somewhere in the range of nothing and one that aggregate to one.

System Design:
System Architecture:

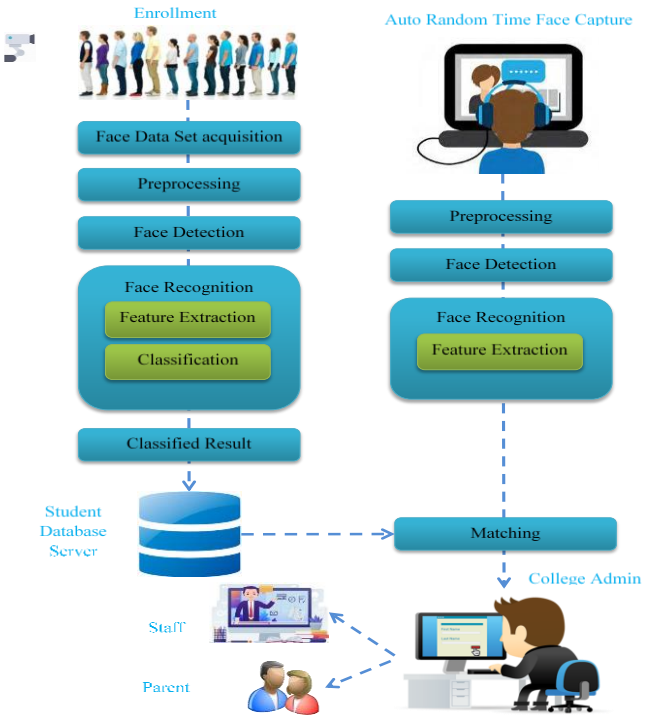

Figure 1.1: Architecture

System Implementation:
Problem Description:

The teacher or lecturer has to enter the attendance of each student manually for each virtual class into their particular campus software. Creating many copies of the attendance record is also a difficult duty for additional academic purposes. In the virtual classrooms, a main issue with fingerprint and iris recognition is the unobtainable of fingerprint and iris scanners in students' devices. Not all smartphones are equipped with these scanners. In the current web based gathering applications, there are no connection points to perceive the unique mark and iris examples of every understudies. The solution for this problem is face tracking method using machine learning.**.** In the virtual class, all students' faces are extracted from the video frames at a random of intervals and store it in the host server. Mainly, students should respond to the CAPTCHAs, prompted by pop-ups at random intervals and also students should enter their UIN (Unique Identification Number) to confirm their presence or active in the virtual classroom for the attendance, the student should enter their CAPTCHAs and UIN within 30seconds.

Result and Discussion:

This section provides the results of the experimental procedures carried out while realising the AIP resent prototype model. Specific results obtained by implementing the AIPresent face recognition module and the ancillary modalities are critically discussed. The results from the face recognition module are discussed in accordance with its training and testing phases. Face recognition can be regarded as successful if at least one of the five training samples matches with the test sample.

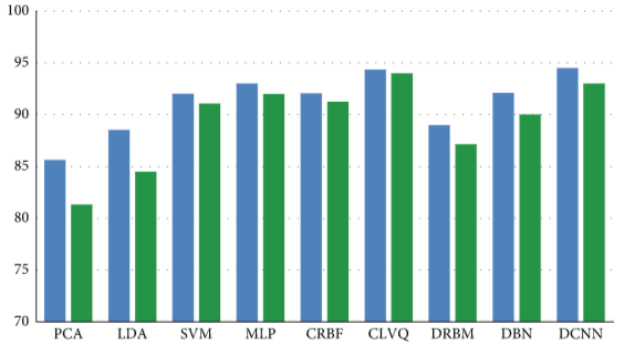

Figure 1.3: Face Recognition Accuracy

The random intervals of time are designed in such a way that it follows the attention span distribution of the students.

Conclusion

Random Interval Attendance Management System (AIPresent) is an innovation based on Artificial Intelligence – Deep Learning, specially designed to help the teachers/instructors across the globe for effective management of attendance during virtual learning. AIPresent facilitates precise and automatic tracking of students' attendance in virtual classrooms. It incorporates a customized face recognition module along with specially designed ancillary submodules. Both the face recognition and the sub modalities are for students' attendance monitoring in virtual classrooms.

Future Enhancement:

By incorporating other ancillary modalities like speech recognition and adding suitable adaptive weights for each modality, the efficiency and reliability of the system can be further enhanced. Further implement this system to online examination.

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