



Prediction Of Academic Performance An Multisource And Multifeature BehavioralData

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Abstract: Analysis of the learning context is carried out to obtain patterns of student behavior in the teaching and learning process. This project aims to detect student behavior in both off-line and on-line e- classes as a supporter of the analysis of the learning context. Taking attendance is an important step to monitor the activities of a student and to ensure the eligibility of the student to complete the course. Despite technological advancements ,most of the educational institutes still use the old register system. we propose a new way to take attendance of students in a classroom, which is efficient ,less time consuming and which can be done using devices that are available with people into day's day and age such as smartphones, laptops/ desktops. In the proposed model, the power of Machine learning and versatility of Drive have been put to good use to build a smart attendance system with Face Recognition technique. We using facial recognition based on facial landmark 68 key point descriptor SVM (support vector machine) algorithm to calculate step by step process to calculate student behavioral. The attendance maintenance can be a great burden for the teachers if it is done manually. To resolve this problem, smart and auto attendance management system is being utilized and data stored on sql database.

Keywords:

Context , Attendance, Facial Recognition, Machine Learning

INTRODUCTION

The growing need for information and high-quality video cameras has led to the proliferation of video-based systems that perform tasks such as surveillance, traffic monitoring, etc. This is necessary because such tasks are time consuming given the amount of data involved. Hence manual detection has become almost impossible. A variety of domains (classroom surveillance, content-based video retrieval, etc.) require optimized and robust mechanisms to detect an event from the video. Hence automatic event detection and decision making by the machine is of an urgent need to support the growing need of surveillance systems around the world which will reduce the chances of error and the amount of time spend in analyzing the video if it was to be done manually by humans. In a video, key frames are those which represents the most significant events occurring in that video. It highlights most of the key contents of the video. A video can be naively summarized with the help of key frames. This is an area that has gained the attraction of many researchers. A lot of research has been done to propose different approaches for key frame extraction. Selecting suitable approach is very much application specific. extract key frames is one of the most conventional approaches to summarize videos. This is because it best corresponds to human perceived measurement.

Attention level of students can be evaluated by many approaches. One such approach is by using upper body and frontal face detection. This is a very robust idea and has the ability to work in real time. This idea is very flexible and add-ons can be made to make it more accurate. In this project we propose an algorithm to detect the attention level of a student in classroom during the lecture hours by extracting key frames. Conventional HAAR cascade classifier approach is unified with frontal face and upper body detection to evaluate a student's attention level. The performance of the algorithm is validated by implementing it for three stored videos. The processing time of this approach in detecting attention level of a student is compared with and without key frames. The proposed algorithm shows robust performance with good customization possibilities.

Face is considered as primary key feature to identify and talk with other peoples in the world because face considered as a unique to the other indusial. The unique features for every indusial make facial recognition in implementing the real world. Human distinguish a particular persons face based on the several factors like color, nose, eyes, ears, etc. but for computers ,its difficult to analyze the data so we may use the concept of the vision. The intension of using the computer vision technology to recognize the human features in a computer.

In recent years we observed remarkable changes in face recognition techniques because of available biometric methods, this is the most unnoticeable technique. The installation face recognition systems on a large scale are easy but the actual implementation of face recognition systems is ambitious because it as to take into account for all potential cases variation caused by a modification in face expressions by light-weight, face expression, different styles, image resolution sensing element device, viewing distance etc. Several algorithmic rules are implemented on face recognition and every algorithms has strengths and capabilities by its own. Most of the time we glance at a face and acknowledge by in a flash with the data present already in the database.

LITERATURESURVEY

1. Chaitanya Reddy “Face Recognition Using Artificial Intelligence”

Facial Recognition System can be defined in simple words as the technology that identifies a person and verifies it with the data base by comparing the facial features described by Chaitanya reddy.

2. Santana Fell “Ai To Mark Attendance”

Artificial Intelligence enabled Face detection-based application becoming world famous. This was discussed by Santana Fell. In Washington, American private elementary school in Seattle begins implementing automatic face detection technique called SAFR(Secure accurate Facial Recognition). In this method faces of parents are adding into the database.

3. Jyothi S Bedre ,ShubhangiSapkal “Comparative Study of Face Recognition: A Review”

Scientists started working on computers to recognize human faces from mid-1900s because of its enormous applications on face recognition has received continuous attention from researchers. Face recognition may be outlined because of the technique of characteristic by someone based on biometrics by the approach of matching a capturing image or video with the data present in the database. The data flow process in face Recognition systems starts by having the ability to find face and recognize front all faces from data input devices like mobile phones, cameras, etc. Practically it has been proven that students attended classes only when there is full control on classroom and attendance monitoring.

4. Siswanto, Adrian RhesaSeptian, Anto Satriyo Nugroho, and Maulahikmah Galinium. "Implementation of face recognition algorithm for biometrics based time attendance system."

Authors in researches to get best facial recognition algorithm (Eigen face and Fisher face) provided by the Open by comparing the Receiver Operating Characteristics (ROC) curve and then implemented it in the attendance system. Based on the experiments carried out in this paper, the ROC curve proved that, Eigen face achieves better result than Fisher face. System implemented using Eigen face algorithm achieved an accuracy rate70% to90%.

5. Lukas, Samuel, et al."Student attendance system in classroom using face recognition technique."

Authors proposed method for student attendance system in classroom using face recognition technique by combining Discrete Wave let Transforms (DWT) and Discrete Cosine Transform (DCT). These algorithms were used to extract the features of student’s face followed by applying Radial Basis Function (RBF) for classifying the facialobjects.Thissystemachievedanaccuracyrateof82%

6. Rathod, Hemantkumar, et al. "Automated attendance system using machine learning approach."

Authors proposed an attendance system based on facial recognition. The algorithms like Viola-Jones and Histogram of Oriented Gradients (HOG) features along with Support Vector Machine (SVM) classifier were used to implement the system. Various real time scenarios such as scaling, illumination, occlusions and pose was considered by the authors. Quantitative analysis was done on the basis of Peak Signal to Noise Ratio (PSNR) values and was implemented in MATLABGUI.

7. Okokpujie, Kennedy O., et al. "Design and implementation of a student attendance system using iris biometric recognition."

In this project authors have designed and implemented an attendance system which uses iris biometrics .Initially, the attendees were asked to register their details along with their unique iris template. At the time of attendance, the system automatically took class attendance by capturing the eye image of each attendee, recognizing their iris, and searching for a match in the created data base. The prototype was web based.

FACIAL RECOGNITION

Facial recognition technology involves identifying or verifying a person from a digital image or video frame. It works by analyzing unique patterns in facial features. This technology has various applications, from unlocking smartphones to enhancing security systems and even aiding law enforcement. However, there are also concerns about privacy, surveillance, and

potential misuse of the technology. Facial recognition technology utilizes algorithms to analyze unique patterns in facial features from digital images or video frames. It works by mapping characteristics like the distances between the eyes, nose, and mouth, as well as the shape of the face and contours of facial features. This information is then compared to a database of known faces to identify or verify individuals. There are two main types of facial recognition: verification, which confirms whether a person's face matches a specific image or template, and identification, which searches a database to determine the identity of a person from a captured image. Facial recognition has various applications, including security systems for access control, law enforcement for suspect identification and missing person searches, targeted advertising in retail, and biometric security features for unlocking smartphones and computers.

Despite its utility, facial recognition technology faces several challenges and concerns. These include issues of accuracy, as factors like lighting conditions and facial expressions can affect its performance. There are also significant privacy concerns, as the widespread use of facial recognition could lead to mass surveillance and erosion of personal privacy. Additionally, some algorithms have shown biases, particularly against certain ethnicities or genders, raising concerns about fairness and discrimination. The ethical and legal implications of facial recognition are subjects of on going debate, with calls for regulation to address these concerns. Looking ahead, advancements in machine learning and computer vision techniques are expected to improve the accuracy and reliability of facial recognition systems. Integration with other biometric and surveillance technologies may create more comprehensive security systems. However, there will likely be increasing emphasis on addressing the ethical implication so facial recognition, including issues of consent, transparency, and accountability.

Facial recognition technology is a fascinating area of computer science that has seen significant advancements in recent years. At its core, this technology works by analyzing and identifying unique patterns in facial features, such as the distance between the eyes, the shape of the nose, and the contours of the face. These features are then converted into a mathematical representation, often referred to as a facial signature or template. One of the key applications of facial recognition is in security systems. It's used extensively in access control, allowing individuals to unlock devices or gain entry to secure areas based solely on their facial features. This has replaced traditional methods like passwords or ID cards, offering a more convenient and potentially more secure way of authentication.

Law enforcement agencies also heavily rely on facial recognition technology for various purposes. It can aid in identifying suspects from surveillance footage, assisting in criminal investigations, and locating missing persons. In some cases, facial recognition has even been used to track down individuals with outstanding warrants or to prevent crime in real-time by identifying known offenders in public spaces. Moreover, businesses are increasingly leveraging facial recognition for commercial purposes. Retailers use it to analyze customer demographics, track shopping behavior, and deliver targeted advertisements. This not only enhances the shopping experience for consumers but also provides valuable data for businesses to improve their marketing strategies and customer engagement.

Despite its many benefits, facial recognition technology is not without its challenges and controversies. Concerns about privacy invasion and potential misuse of personal data have led to debates about its ethical implications. There are also technical challenges, such as ensuring accuracy across different demographics and mitigating biases that may exist in the algorithms. Looking ahead, the future of facial recognition technology holds promise but also calls for responsible development and deployment. Continued research and innovation will be crucial in addressing the technology's limitations and ethical concerns while maximizing its potential benefits for society. As the field evolves, it will be essential to strike a balance between innovation, privacy, and security to ensure that facial recognition technology serves the greater good.

SYSTEM SPECIFICATION:

Software Specification

Frontend	:GUI
Backend	:python
Software tool used	:Thonny
Platform	:Windows8

SYSTEM FUNCTION

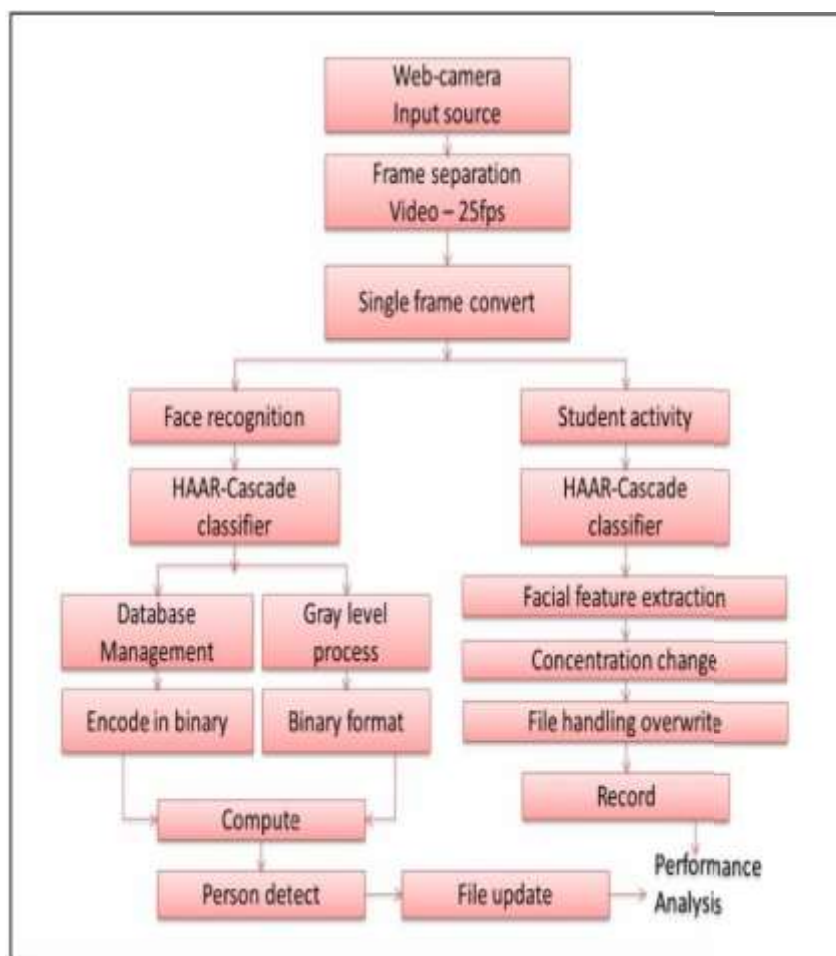


Fig .1: Architecture Diagram of HAAR System



Fig. 2 Architecture diagram of GUI

SYSTEM MODULES

There are five modules in this system

- Camera input module
- Front end Staff login module
- Face recognition module
- Attention level monitoring module
- Backend storage module

Camera input module – In this module, the camera will capture the face of the student. A digital video camera captures moving images using technology similar to that used by a still digital camera. It uses light sensors to capture the images. The images are then changed into binary numbers. The binary numbers are then stored in files on the camera's backing storage.

Front end Staff login module – In this module, the staff can login and enter into attendance mode and monitoring mode. Front end login page is where user can login with their username or email and password and after login it will take the user to their profile or some other pages depending on their respective to roles.

Face recognition module – This module will recognize the face of the student and compare with database to mark as present .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 pin pointing and measuring facial features from a given image.

Attention level monitoring module – This module will monitor the student behavior inside the classroom using facial feature extraction. The student behavior monitoring system is directly connected to the camera network and academic portal to retrieve the detailed schedule and reduce the scale of the student recognition, very similarly to Ngo et al. because their system also takes automatic attendance.

Backend storage module – In this module, the marked attendance and behavioral analysis of students will be stored in backend storage. If this value is Storage System, the storage system is configured as back-end storage. If this value is Storage Virtualizer, the storage system is configured to virtualize back-end storage.

HAAR CASCADE CLASSIFIER

Object Detection using HAAR feature-based cascade classifiers is an effective method proposed by Paul Viola and Michael Jones in the 2001 paper, "Rapid Object Detection using a Boosted Cascade of Simple Features". It is a machine learning based approach in which a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, HAAR features shown in below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting the sum of pixels under the white rectangle from the sum of pixels under the black rectangle. The HAAR cascade classifier is a machine learning-based object detection algorithm used to identify objects in images or video streams. It's particularly well-known for its application in detecting faces, but it can also be trained to recognize other objects like eyes, cars, or pedestrians.

Feature Selection:

The algorithm starts by selecting features that are relevant for detecting the object of interest. In the case of face detection, these features might include edges, lines, or other patterns that are commonly found in human faces.

Training:

The classifier is then trained using a large data set of positive and negative examples. Positive examples are images containing the object to be detected (e.g., faces), while negative examples are images that don't contain the object. During training, the algorithm learns to distinguish between the positive and negative examples based on the selected features.

Cascade of Classifiers:

The trained classifier consists of a cascade of stages, each of which contains multiple weak classifiers. These weak classifiers are simple decision rules that examine a small portion of the image and determine whether the object is likely to be present in that region. The cascade structure allows for efficient computation by quickly rejecting regions of the image that are unlikely to contain the object.

Detection:

During the detection phase, the cascade classifier is applied to the input image in a sliding window fashion. The classifier is sequentially applied to each region of the image, and at each stage of the cascade, a decision is made about whether to continue to the next stage or to reject the region. Regions that pass all stages of the cascade are considered to contain the object of interest.

Post-processing:

Once potential object region have been identified, post-processing steps may be applied to refine the detections or to filter out false positives. For example, non-maximum suppression can be used to merge overlapping detections or to discard detections below a certain confidence threshold.

The HAAR cascade classifier is known for its simplicity, speed, and effectiveness, particularly in real-time applications such as face detection in video streams. However, it has some limitations, such as sensitivity to variations in lighting conditions, occlusions, and changes in pose or scale. More advanced object detection algorithms, such as convolutional neural networks (CNNs), have become increasingly popular for tasks requiring higher accuracy and robustness.

Now all possible sizes and locations of each kernel are used to calculate plenty of features. For each feature calculation, we need to find the sum of the pixels under the white and black rectangles. To solve this, they introduced the integral images. It simplifies calculation of the sum of the pixels, how large may be the number of pixels, to an operation involving just four pixels.

But among all these features we calculated, most of them are irrelevant. For example, consider the image below. To show two good features. The first feature selected seems to focus on the property that the region of the eyes is often darker than the region of the nose and cheeks. The second feature selected relies on the property that the eyes are darker than the bridge of the nose. But the same windows applying on cheeks or any other place is irrelevant. So how do we select the best features out of 160000+features? It is achieved by Adaboost.

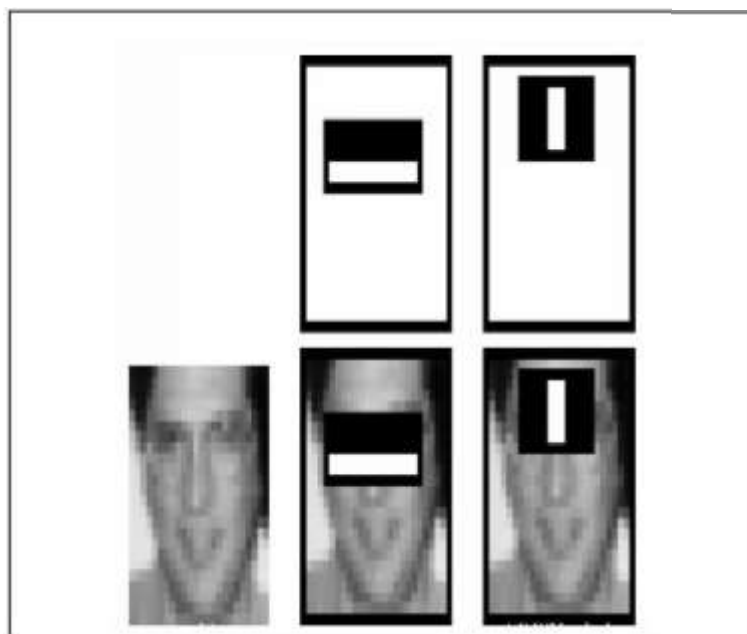


Fig.3 HAAR Cascade Classifier

FACE DETECTION:

Face detection is a type of application classified under “computer vision” technology. It is the process in which algorithms are developed and trained to properly locate faces or objects (in object detection, a related system), in images. These can be in real time from a video camera or from photographs. An example where this technology is used are in airport security systems. In order to recognize a face, the camera software must first detect it and identify the features before making an identification. Likewise, when Facebook makes tagging suggestions to identify people in photos it must first locate the face. On social media apps like Snapchat, face detection is required to augment reality which allows users to virtually wear dog face masks using fancy filters. Another use of face detection is in smart phone face ID security.

In this project, I implemented a system for locating faces in digital images. These are in JPEG (Joint Photographic Experts Group) format only. Before we continue, we must differentiate between face recognition and face detection. They are not the same, but one depends on the other. In this case face recognition needs face detection for making an identification to “recognize” a face. I will only cover face detection.

Face detection uses classifiers, which are algorithms that detect what is either a face(1) or not a face(0) in an image. Classifiers have been trained to detect faces using thousands to millions of images in order to get more accuracy. Open CV uses two types of classifiers, LBP (Local Binary Pattern) and HAAR Cascades.

ABBREVIATION:

HAAR- High Altitude Acute Response GUI –

Graphical User Interface

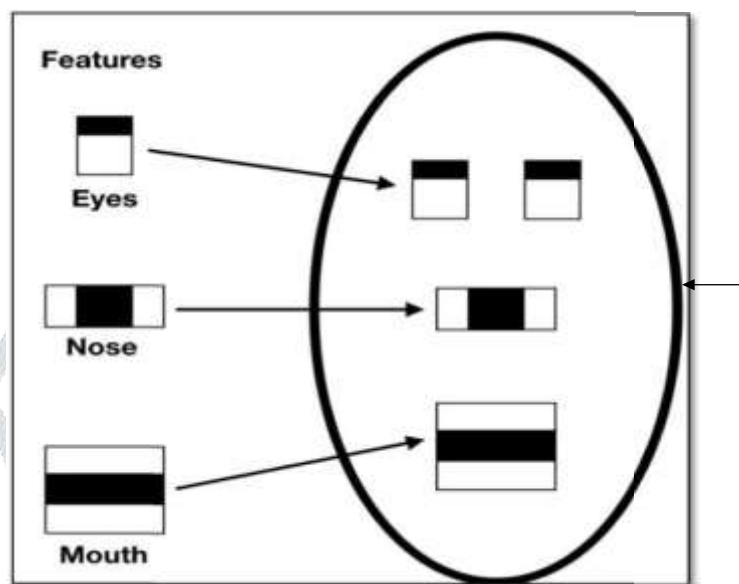
RESULT ANALYSIS:

Fig.4: Feature Extraction

- It will mark the attendance
- Activities of the students will be record

CONCLUSION:

As an attempt to evaluate the concentration level of a student in classroom, this project has proposed an HAAR algorithm which combines extraction approach with face and upper body detection methods. The HAAR algorithm is verified using videos. In each of the video the algorithm calculated the percentage of attention of a student in a classroom and also It mark the attendance. The algorithm is implemented with and without finding key frames from the given videos. The response times are compared and found that the algorithm gives the results faster when it is used with a feature extraction approach. The HAAR cascade classifier for face detection is used in this project. The proposed approach can be improved further to implement it for multiple students in a classroom.

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