

Student Engagement and Attention Detection Using Biometric And Deep Learning Techniques

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Abstract -India always an important role in the global education. India is always considered as one of the largest network of educational institutions. Although several constraints are been associated with our learning system. We try to provide the same content of teaching to all students with different inter personal skills. The most important factor is lack of student motivation towards a subject, course etc. Adaptive learning is an educational method that utilizes computers as an interactive teaching device. In existing most educational agents do not monitor engagement explicitly, but rather assume engagement and adapt their interaction based on the student's responses to questions and tasks. Thus dynamic student behavior analysis is a first step towards an automated teacher feedback tool for measuring student engagement. In our system, we propose a hybrid architecture system invoking student facial emotion recognition, eye gaze monitoring, head movements identifications based analyzing dynamic student engagement / behavior in classroom and towards a specific course at e-learning platforms. Our proposed architecture uses feature extraction algorithms like Principal Component Analysis (PCA) for facial emotion recognition, Haar Cascade for pupil detection and Local Binary Patterns for recognizing head movements. To optimize the results with good accuracy, in the proposed system *Open Source Computer Vision (OpenCV)*, a computer vision and machine learning software library is used.

For machine learning approach and to provide accurate results we propose convolutional neural network algorithm. Thus based on the students input weightage is allocated, based on the final score, we do compare with the threshold value. If the students attention value is greater than the threshold value, theory based deliverance is recommended. If the students attention value is lesser than the threshold value, video, smart class, motivational video based deliverance is recommended. For Experimental results we have decided to use Pycharm tool.

1. INTRODUCTION

In a virtual learning environment, learners can lose motivation and concentration easily, especially in a platform that is not tailored to their needs. Our research is based on studying learner's behavior on an online learning platform to create a system able to clustering learners based on their behavior, and adapting educational content to their needs.

As the cost of education (tuitions, fees and living expenses) has skyrocketed over the past few decades,

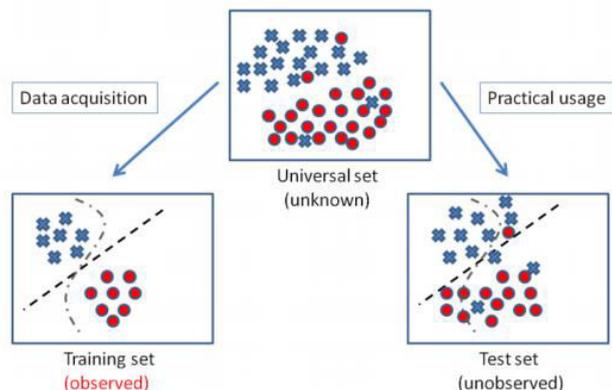
prolonged graduation time has become a crucial contributing factor to the ever growing student graduation. In fact, recent studies show that only 50 of the more than 580 public four-year institutions in the United States have on-time graduation rates at or above 50 percent for their full-time students. To make college more affordable, it is thus crucial to ensure that many more students graduate on time through early interventions on students whose performance will be unlikely to meet the graduation criteria of the degree program on time. A critical step towards effective intervention is to build a system that can continuously keep track of students' attention level and accurately predict their mood of listening and based on that data the teaching can be delivered.

2. EXTRACTION

A. MACHINE LEARNING

"Optimizing a performance criterion using example data and past experience", said by E. Alpaydin, gives an easy but faithful description about machine learning. In machine learning, data plays an indispensable role, and the learning algorithm is used to discover and learn knowledge or properties from the data. The quality or quantity of the dataset will affect the learning and prediction performance. The textbook (have not been published yet) written by Professor Hsuan-Tien Lin, the machine learning course instructor in National Taiwan University (NTU), is also titled as "Learning from Data", which emphasizes the importance of data in machine learning. Fig. 1 shows an example of two-class dataset.

Training Set and Test Set In machine learning, an unknown universal dataset is assumed to exist, which contains all the possible data pairs as well as their probability distribution of appearance in the real world. While in real applications, what we observed is only a subset of the universal dataset due to the lack of memory or some other unavoidable reasons. This acquired dataset is called the training set (training data) and used to learn the properties and knowledge of the universal dataset. In general, vectors in the training set are assumed independently and identically sampled (i.i.d) from the universal dataset. In machine learning, what we desire is that these learned properties can not only explain the training set, but also be used to predict unseen samples or future events. In order to examine the performance of learning, another dataset may be reserved for testing, called the test set or test data. For example, before final exams, the teacher may give students several questions for practice (training set), and the way he judges the performances of students is to examine them with another problem set (test set).



3. DOMAIN INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them.

It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps.

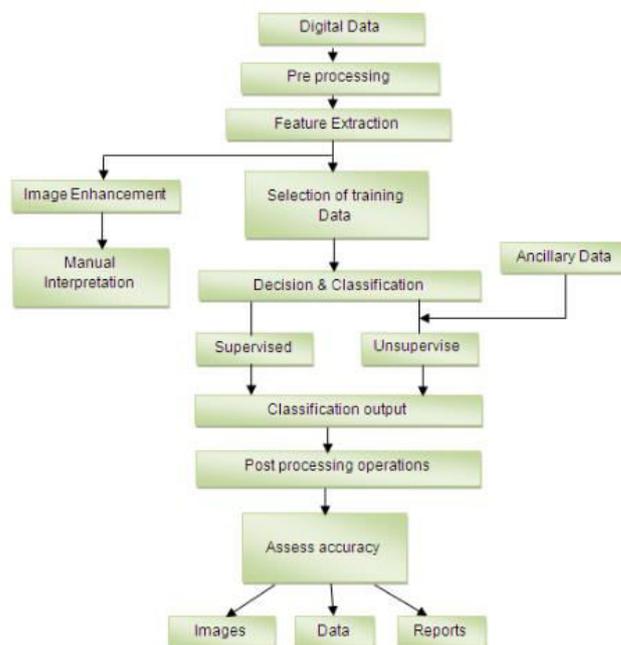
- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

Types

The two types of methods used for Image Processing are Analog and Digital Image Processing. Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing.

Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general

phases that all types of data have to undergo while using digital technique are Pre- processing, enhancement and display, information extraction.



4. EXISTING SYSTEM

India is always considered as one of the largest network of educational institutions. Although several constraints are been associated with our learning system. We try to provide the same content of teaching to all students with different inter personal skills. The most important factor is lack of student motivation towards a subject, course etc. Adaptive learning is an educational method that utilizes computers as an interactive teaching device. Even in adaptive learning student's understanding is not been monitored regularly. In existing most educational agents do not monitor engagement explicitly, but rather assume engagement and adapt their interaction based on the student's responses to questions and tasks. Thus dynamic student behavior analysis is a first step towards an automated teacher feedback tool for measuring student engagement.

4. PROPOSED SYSTEM

Thus dynamic student behavior analysis is a first step towards an automated teacher feedback tool for measuring student engagement. Our proposed system can be applied in both traditional / e-learning systems. In our system, we propose a hybrid architecture system invoking student facial emotion recognition, eye gaze monitoring, head movements identifications based analyzing dynamic student engagement / behavior in classroom and towards a specific course at e-learning platforms. Our proposed architecture uses feature extraction algorithms like **Principal Component Analysis**

(PCA) for facial emotion recognition, **Haar Cascade** for pupil detection and **Local Binary Patterns** for recognizing head movements. For machine learning approach and to provide accurate results we propose **convolutional neural network algorithm** based Open CV library. Experimental results are been implemented using Pycharm.

5. RESULTS & DISCUSSION

In this project study, human biometric like eye, emotion, head movements are been tracked in real time using webcam. Using feature extraction and machine learning techniques, the biometric state is been identified. Assigning weightage to each biometric state, the engagement is predicted and based on that the theory, media based learning content is recommended.

6. CONCLUSIONS

The hybrid biometric based learner analysis does appear to be a promising new tool for evaluating learners' behavior dynamically. This technology can provide many benefits to e-learning, such as facilitating adaptive and personalized learning. Thus through this proposed system, the tutor can change the deliverance by dynamically analyzing the learner attention level. This would bring a revolution in the education sector.

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