

## Classifying Student Attentiveness Using Machine Learning Technique for Improving Learning Systems

**Dr Piyush Kumar Pareek\***

*Professor and Head, Department of Computer Science & Engineering,  
East West College of Engineering, Bengaluru, India.*

**\*Corresponding Author**

**E-mail Id:-**piyushkumarpareek88@gmail.com

### ABSTRACT

*In the studies carried out where different researchers have done various studies to categorize the student's concentration. Many methods are reliant on the Qualitative Estimation and has many lacking Quantitative Estimation. Thus the work is to bridge the difference between the two Estimation methods for effective attention of the student. This research applies the ML algorithms such as K-means and SVM algorithm. Results of the research can be used to improvise the teaching for all the teachers at any levels and can make them utilize the method to strategize their teaching systems. The paper mentions about ML algorithms with can be used by teachers to get feedback for teaching. Thus, benefitting the students to improve learning method. Ultimately this yield to students to do better in the respective subjects.*

**Keywords:** Support vector machines, K-means, Kinect, Personalized learning systems

### INTRODUCTION

There have been many researches that is being used to understand the student's concentration. Many of the research is based on the Qualitative Approach where they find and measure the concentration of the students [1-3]. There are some studies which suggests the research being carried out in the Qualitative manner to find out the student's concentration level. However, there is a bracelet being used to understand these student's concentration [4]. Meanwhile it is eye and head position which also adds as a parameters to find the students attention [5] along with facial expression [6]. Classifying The Students in terms of Concentration strength can be helpful for the teachers to provide the feedback thus improving their teaching style. There are four types of learners-one with innovation, one interested in implementation, one who is sustainable in the study and the one who has resistant learning capability[7]. If the teacher is able to categorize all this quality then students

can be separated based on their learning ability. The Researchers have also proposed the personal online learning approach which is on the basis of Genetic Algorithms (GA) and case study approach [8]. Here Adaptive UI have been proposed which are on the basis on self-learning [9].

### REVIEW OF LITERATURE

According to Nazeem G [16] the e-learning has been the most trending type of academic these days. Which has made shift in the education. Due to this it has brought futuristic approach in the learning which is known as intelligent e-learning. The experimental analysis carried out by Nazeem [16] uses SVM technique showing accuracy of 98.6% with 0.0069 error rate.

A very novel approach is used [17] for e-learning technique of different areas. The technique is consisted of an object model, user model etc. and there is an algorithm which is used for categorization. The research in the paper uses the algorithm

that are robust, independent of domain which is Bayesian Network, KNN.

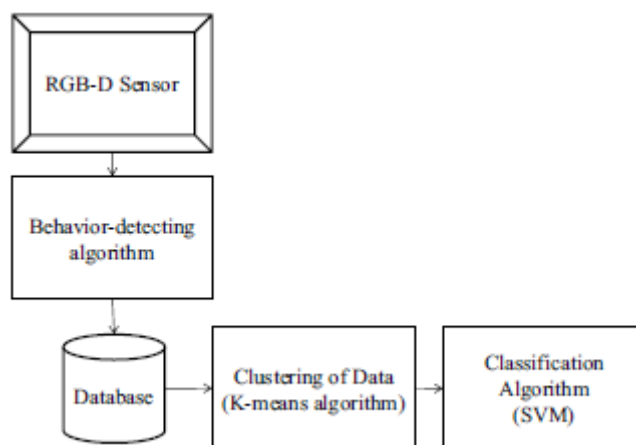
Another possible angle in the e-learning is discussed in the understanding the e-learning technique. Here the author [18] discusses about the model proposed known as LTSA [19] which uses web based environment for estimation.

There is an auto estimation of e-learning [20] technique used by the researcher in the paper. The researcher explains about how there is promising outcomes based on

the automated tool used for the assessment. Using the score the assessment gives the students an analysis of their performance without the supervision of any teacher.

There is another paper [21] which discusses about the flexibility level of learning technique. The proposed approach estimates the web learning to LTSA and SCORM [22]. The Analysis of the SCORM is discussed by various researchers in their respective papers as discussed in papers [23-28].

## METHODOLOGY



*Fig.1:-System Overview*

The Figure 1 shows the proposed system flow. As mentioned the RGB-D sensor is used for the detection of each student's attention. The algorithm that is used in the Real time calculation of student's attention and simultaneously storing in the repository. After this there is clustering of 2 groups in the repository using K-Means Algorithm [10]. After categorizing the data they will be labeled using SVM algorithm [11] as Concentrative and Non-Concentrative [12-14].

## EXPERIMENTS

### Data Origin

The data used in this area of research is used to randomly choose the data within particular range of 0 to 12. For study

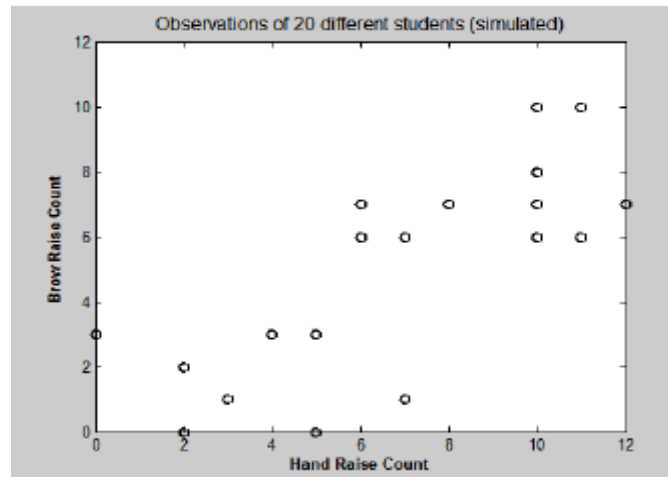
purpose the student's concentration level were being exhibited. The Figure 2 illustrates the data origin. For the study purpose twenty students were being considered.

### K-means Algorithm

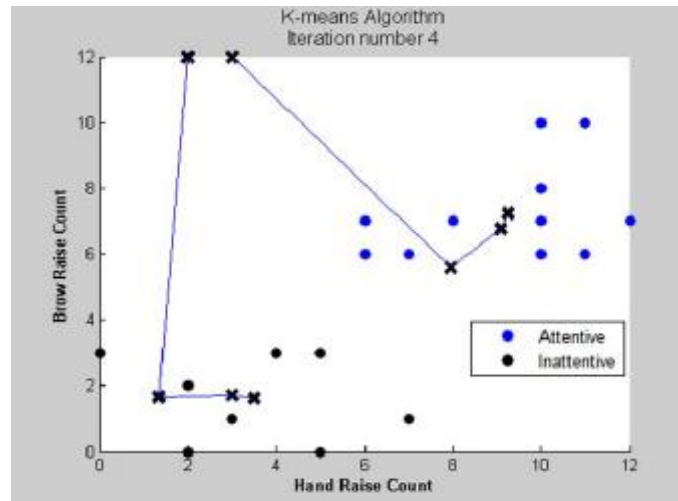
For the data generated we need to cluster the data the K-means algorithm is used to group these different data as shown in Algorithm 1. The algorithm has 4 trials in the Figure 3.

### Support Vector Machine Algorithm

After the data are grouped using K-means algorithm, we using SVM for classification as shown in Algorithm 2.



*Fig.2:-Plot of simulated student behaviors*



*Fig.3:-Result of K-means clustering*

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#### ALGORITHM 1: K-means Algorithm

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Randomly initialize Grouping K:

Iterative {

For i is 1 to n

Centroid  $c(i) = \text{indexing (1 to Z)}$

Closest to  $x(i)$

For z is 1 to Z

$U_z = \text{average of points assigned to group } z$

}

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#### ALGORITHM 2: SVM Algorithm

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Value Estimated

Estimate "a=1" if  $\theta^T z \geq 0$

Estimate "a=0" if  $\theta^T z < 0$

Trained Date

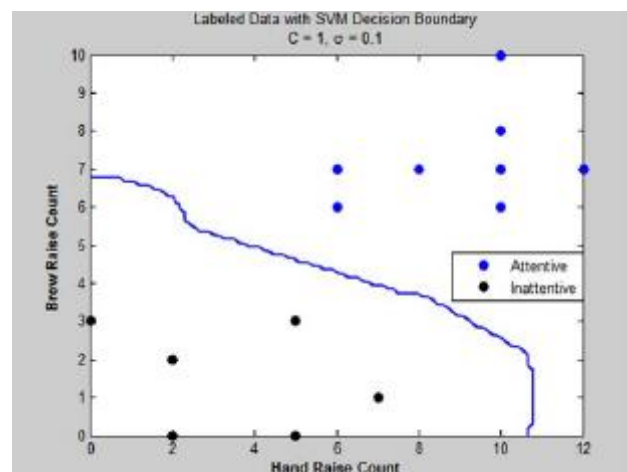
$$\text{Minimum } \theta_{\text{Cluster}} = \sum_{i=1}^m z^{(i)} \text{cost}_1(\theta^T f^{(i)}) + (1-z^{(i)}) \text{cost}_0(\theta^T f^{(i)}) + \frac{1}{2} \sum_{i=1}^m (\theta_j^T M \theta_j)$$

Where  $f_i$  is : 
$$f_i = \exp\left(-\frac{\|x - t^i\|^2}{2\sigma^2}\right)$$

## RESULTS

The group of data is done using K-means algorithm and is categorized by SVM. Figure 4 suggests final categorization and the classification of 20 students selected

for the study. From the Figure 4 results were not used in the initial training and grouped. In real scenario more students are taken for the study and classify accordingly. [15]



**Fig.4:-**Result of labeled data applied to the SVM

## CONCLUSION

The group of data is done using K-means algorithm and is categorized by SVM. Figure 4 suggests final categorization and the classification of 20 students selected for the study. From the Figure 4 results were not used in the initial training and grouped. In real scenario more students are taken for the study and classify accordingly. The research is the foundation for the further system to be built which categorizes the student group into concentration and non-concentration. In the research carried out, the sample student were being represented and studied their facial expression, eye expression changes during the instruction. For the study RGB-D camera is used to detect student's concentrative nature. The data generated is grouped into concentrative and non-concentrative and is then trained using SVM to classify the student categories. The result help teachers in understanding the feedback from their learning style and

give them proper guidance and training in effective manner.

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