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Effect of Academic Interest and Emotional Happiness on Academic Performance in Learning Environment.

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Abstract: ***According to Bloom's Taxonomy, the motto of education is to groom the students' as a better personality in knowledge, skill set and emotions under the supervision of academicians. Development of information technology paves the way to analyse the data from the educational environment and make decisions which help to be in track to achieve the motto. i.e. Educational Data mining. Education Data mining is one of the research domains of data mining which convert the data from the educational sector as insights for decision making. This paper is to analyse the effect of student's academic interest on emotional happiness and academic performance by applying supervised and unsupervised learning techniques. Students' Emotional Happiness and students' academic performance is evaluated by the Oxford Happiness Inventory and criterion reference model. Academic interest is received as yes or no responses from the students. Naive Bayes classification algorithm and K Means clustering algorithm is applied to categorise the student participants based on their happiness scale, academic interest and academic performance. The association between academic interest and performance is determined using predictive and descriptive mining. By this research, it is witnessed the positive association between academic interest, happiness and performance. The insights of this investigation will allow the teachers' to understand the students in a better way and do the needful to enhance academic efficiency.***

Keywords: Education, Bloom's Taxonomy, Academic Interest, Happiness, K-Means clustering, Navie Bayes Classification, Apriori Association.

I. INTRODUCTION

Educational Data mining[12] is one of the emerging research fields of data mining that explore the data collected from the educational environment and helps the stakeholders in decision making by discovering insights using supervised and unsupervised techniques. These techniques help to establish a better understanding of students in the academic environment. Student's well-being is discovered using oxford happiness inventory. Criterion Reference Model is used to group the students' based on their academic performance. The continuous assessment scores of theory and programming are taken as performance. Based on Bloom's taxonomy and educational objectives, this research examines the effect of academic interest, emotional happiness on academic performance in academics.

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K-Means clustering algorithm is utilised for discriminating the student participants under clusters happy and unhappy, yes and no, above average and below average according to their Happiness level, Academic Interest and performance.into classes of similar students. Navies Bayes classification, a supervised learning technique is employed to classify the student's subcategory using the dataset. This technique identifies student subclasses based on the research criteria. Apriori algorithm is implied to discover the association rules based on the association between emotional happiness, academic interest and performance. The research aims to discover the relation between happiness, academic interest and performance using supervised and unsupervised learning process.

II. RELATED WORK

A. Bloom's Taxonomy:

Bloom's Taxonomy [3] explains the three domains of the learning process as Cognitive Domain (Intellectual), Affective Domain (Emotional), and Psychomotor (Skills). Benjamin Bloom framed Bloom's Taxonomy. According to Bloom, a student during is learning process grows cognitively, affectively and skillfully.

B. Oxford Happiness Inventory:

The Oxford Happiness Inventory is of 29 multiple choice questions [1]. Every question has four ordinal options constructed to reflect incremental steps as a low level of happiness and a high level of happiness. The student participants are requested to answer one choice for a question, which describes the way he/she has been over a week. The score is calculated accordingly to the student responses with which students are categorised as Happy and Un Happy.

C. Criterion –Reference Model

A criterion – reference model is a model to evaluate the student level of attaining the objective, of course. The evaluation is carried out with specific measures. The outcomes of the model are the relations that match the students' performance with the measures defined. The result is assigned based on the standard that the student has attained on the criteria [2]

D. K-Means Clustering Algorithm:

K-Means algorithm[9] is well known and most straightforward unsupervised learning to perform clustering for a given problem.

The procedure is as follows,

1. Define K centers one for each Cluster.
2. Take each point of data set and associate it to the nearby center. This is done by calculating the distance between the data point and centers.
3. The data point, which is closed to the cluster center, is assigned to that Cluster whose distance is close to the cluster center.
4. Repeat step 3, Recalculating the new cluster center until data points exist.

E. Navie Bayes Classification Algorithm:

The Naive Bayes algorithm [4] is a simple probability classification algorithm which counts the occurrence and combinations to calculate the set of the probability of a given data set. It is a supervised learning technique. The algorithm makes use of Bayes's theorem, that assumes all variables to be independent and as a class variable. Bayes conditional probability is given below,

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

Figure 1 Bayes Theorem

Where,

P(A|B), the conditional probability of A when B occurs

P(A), probability of A

P(B|A), the conditional probability of B when A occurs

P(B), probability of B.

Apriori Algorithm:

Apriori algorithm is a traditional algorithm in data mining to mine frequent itemsets and association rules.

The main concept in the Apriori algorithm is the anti-monotonicity of the support measure

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According to the concept,

1. All subsets of a frequent itemset must be frequent
2. Similarly, for any infrequent itemset, all its supersets must be infrequent too.

General steps of the algorithm,

Step 1: Apply minimum support to find all the frequent sets with k items in a database. (Pruning)
Step 2: Use the self-join rule to find the frequent sets with k+1 items with the help of frequent k-itemsets. Repeat this process from k=1 to the point until the possibility to apply the self-join rule (Joining)

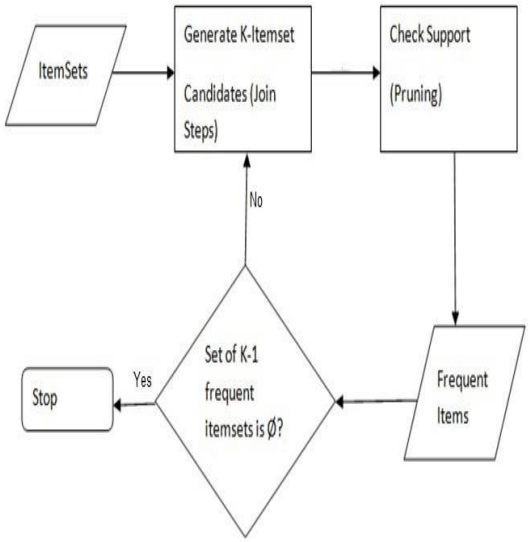

Figure 2 Process of mining frequent sets

Two General steps to discover association rules,
Step 1: Find all the frequent itemsets whose support is higher than the threshold support.
Step 2: Generate rules from each frequent itemset using the binary partition and check for the rules with high confidence.

III. METHODOLOGY

Phase 1: Pretesting of the Questionaire :
In phase 1, the Oxford Happiness inventory is pretested. Then analyse test for Happiness Level was conducted to students undergoing post-graduation degree in computer applications. Based on the responses to the inventory, the student participants are characterised as students of Happiness and Unhappiness. The academic interest of the students is collected manually from the students. Accordingly, students are categorised under yes and no. The continuous assessment scores of students are considered as a performance factor[8]. Based on the Criterion Reference Model, the scores are grouped under Above Average (Marks >=60), and Below Average(Marks<60). Now the dataset comprises of the responses of analyse test of Oxford Happiness Inventory, academic interest and their academic performance.
Phase 2: K-Means Clustering :
K-Means Clustering Algorithm is applied to identify the clusters among the students based on the academic interest, Happiness Level and performance. Accordingly, cluster groups are assigned as yes and No for academic interest, happy and unhappy for happiness level and above average and below average based on performance.
Phase 3:Navies Bayes Classification:
The Navies Bayes classification algorithm is utilised to analyse by classifying the student data set based on academic interest as yes and low, happiness level as happy and unhappy, and Similarly, performance as above average and below average.
Phase 4: Apriori Association Rule Mining Algorithm

The relationship between the academic interest, happiness level and the performance of the student participants are determined using the Apriori algorithm.

IV. RESULT AND DISCUSSION

The association between emotional happiness, academic interest and academic performance of the learners are analysed with the data set containing information collected from 300 students.

Table 1: Emotional Happinee Level and Cluster Assignments

C0	C1	Happiness
180	0	Happy
0	120	Unhappy

Table 2: Academic Interest and Cluster Assignments

C0	C1	Interest
180	0	Yes
0	120	No

Table 3: Academic performance and Cluster Assignments

C0	C1	Performance
180	0	Above Average
0	120	Below Average

Table 1, Table 2 and Table 3 depicts the cluster assignments obtained by employing the K-Means clustering algorithm of Emotional happiness, Academic Interest and performance, respectively. The happy level is assigned to C0, and Unhappy Level is assigned to C1. Academic interest, Yes is assigned to C0, and No is assigned to C1. Academic performance, Above Average, is assigned to C0, and Below Average is assigned to C1.

Table 4: Confusion Matrix for Emotional Happiness

Cross Validation		Predicted		
		a	b	Happiness
Actual	A	180	0	Happy
	B	0	120	Unhappy

Table 5: Confusion Matrix for Academic Interest

Cross Validation		Predicted		
		a	b	Interest
Actual	A	180	0	Yes
	B	0	120	No

Table 6: Confusion Matrix for Academic Performance

Cross Validation		Predicted		
		A	b	Performance
Actual	A	180	0	Above Average
	B	0	120	Below Average

Table 4, Table 5, Table 6 shows the Confusion Matrix for Emotional happiness, Academic Interest and Academic Performance. The Confusion Matrix reveals that various classes using two sigmoid nodes to identify two categories of,Happiness(Happy and Unhappy), Academic Interest (Yes and No), Academic Performance(Above Average and Below Average). Navies Bayes Classification obtains these Confusion Matrices.

BEST RULES MINED

HAPPINESS(6)=HAPPY PERFORMANCE=Above Average 180 ==> INTEREST AND ACCEPTANCE=YES 180 <conf:(1)> lift:(1.67) lev:(0.24) [72] conv:(72)
INTEREST AND ACCEPTANCE=YES PERFORMANCE=Above Average 180 ==> HAPPINESS(6)=HAPPY 180
<conf:(1)> lift:(1.67) lev:(0.24) [72] conv:(72)
INTEREST AND ACCEPTANCE=YES HAPPINESS(6)=HAPPY 180 ==> PERFORMANCE=Above Average 180
<conf:(1)> lift:(1.67) lev:(0.24) [72] conv:(72)
PERFORMANCE=Above Average 180 ==> INTEREST AND ACCEPTANCE=YES HAPPINESS(6)=HAPPY 180
<conf:(1)> lift:(1.67) lev:(0.24) [72] conv:(72)
HAPPINESS(6)=HAPPY 180 ==> INTEREST AND ACCEPTANCE=YES PERFORMANCE=Above Average 180
<conf:(1)> lift:(1.67) lev:(0.24) [72] conv:(72)
INTEREST AND ACCEPTANCE=YES 180 ==> HAPPINESS(6)=HAPPY PERFORMANCE=Above Average 180
<conf:(1)> lift:(1.67) lev:(0.24) [72] conv:(72)
HAPPINESS(6)=UHAPPY 120 ==> INTEREST AND ACCEPTANCE=NO 120
<conf:(1)> lift:(2.5) lev:(0.24) [72] conv:(72)
INTEREST AND ACCEPTANCE=NO 120 ==> HAPPINESS(6)=UHAPPY 120
<conf:(1)> lift:(2.5) lev:(0.24) [72] conv:(72)
PERFORMANCE=Below Average 120 ==> INTEREST AND ACCEPTANCE=NO 120
<conf:(1)> lift:(2.5) lev:(0.24) [72] conv:(72)

Table 7 shows the strong association between Academic Interest, Emotional Happiness and Academic performance with confidence 1.It depicts that students with academic interest no, are unhappy in the academic environment and their academic performance is below average. Similarly, the students with academic interest yes, are happy and good at their academic performance.

V. CONCLUSION

K-Means Clustering, Navies Bayes Classification and criterion reference model, are applied to discover classes based on happiness, academic interest and performance. From the association rules, mined by apriori algorithm, it is observed that Students whose academic interest to pursue the course are emotionally happy, and their academics proficiency is above average.
This research reveals to concentrate on students having no interest in the course for Psychological transformation and better transformation.

The Correlation discloses the strong association between academic interest, happiness and performance.

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