

Predicting Student Performance Using Data Mining

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Abstract: The objective of the paper is to analyze the performance of a student by evaluating EQ and IQ level and also to check the correlation between EQ IQ and performance. Present system predicts the performance of student by comparing their EQ and IQ with some tests referred by the psychology department. Our study aims to establish and monitor the performance using EQ and IQ achievement among the undergraduate students by data mining procedures. Initially prepared the questionnaire of EQ and IQ. The data were collected from 150 students. Using WEKA tool, the data given as input. Using different classification algorithms predicted the individual performance of student by data mining concepts. And also compare the efficiency of classification algorithms and find the efficient one among them. EQ IQ is found to have a significant relation with the performance of students. Logistics function and random tree were used to explore the performance of student semester by semester. By means of applying these methods, the performance by graduation is predicted and accuracy is evaluated.

Keywords: Data mining, Emotional quotient, Intelligent quotient, Logistic function, WEKA tool

I. INTRODUCTION

Educational Data Mining (EDM) uses large data educational frame such as universities, colleges and schools and explores them to determine hidden information and gain knowledge by using modern technology [9]. Emotional quotient (EQ) plays an important role in influencing the development of student's learning and academics [6]. Intelligence Quotient (IQ) is a set of standardized tests derived for evaluating human intelligence level [6]. EQ counts for twice as much as IQ for determining the performance. EQ and IQ has been identified as a medium for improving academic learning and academic grades success throughout 4-year engineering degree programs [12]. The emotion management, feeling, communication skill, and leadership are essential for a student in nurturing excellent performance as holistic [12]. Emotional intelligence is a better

predictor of success than conventional measures of IQ test [6]. Data mining is the process of discovering patterns [4], new knowledge from large data set [8], also called knowledge discovery in database [7]. Involved in many applications such as business, commerce and also nowadays it is approaching towards the educational research such as academics and learning analytics [11]. WEKA is expanded as Waikato Environment for Knowledge Analysis, a collection of machine learning algorithms for data mining tasks [7].

This paper tries to look for the relation between the IQ and EQ of a undergraduate student and how EQ influences IQ using data mining techniques. This work tries to predict the performance of student using the EQ and IQ score evaluated using EI test.

II. LITERATURE SURVEY

The comparison of emotional quotient and intelligence quotient among personality and gender. There is no significant difference between EQ and IQ on the basis of gender. And extrovert students have more EQ and IQ than introvert students [1]. EQ is highly essential for innovation, with the Knowledge Management (KM). The individuals should improve their EQ with the organization improving their EQ thereby the organization improve its KM practices [2]. EQ has been identified as a medium for improving academic learning and academic grades throughout 4-year engineering degree. In the study, the EQ scores were measured using the Malaysian EQ Inventory (MEQI) Test. And it was found that there is a significant change in the EQ level of student [3]. Emotional Intelligence may indeed be a key determinant of employee's effective performance and it is considered more important than Intelligence quotient at workplace [6]. Various factors affecting employability like emotional skill parameters have a greater effect on placement of student compared with the other as per expectation [4]. C4.5, Naïve Bayes [5], AODE, and Multi-labeled K-Nearest Neighbor [7], Analyzing the performance of student's skill, C4.5 gives more number of instance classified with accuracy in specific time of execution when compared to Naïve Bayes classification techniques based on the significance

of selected attributes such as Logical Reasoning, Numerical Ability and Perceptual speed [8]. The factors like Survive, Success, Satisfied and Supreme is classified and clustered depending on the estimated quantification of Emotional and Intelligent Quotient [12].

III. METHODOLOGY

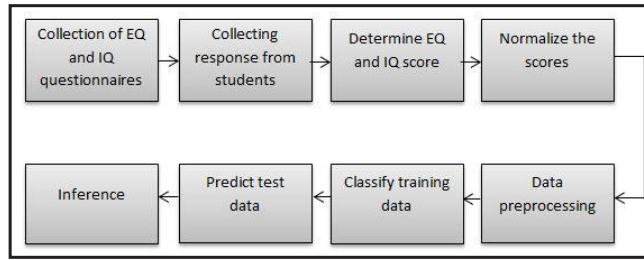


Fig. 1: Flow of Processes in the Prediction

A. Collection of EQ and IQ Questionnaires

This model requires EQ and IQ estimation for the prediction of the performance of a student. A set of 60 questions were collected and categorized as 40 IQ questions and 20 EQ questions. The reliability of the questionnaire was checked under the guidance of person concerned in that field. The set of questions was approved by the person.

B. Collecting Response from Students

The response was collected from the undergraduate student of Computer Science and Engineering Department. The data was collected from different semester (i.e., semester 8 and 6). The test was conducted with a set of 150 students in Moodle which a system provided by the college for academic purpose having a credential for each individual.

C. Determine EQ and IQ Score

EQ questions contained a maximum weightage of 5 marks getting a total in 100 marks. Similarly each questions of IQ contained a weightage of 1 mark getting a total in 40 marks.

D. Normalize the Scores

EQ scores was calculated with a total of 100marks and so IQ scores are converted to 100marks of the easiness of categorization. Along with EQ and IQ scores the performance of the student n academics were also collected. The results were classified into 6 classes based on the range of marks. The classes were S, A, B, C, D, E.

TABLE I: CLASSIFICATION OF MARKS TO GRADE

Grade/Class	Marks
S	≥ 71
A	61-70
B	51-60
C	41-50
D	31-40
E	≤ 30

The scores were converted based on 6 classes as the university system. And also it provides a perfect and more efficient prediction of student performance.

E. Data Preprocessing

The collected data that was split into two sets named as training set and test set. The training set is used to train the system and the test set is used for testing the collected information. The training set is given as the initial input to the WEKA tool. The data is preprocessed within the tool.

F. Classify Training Data

The training set is classified using logistic function. The logistic function is an algorithm used for classifying the variable set of data. It uses probability for the prediction. The classification was performed using different classification algorithms such as logistic function, j48, random tree, naïve bayes and decision tree.

G. Predict Test Data

TABLE II: SAMPLE OUTPUT

EQ	IQ	PREDICTED MARKS
S	C	A
S	D	B
S	E	D
A	D	A
A	E	B
B	C	A
B	D	B
B	E	B
C	D	B
C	E	C

The test set is supplied to the classifier algorithm and the performance is predicted using the trained results with different classification algorithms. Comparing the predicted result with

different classifier algorithm, the best matching with their performance was given by logistic function. Thus Logistic function gives the best result and accuracy (77%).

H. Inference

Concluding the effect of EQ and IQ on student performance. Also the influence on EQ over IQ. Inferencing the performance of a student given the EQ and IQ score.

IV. EXPERIMENTAL RESULT

The test was conducted with a set of 150 students in the college. The students took the EQ and IQ test in moodle and the scores were taken. These scores were converted to grades based on the range of score. Also the student academic performance marks was taken.

The data collected was categorized into two sets, training set and test set. The training set consisted of 90 instances and the test data consisted of 60 Instances.

The training file consisted of EQ and IQ score with their marks which is given as the input file for data preprocessing in .arff file format. The training set is classified using classifier. Similarly the test data is supplied in the same format as the training file and the classifier is selecting. If the file is not compatible with the input file then it will show incompatible format and cannot perform the operation.

The process was performed using different classifiers such as logistic function, j48, random tree, naive bayes and decision tree. And it was found that the best prediction was received with the logistic function when comparing the predicted grade with the collected grade.

The predicted file can be validated by visualizing the classifier error and storing the predicted output file which will also be in the same format as of input file.

Analyzing the accuracy of different classification algorithm by comparing the predicted performance with the collected data.

TABLE III: PERFORMANCE COMPARISON

Algorithm	Accuracy
Logistic	77.19
J48	71.92
Random Tree	80
Naïve Bayes	68
Decision Tree	71.92

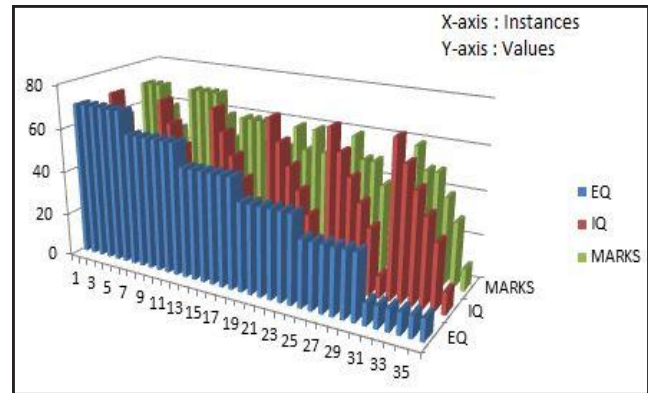


Fig. 2: Resultant Graph

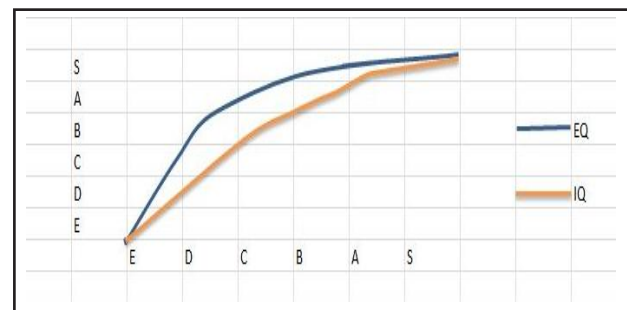


Fig. 3: Variation of Performance with EQ & IQ

V. CONCLUSION

We have analyzed EQ, IQ and academic performance using data mining technique. This paper aims to find whether there is any correlation between EQ and IQ of a student. And also to find whether there is any influence of EQ in the student performance. We have used logistic regression, j48, random tree, naive bayes and decision tree for the prediction model. And also compared the accuracy of these algorithms. It was found from the study that the EQ level of a student as an influence in the student performance. From the result we can conclude that logistic regression is more suitable when we used 60% data as training data and 40% as testing data predicting the performance of student. With this result, we are able to see significant relationship between EQ and IQ parameters.

This research work was done using college students. In future it can be also done with plus two student so that it can be used to predict whether a student coming to join engineering course, is he mentally ready for the course. And also based on the results this can be extended as a product which can make the process easier.

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