



Prediction of Student Achievement through Teacher's Professional Characteristics by using Artificial Intelligence

Muhammad Ismail Sheikh	BS B.ed Hons(2018-2022) University of Education, Lahore, Punjab, Pakistan. Email: ismailsheikh900@gmail.com (Corresponding Author)
Haseeb Ahmad	BS Electrical Engineering(2018-2022) Comsats University, Lahore, Punjab, Pakistan.
Huma Lodhi	Assistant Professor, University of Education, Lahore, Punjab, Pakistan.

Abstract: Teacher characteristics are important for teaching learning and are important predictors of students' achievement. The present study aims to predict students' academic achievement criteria on teachers' characteristics with the help of artificial intelligence (AI). The data were collected from 100 students from one of the universities in Lahore, Pakistan, through a questionnaire comprising of teachers' characteristics effective for teaching, against a 4-point scale varying from strongly agree to strongly disagree to find extent of the existence of certain characteristics in the teachers. The analysis was done to predict the student grade based on teacher characteristics in the class with the help of artificial intelligence. Two machine learning models were built, and their accuracy was compared. The k-Nearest Neighbor (KNN) and Multiple Linear Regression (MLR) models were built. The accuracies of the KNN and MLR were 83% and 91%, respectively. This work concluded that the MLR model could be effectively used to predict student performance.

Key Words: K-NN, MLR, AI, Student Grade, SVM

Introduction

Teacher behaviour is the act of teaching for the students to help them understand the concept completely. It is observed that the way of teaching or technique of a teacher has a different impact on each student's efficiency (performance/grade). The teacher plays the main role in improving the learning capability of a student by providing a good learning environment. Each student has their behaviour and learning tendency. In this work, the complete focus is on the supply side of academia. That's why there is no detail of students' behaviour and their learning

tendency. The research ([Zamanian & Saeidi, 2017](#)) found that knowledge of a teacher on a subject and the teacher's attitude has a direct effect on student performance.

To develop any county's educational system, there is a need to improve the quality of teaching methods in the educational institute. So, the educational institute must adopt new ways to increase the performance of students. By analysing the performance data of students, new strategies can be planned. This will help to estimate the failure rate of the students in advance in an educational institute.

Citation: Sheikh, M. I., Ahmad, H., & Lodhi, H. (2022). Prediction of Student Achievement through Teacher's Professional Characteristics by using Artificial Intelligence. *Global Educational Studies Review*, VII(II), 325-339. [https://doi.org/10.31703/gesr.2022\(VII-II\).31](https://doi.org/10.31703/gesr.2022(VII-II).31)

The planned strategies can help to reduce the failure rate of students.

In the current era, the best way is to use Artificial Intelligence (AI) to predict student performance by applying machine learning algorithms to the data set which comes from the educational database. This method of prediction is called educational data mining ([Bakhshinategh, Zaïane, Elatia, & Ipperciel, 2018](#)). This method analyses the pattern of the input data and predicts the output, and the output is based upon the learned pattern.

In machine learning, the KNN is the simplest algorithm. This algorithm can be used for classification problems as well as regression problems. In this work, KNN was used for the regression problem. The built KNN model predicts the student's grade based on the teacher's attitude in class. The observation of the model was collected from both test and training data ([Zhang, 2016](#)). Following are the steps which must be followed to build a KNN model.

- Find the distance between the new data point and each training point.
- Select the best value of k. This tells the model how many neighbour points will be looked at when a new point of observation is assigned.

MLR uses two or more than two input attributes to predict the output. This model creates a linear relationship between independent variables (input) and dependent variables (output). It is also known as multiple regression, which is an extension of simple linear regression ([Kaya Uyanık & Güler, 2013](#)). The following equation is the formula of MLR.

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_p x_{ip} + \epsilon$$

where for $i = n$ observations:

y_i = The dependent variable

x_i = The explanatory variables

β_0 = The y-intercept (constant term)

β_p = The slope coefficients for each explanatory variable

ϵ = The model's error term (also known as the residuals)

In this work, the k-nearest neighbour algorithm (KNN) and multiple linear regression algorithm (MLR) were used to predict the student's grade. The input attributes, which are called features of the data set, are based on teacher behaviour in class. The effect of teacher professional characteristics on students' grades was discussed, and the grade prediction models were built. The data was taken from Pakistan's University of Education (UE) Lahore. A questionnaire form was filled out by 100 students regarding a particular teacher's behaviour in class. All the students were once studying from the teacher. Fifteen most effective characteristics of a teacher were shortlisted. These effective characteristics were the features of the model. The model predicted the grade of students according to the pattern which was learned from the features.

Many teachers do not know that their attitude affects the student grade. This study will show the effect of teacher behaviour on student performance by using artificial intelligence. By using this methodology, educational institutes' administration can improve the standard of their teachers or replace them to become more prominent in academia. This will help the educational institute to full fill its visions. This work will be very helpful for the teacher to analyse themselves to become more effective for the students.

Literature Review

From the fifteen years, this work ([Walker, 2008](#)) showed the knowledge gained to utilise the effectiveness of teacher characteristics on students, which belong to custom and non-custom classes. The students who did this survey were registered in many educational courses like the method of teaching, etc. Students having a bachelor's or master's degree in other fields were also helped in this survey. The method used to do this survey was an essay writing assignment to the students given by the instructor. The question of the assignment was to write an essay on the most effective or memorable teacher of your life. The results of this fifteen-year survey were that students mentioned many characteristics of their most

memorable teacher. The characteristics were teacher lecture preparation, teacher behaviour in class, teacher positive attitude, etc. At the end of the results, twelve characteristics were shortlisted as effective teacher characteristics, which were positivity, holding high expectations, etc. This work concluded that teachers of any field must follow these characteristics and add them to their nature. To increase the impact of teachers' nature, teachers should follow these characteristics. It is recommended that machine learning algorithms for data analysis processing should be used to complete the survey in a short time instead of getting data for 15 years. Using machine learning data processing keeps the work easy and gives more precious and accurate results in a short time.

Data mining is applicable in many fields. One of the major applications of data mining is present in the education system. These data mining techniques can be used to predict any course result or final result of a student. National Defence University of Malaysia (NDUM) made a model based on Artificial Neuron Network (ANN) to predict student's results ([Wook et al., 2009](#)). Academia institutes save different types of data, which tells a different types of information. In academic institutes, all the grade records of the student have been saved. This record helps to generate the final result (CGPA or GPA) of the student. Many machine learning algorithms were built to predict the student grade. In work ([Ihsan Zul, 2016](#)) k-nearest neighbour algorithm was used. The prediction was made with the help of previous students' result data. On the data set, first, the data cleaning was done. In data, cleaning unwanted information was removed from the data set like the name of the student. After this data acquisition was made, in this step, those features were selected for data processing which directly affects the student grade like the previous semester's result. Then the data was split into training and test data. After training the data, a model was built. The accuracy of the model was 70%. The k value was 2. Midterm marks and student presence were the main features of the model. It was recommended that multiple machine learning

models should be implemented to compare the accuracy of different models.

In schools or universities, regular class tests take place at regular intervals. Suppose a student wants to get a good result at the end of the year. Then the student must appear in each class test. In the work ([Gadhavi, Smt, & Patel, 2017](#)) Smt. Chandaben Mohanbai Patel Institute of Computer Applications (CMPICA) institute's exam pattern was considered. According to the pattern, three class tests should be taken for each subject. In the end, one sessional exam must be taken. Class tests and sessional exam weightage were 30% and 70%, respectively. In this linear work regression (LR) based model was built and used to predict the final result of a student. Class test marks were used as independent values to predict the sessional marks of a student. The average of class tests and predicted sessional marks were then predicted as the final result of a student. Figure 1 shows the grade point table which was used in this work to build the model. The model was trained with the entries of 181 students' numbers in a subject. It was recommended that more features should be used to predict the final result of students, like teacher behaviour and attitude toward the class.

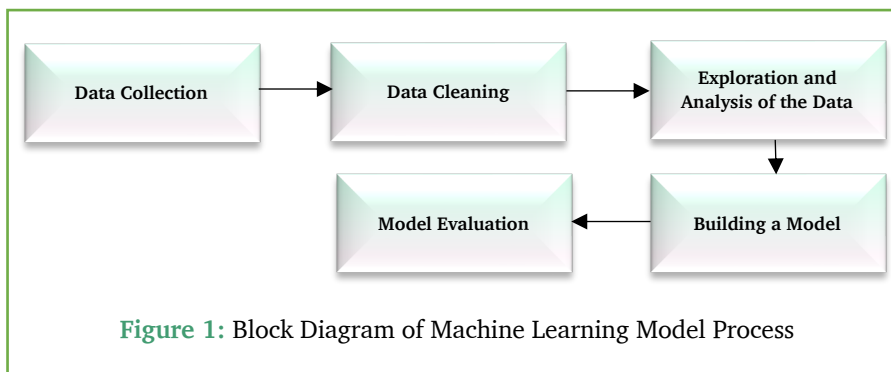
There is a need that educational institutes should adopt strategies to increase the performance of students. Educational data like marks, the attitude of students in class, etc., can be used to predict student performance. In the work ([Aissaoui, Madani, Oughdir, Dakkak, & el ALLIOUI, 2020](#)) Multiple Linear Regression (LRM) model was built to predict student performance. The dataset was taken from the University of California Irvine (UCI). In multiple linear regression, two or more two independent variables are used to predict a value. In the model, all the data was fitted in a linear equation. First, the data preprocessing was done. Those features were selected that affect the student performance directly, like class marks, assignment marks, etc. Then the data was split into training and test. The model was built and trained on the training data.

Research Methodology

The first step of this work was to get the data. So, a questionnaire form was filled out by 100 students. These students were registered in BS-Education, at the University of Education (UE) Lahore. The form contained multiple-choice questions for each student regarding the behaviour of the teacher. A specific teacher behaviour data was collected from its 100 students. The completed questionnaire form

was pasted in Appendix A. The fifteen characteristics of the teacher were collected, and the student performance was collected in the form of CGPA in the course.

The second step of this work was to make the machine learning models and predict the student grade using artificial intelligence with the help of collected data. Figure 1 shows the block diagram of the machine learning model process.



- **Data Collection:** Data was collected from the questionnaire survey.
- **Data Cleaning:** Redundant and missing data was removed or replaced from the dataset.
- **Data Exploration & Analysis:** In this step, the relationship between various input attributes were studied with the output.
- **Building a Model:** The models were built. In this work, the KNN and MLR were built.
- **Model Evaluation:** The efficiency and accuracy of the models were checked.

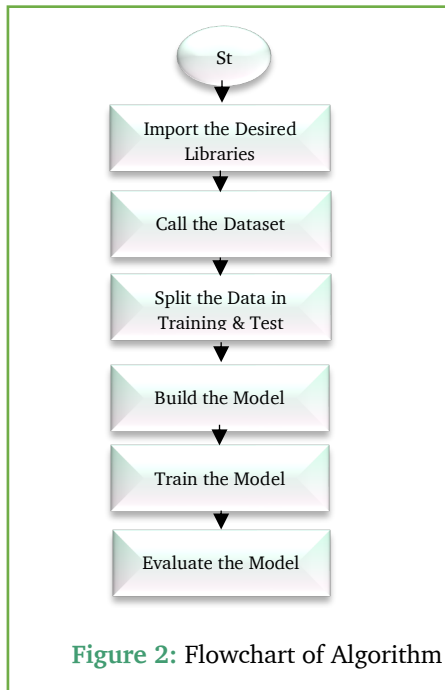
used by the models. After getting the data, models were built on the Google Colab platform, which used python programming language. At last, with the help of artificial intelligence's machine learning models, the KNN and MLR models were built. The dataset of MS-Excel was given in Appendix B.

Working Flow of Algorithms

The working flow of machine learning algorithms is shown in Figure 2. First, the desired libraries were imported. Then dataset was called out. When the dataset was called out, the next step was to split the data into test and train datasets. After this step, the model is built, and the model gets trained on the training data. After training, the model evaluation was done on the test data, and accuracy was measured. The accuracy tells the efficiency of the model. The source code of both models is attached in Appendix C.

Instruments of the Work

A structured questionnaire form was developed, which was used to get the data from the students. The collected data was placed in MS-Excel to make a proper dataset that was



Result and Evaluation

The following Figures show the Linear Relationship of Features of the Dataset with Output (CGPA).

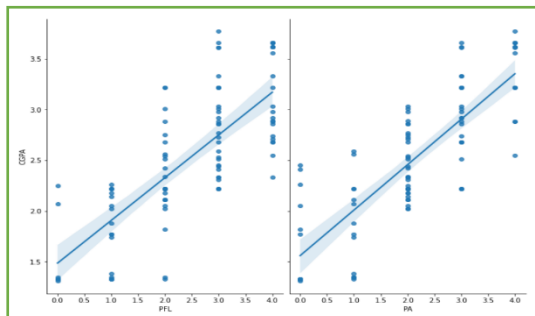


Figure 3: PEL and PA Relation with CGPA

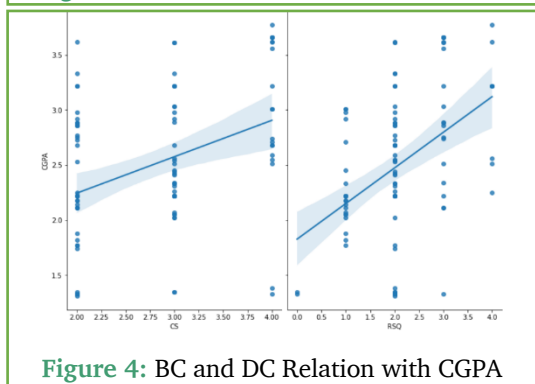
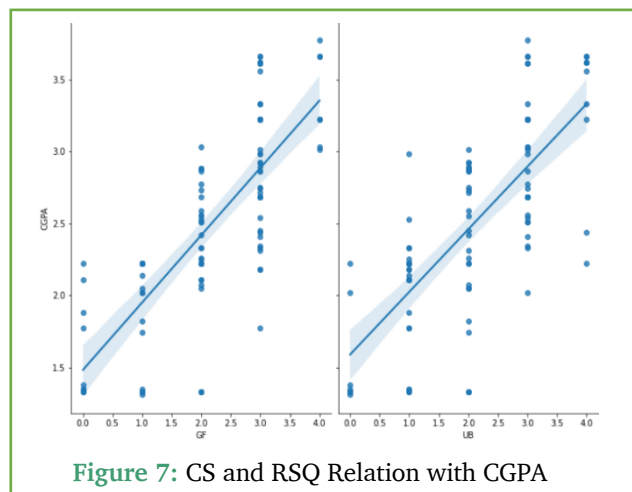
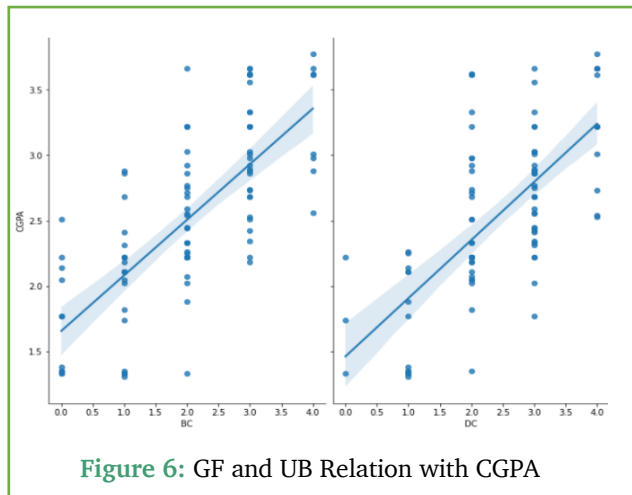
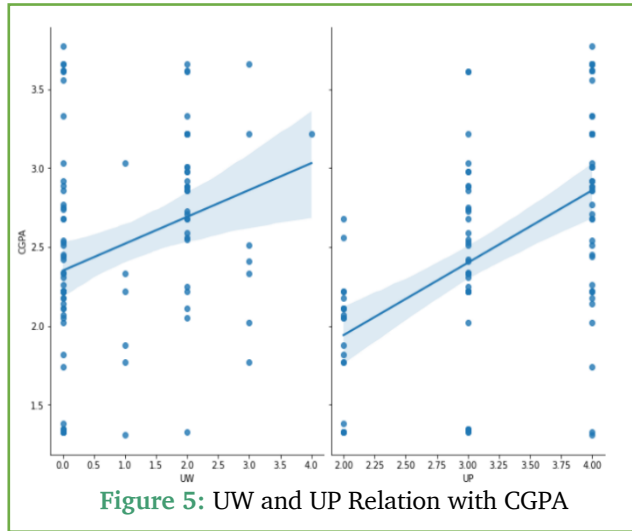


Figure 4: BC and DC Relation with CGPA



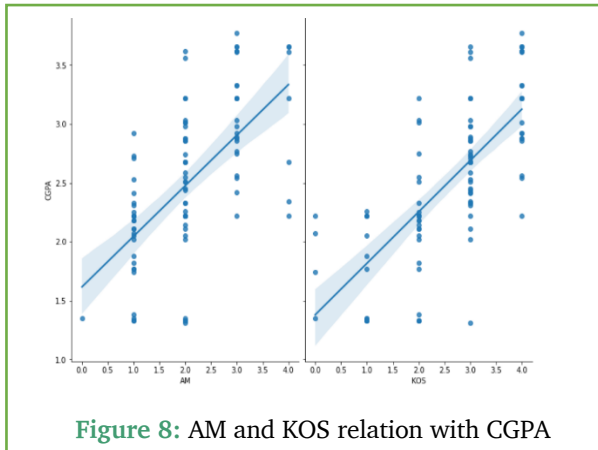


Figure 8: AM and KOS relation with CGPA

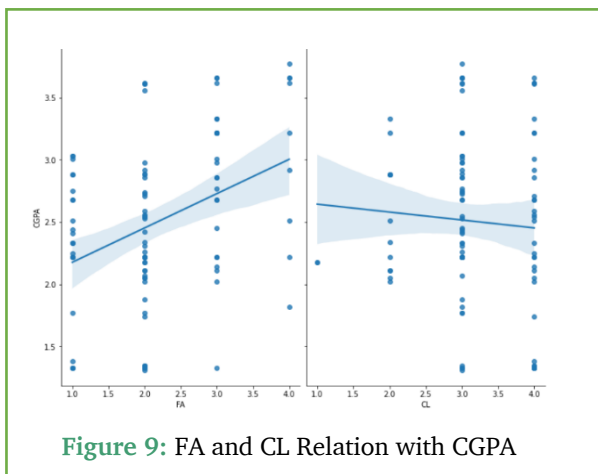


Figure 9: FA and CL Relation with CGPA

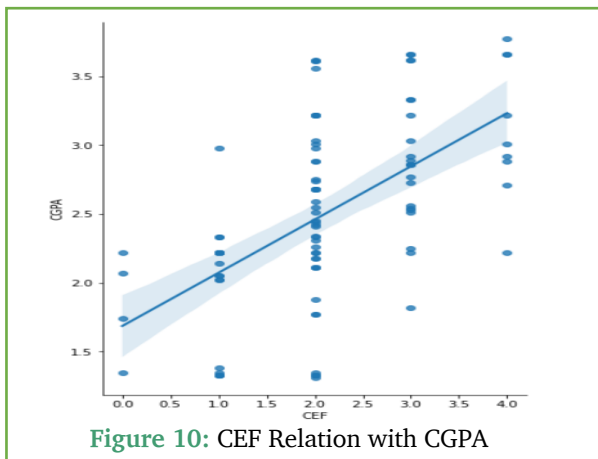


Figure 10: CEF Relation with CGPA

Table 1 shows the accuracy of the KNN and MLR models. This showed that the accuracy of MLR was more than KNN. Hence KNN model

was preferred for the prediction of student grades using teacher effective characteristics.

Table 1. Accuracy of the Models

Models	Accuracy
KNN	83%
MLR	91%

Table 2 shows the ratio of test and train dataset (10:90, which means 10 % of data was used for

test and 90% data used for training) with the accuracy of models.

Table 2. The Ratio of Test and Training Dataset

The Ratio of Test and Training Data	KNN	MLR
10:90	83%	91%
20:80	74%	91%
30:70	74%	91%
40:60	73%	90%
50:50	67%	90%

Table 2 concludes that when the test data increased and training data were reduced in the KNN model. The accuracy of the model was reduced significantly. But in the case of MLR, the accuracy did not reduce significantly.

Table 3 showed the effect on the accuracy of the KNN model when the kth value was changed. Note the test train ratio was set at (10:90) when the kth value was changing.

Table 3. The Effect of the kth value on KNN Accuracy

Kth Value	KNN Accuracy
1	83%
2	77%
3	77%
4	74%
5	73%

Hence Table 3 showed that with the increase of the Kth value, the accuracy of the KNN model was reduced.

Conclusion

This research gave the important input attributes that were used to predict student performance. In this work, the CGPA data of students was recorded based on teacher behaviour in the class. The data of this work was found from a questionnaire survey from the students of a teacher. Students also shared their thinking after the survey. They shared their opinions of effective teacher characteristics.

In this work, after collecting the data. The

data was converted into a proper dataset in MS-Excel. In the end, the KNN and MLR models were built. The accuracy of the KNN and MLR was 83% and 91%, respectively. It was concluded that the MLR model should be used to predict the student grade.

We hope that the academic institutes acknowledge these fifteen characteristics of the teacher. And make some policies that allow the teacher to adapt them to increase the performance of the students.

References

- Aissaoui, O., Madani, Y., Oughdir, L., Dakkak, A., & el ALLIOUI, Y. (2020). A Multiple Linear Regression-Based Approach to Predict Student Performance. https://doi.org/10.1007/978-3-030-36653-7_2
- Bakhshinategh, B., Zaïane, O., Elatia, S., & Ipperciel, D. (2018). Educational data mining applications and tasks: A survey of the last 10 years. *Education and Information Technologies*, 23. <https://doi.org/10.1007/s10639-017-9616-z>
- Gadhavi, M., Smt., & Patel, C. M. (2017). Student final grade prediction based on linear regression.
- Ihsan Zul, M. (2016). Prediction of Student Final Grade by using k-Nearest Neighbor Algorithm.
- Kaya Uyanık, G., & Güler, N. (2013). A Study on Multiple Linear Regression Analysis. *Procedia - Social and Behavioral Sciences*, 106, 234–240. <https://doi.org/10.1016/j.sbspro.2013.12.027>
- Walker, R. (2008). Twelve Characteristics of an Effective Teacher: A Longitudinal, Qualitative, Quasi-Research Study of In-Service and Pre-Service Teachers' Opinions. *Educational Horizons*, 87.
- Wook, M., Yahaya, Y. H., Wahab, N., Isa, M. R. M., Awang, N. F., & Seong, H. Y. (2009). Predicting NDUM Student's Academic Performance Using Data Mining Techniques. *2009 Second International Conference on Computer and Electrical Engineering*, 2, 357–361. <https://doi.org/10.1109/ICCEE.2009.168>
- Zamanian, J., & Saeidi, M. (2017). Iranian EFL Teachers' Perceptions, Practices and Problems Regarding Raising Students' Intercultural Awareness. *International Journal of English Linguistics*, 7, 257. <https://doi.org/10.5539/ijel.v7n4p257>
- Zhang, Z. (2016). Introduction to machine learning: K-nearest neighbors. *Annals of Translational Medicine*, 4, 218. <https://doi.org/10.21037/atm.2016.03.37>

APPENDIX – A

Student Survey Questionnaire of the Teacher Effective Characteristics

Name: _____

Teacher Name: _____

Registration: _____

Semester: _____

Please Complete the Following Questionnaire with Specific Regard to the Inquiry, by Placing a CROSS in the Appropriate Box.

Teacher Characteristics	Strongly Agree (4)	Agree (3)	Just Satisfied (2)	Disagree (1)	Strongly Disagree (0)
The teacher was fully prepared for the lecture.					
The teacher has a positive attitude toward students.					
The teacher build confidence in you.					
The teacher knows how to deliver the concept.					
The teacher uses the whiteboard during lectures.					
The teacher uses the projector during lectures.					
The teacher grades fairly.					
The teacher understands the behavior of students.					
The teacher has good communication skills.					
The teacher respects the questions from students.					
The teacher admits the mistakes.					
The teacher knows his/her subject.					
The teacher has a forgiving attitude.					
The teacher continuously teaches the lecture.					
The teacher makes the class environment friendly.					

APPENDIX – B

	PFL	PA	BC	DC	UW	UP	GF	UB	CS	RSQ	AM	KOS	FA	CL	CEF	CGPA
female	gender	3	2	0	0	4	0	0	3	2	4	4	4	4	1	2.22
female	1	2	0	1	0	4	1	1	2	1	2	2	3	4	1	2.14
female	1	1	1	0	0	4	1	2	2	2	1	0	2	4	0	1.74
male	3	2	0	2	0	4	2	3	3	4	2	3	4	2	2	2.51
male	1	0	2	1	0	4	2	2	3	2	2	1	2	3	2	2.26
female	4	3	3	2	0	3	3	3	4	3	2	3	2	3	2	2.74
female	0	1	1	1	0	3	0	1	3	2	2	0	2	4	2	1.35
male	2	2	2	3	0	3	3	2	2	3	3	2	1	3	2	2.75
male	4	3	3	3	0	4	3	3	2	2	3	4	3	2	3	3.33
female	2	1	4	3	2	2	2	3	3	4	3	4	2	4	3	2.56
male	1	0	0	0	0	3	1	2	2	2	2	2	3	4	1	1.33
male	2	0	1	2	0	2	1	2	2	1	1	2	4	3	3	1.82
female	2	2	3	3	0	3	3	3	3	3	4	3	2	2	2	2.34
male	1	1	0	1	0	2	0	0	4	2	1	2	1	4	1	1.38
female	4	4	3	3	0	4	3	4	4	3	2	3	2	3	2	3.56
female	0	2	2	1	2	3	2	1	2	4	1	2	1	4	3	2.25
male	2	4	3	3	3	3	3	3	4	4	3	4	4	2	3	3.22
female	1	0	0	1	0	2	2	0	2	2	2	1	2	4	1	1.33
male	3	0	1	3	3	3	3	3	3	2	1	3	1	3	2	2.41
female	2	1	1	2	2	2	0	1	2	1	2	3	3	4	2	2.11
male	0	0	1	1	1	4	1	0	2	2	2	3	2	3	2	1.31
female	4	2	2	2	2	4	3	2	4	1	1	3	2	4	4	2.71
male	2	2	2	3	3	3	1	3	3	1	1	2	3	2	1	2.02
female	2	3	3	2	3	3	2	3	4	3	2	2	1	4	3	2.51
male	3	0	2	3	0	4	3	2	3	1	2	3	3	3	2	2.45
male	1	1	0	3	3	2	3	1	2	2	1	2	1	3	2	1.77
male	3	2	1	3	0	4	2	4	3	1	2	3	2	3	4	2.22
female	2	3	4	3	2	4	4	3	4	1	2	4	1	4	2	3.01
male	1	0	2	1	0	2	2	1	4	3	2	2	1	3	2	1.33
female	4	2	2	3	3	3	2	1	3	2	2	3	1	4	1	2.33
female	2	3	3	3	2	4	3	3	4	2	4	3	3	4	2	2.68
female	2	2	1	1	0	2	2	1	2	3	1	2	2	2	2	2.11
female	4	3	3	4	3	4	4	3	4	3	4	4	4	3	4	3.66

male	2	3	2	4	2	4	3	3	2	4	2	4	3	4	2	3.22
male	1	2	1	2	0	4	3	1	2	1	1	2	2	1	2	2.18
male	2	2	2	4	0	4	3	3	3	2	3	4	2	4	3	2.54
female	3	4	3	3	2	4	2	2	2	3	2	3	2	2	4	2.88
female	3	2	2	2	1	3	3	3	3	1	1	3	1	3	2	2.33
female	2	0	1	1	0	2	1	0	2	0	2	1	2	4	1	1.33
male	1	2	1	2	0	4	1	0	3	2	2	3	2	4	1	2.02
male	3	2	2	3	0	4	3	4	3	2	2	3	1	3	2	2.44
female	3	2	1	3	0	3	3	2	3	2	1	3	2	3	2	2.31
female	3	2	3	3	0	3	2	3	2	3	2	3	3	3	3	2.86
male	3	4	4	4	0	4	4	3	4	4	3	4	4	3	4	3.77
female	3	2	3	4	2	3	2	2	2	2	1	3	2	3	3	2.73
male	2	2	3	3	0	3	2	2	3	2	3	3	2	3	2	2.42
female	2	1	2	2	0	3	1	1	2	2	1	2	3	3	2	2.22
female	1	2	1	2	2	2	1	2	3	1	2	1	2	2	1	2.05
female	3	2	3	4	2	4	3	2	4	1	2	2	3	3	4	3.01
male	3	4	2	4	0	4	3	4	4	3	4	4	3	3	3	3.66
male	3	2	3	4	0	3	2	1	2	2	1	3	2	3	3	2.53
male	2	2	2	2	2	3	2	1	3	1	2	2	3	3	1	2.22
male	3	2	2	3	0	4	2	3	2	2	2	3	1	4	2	2.68
male	3	3	2	3	0	4	3	2	2	1	1	4	4	3	4	2.92
female	1	3	1	2	0	3	1	2	3	2	1	2	1	3	3	2.22
female	3	1	2	3	2	3	2	2	4	2	2	3	2	4	2	2.59
female	4	4	3	2	0	4	3	4	4	4	3	4	4	4	3	3.62
male	4	2	2	3	1	3	2	3	3	3	2	2	1	3	3	3.03
male	2	0	0	2	0	2	2	2	3	1	1	2	2	4	1	2.05
female	3	3	2	3	2	4	3	2	2	2	3	3	2	4	3	2.86
male	3	2	3	2	0	3	2	1	3	2	2	1	2	3	1	2.22
male	4	3	3	2	2	4	3	4	2	3	3	4	3	4	3	3.62
female	0	0	1	1	0	4	0	2	2	2	1	2	2	4	1	1.33
female	3	3	2	3	2	4	4	3	3	2	3	3	3	3	2	3.22
male	4	3	1	3	2	4	2	2	2	2	2	4	1	2	2	2.88
male	3	2	3	2	2	3	3	3	3	2	3	3	2	3	2	2.98
male	3	3	3	2	2	4	3	4	3	2	3	4	3	4	3	3.33
male	1	1	0	1	0	3	0	1	3	2	1	1	2	3	0	1.35

Prediction of Student Achievement through Teacher's Professional Characteristics by using Artificial Intelligence

female	3	3	3	4	0	3	3	3	3	2	3	4	2	4	2	3.61
female	3	2	2	3	0	4	2	3	2	2	3	3	3	3	3	2.77
male	1	3	2	3	0	4	1	1	2	1	3	0	2	2	1	2.22
female	1	0	0	1	1	2	0	1	2	1	1	1	2	3	2	1.77
male	1	1	2	1	1	2	0	1	2	1	1	1	2	3	2	1.88
male	4	3	4	2	2	3	3	1	2	1	2	3	3	3	1	2.98
male	4	3	2	2	4	4	3	4	3	3	4	3	3	3	2	3.22
female	2	1	0	2	0	3	1	0	2	0	0	1	2	4	1	1.35
male	3	4	4	2	2	3	3	3	3	3	4	3	2	3	2	3.61
female	2	2	2	2	0	2	2	1	2	3	2	1	2	4	0	2.22
male	4	2	3	3	0	3	3	2	3	3	3	3	2	3	3	2.89
female	3	2	1	2	1	3	1	1	3	1	2	2	2	3	1	2.22
female	4	3	1	3	0	3	3	3	3	2	2	3	1	3	2	2.68
male	4	3	3	2	2	4	3	2	3	2	3	4	2	4	3	2.92
female	1	2	0	2	0	3	1	2	3	2	1	1	1	3	2	2.22
female	4	4	2	3	2	3	2	2	4	2	2	2	2	3	2	2.55
male	4	4	4	2	0	4	3	4	4	2	2	4	2	3	2	3.62
male	3	3	3	3	0	4	4	3	3	2	3	3	1	3	2	3.03
male	0	1	2	2	0	2	2	2	3	1	1	0	2	3	0	2.07
female	4	2	1	3	2	4	3	2	2	2	2	4	3	3	3	2.86
female	2	1	2	2	0	2	2	1	2	2	1	2	1	3	1	2.22
female	4	4	3	4	2	4	3	4	4	3	3	4	3	4	3	3.66
male	0	1	1	1	0	3	0	2	2	2	1	1	1	3	2	1.33
male	3	4	3	4	2	4	4	3	3	2	3	2	3	4	4	3.22
male	2	4	4	2	2	3	2	2	2	2	3	4	1	2	2	2.88
male	1	0	1	1	2	2	2	1	2	2	2	1	1	4	2	1.33
male	3	2	2	2	0	3	2	1	3	2	2	2	1	3	1	2.33
female	4	3	3	2	2	2	3	3	4	2	2	3	3	3	2	2.68
male	2	2	1	1	0	2	2	1	2	3	1	2	2	2	2	2.11
female	4	4	4	3	0	4	4	3	4	3	3	3	4	3	4	3.66
male	3	4	3	4	2	4	3	3	2	4	2	4	3	3	2	3.22
male	2	2	3	2	0	2	3	1	2	1	1	2	2	1	2	2.18

Table APPENDIX -B-1. Abbreviations of Appendix B Table (Features of the Dataset)

Abbreviations of Appendix B Table	Meaning of the Abbreviation
PEL	Prepare Full Lecture
PA	Positive Attitude
BC	Build Confidence
DC	Deliver Concept
UW	Use Whiteboard
UP	Use Projector
GF	Grades Fairly
UB	Understand Behavior
CS	Communication Skills
RSQ	Respect Student Questions
AM	Admit Mistakes
KOS	Knowledge of Subject
FA	Forgiving Attitude
CL	Continues Lecture
CEF	Class Environment Friendly
CGPA	Cumulative Grade Point Average

APPENDIX – C

Code Of Knn Model

```
import pandas as pd #importing pandas
libabry
df =
pd.read_csv('/content/student_final.csv') #
importing dataset
df.head() #calling data set
# Split Data"
X = df.drop(['gender',"CGPA"], axis=1)
y = df['CGPA']
print('Shape of X = ', X.shape)
print('Shape of y = ', y.shape)
from sklearn.model_selection import
train_test_split
#The random_state is a parameter that allows
you to obtain the same results every time the
code is run
X_train, X_test, y_train, y_test =
train_test_split(X, y, test_size=0.1,
random_state=0)
print('Shape of X_train = ', X_train.shape)
print('Shape of y_train = ', y_train.shape)
print('Shape of X_test = ', X_test.shape)
print('Shape of y_test = ', y_test.shape)
#knn model for regression
from sklearn.neighbors import
KNeighborsRegressor
```

```
regressor=
KNeighborsRegressor(n_neighbors=10,
metric='minkowski')
regressor.fit(X_train, y_train)
regressor.score(X_test,y_test)
```

Code Of Mlr Model

```
#importing libraries
import pandas as pd #used to manage and
handle the data
import numpy as np #used to perform
math operation with data
from sklearn import linear_model #for
linear regression
import seaborn as sns # for plotting
# Reading CSV
df =
pd.read_csv('/content/student_final.csv')
df.head()
#creating dataframes
inputs = df.drop(['gender','CGPA'],axis
=1)
inputs
target = df.CGPA
target
%matplotlib inline
sns.pairplot(df,x_vars=['CEF'], y_vars =
'CGPA',size=9,aspect = 0.3,kind='reg')
```

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(inputs, target, test_size = 0.5,
random_state = 0)

#linear regression
model = linear_model.LinearRegression()
#training
model.fit(X_train,y_train)
model.score(X_train,y_train)`
```