A AI based Model for Achieving High Reliability Faculty Performance Using Various Machine Learning Algorithms

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Abstract: The objective of this research is aimed to predict performance through using machine learning algorithms. Faculty performance is quintessential to ensure effective pedagogical and educational objectives. Nonetheless, the evaluation of teachers has been used to be a manual and temperamental task for school administrators The concern about the student evaluation instrument which is most widely applied tool to evaluate faculty performances in a university is generally grounded on students not having enough experience and/or being affected by influence of the course and grades given by the teacher concerned and the course being compulsory or elective. In achieving the objectives, this research uses factors like the length of service, designation, academic rank, workload, and the demographic profile of the faculty. Loaded with the availability of the dataset, a data mining technique simulation in MATLAB R2021B software tool using various machine learning algorithms namely Support Vector Machine (SVM), Decision Tree – Fine Tree, and Ensemble- Bagged Tree. It is clearly observable that the Ensemble Bagged Tree algorithm emerged with the higher accuracy results.

Keywords: predictive analysis, data mining technique, machine learning algorithm, faculty performance, classification method

1. Introduction

In general, faculty performance evaluation refers to the formal process a higher education institution uses to review and rate teachers' performance and effectiveness in the classroom. Ideally, the findings from these evaluations are used to provide feedback to teachers and guide their professional development. In educational organizations, the performance evaluation of each teacher is a relevant issue for quality measures. The literature review suggests tools for teacher's evaluation such as guides, and rubrics, with different evaluation criteria or evaluations in a class by specialized academics in the pedagogy area. This traditional context limits the teachers' engagement to develop his/her performance as well as the principle to predict the strengths and weaknesses attached. Hence, the school administration needs to use initiative methods to evaluate the teachers' performance.

Nonetheless, it increasingly evident that high score and outcomes on these standardized instruments or highly qualified, that is having requisite qualification and certifications – does not necessary predict high effective teaching – a kind of teaching that enriches student learning. The queries remain, in what way to achieve highly effective teaching performance, and how can we measure it? There are various factors that conditions the quality of teaching, furthermore, the degree of influence of each factor are not the similar. Thus, teacher's heavy workload, designation, related school responsibilities and

other nonlinear relationships and other reasons evaluation of the teaching quality, often make a mere formality of the work, or simple enough system, or one sided insufficient. So, it is inevitable to find a new method to evaluate the teaching performance. This is where the machine learning algorithm comes in.

The main objective of this paper is to improve teacher performance through the study of their specialization and proficiency and the time of the period in the service of the educational process, evaluate and determine avenues of the teachers in improving their performance. By proposing directed courses according to his need and build on what he has from previous knowledge and other work-related recommendations to the teacher. Hence, in terms of the training adds new information and knowledge to the experience and improves his performance in the classroom and in the delivery of scientific material for students, and how to manage time and deal with the modern means.

Salem, et al. states that data mining techniques and various machine learning algorithm have been applied in many application domains such as Banking, Fraud detection, Instruction detection and Communication, marketing, medicine, real estate, customer relationship management, engineering, web mining and recently in education which known as Educational Data Mining Most research focused on improving the performance of students and improves the curriculum and what is reflected in the educational process, there are a few researches that have been proposed for teacher performance.

Different educational systems gather and utilize large data

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on faculty, staff and students. These datasets particularly on Teacher's profile and performance data are employed to test the performance of teacher across their time of teaching from one semester to another semester. The key demographics of teacher's characteristics, educational attainment, teaching workload, designation in a semester and number of subject teaching preparation on each provides the training data set and creates a regression function to estimate the performance of teachers in upcoming semesters.

Theoretical/Conceptual Background

This study is anchored on a Machine Learning Theory of Avrim Blum also known as Computational Learning Theory. Blum explains that the area of Machine Learning deals with the design of programs that can learn rules from data, adapt to changes, and improve performance with feedback.

Many of the problems we now want computers to solve are no longer tasks we know how to explicitly tell a computer how to do. These include identifying faces in images, autonomous driving in the desert, finding relevant documents in a database (or throwing out irrelevant ones, such as spam email), finding patterns in large volumes of scientific data, and adjusting internal parameters of systems to optimize performance. Furthermore, he said that we need systems that can adapt to changing conditions, that can be user-friendly by adapting to needs of their individual users, and that can improve performance over time.

In reality, dilemma and problems can be tackled with mathematics, resulting in a range of possible solutions to help guide decision making by performing predictions analysis. Studies regarding both students and teachers are sometimes uncomfortable with the notion of math modeling because it is open-ended. Mathematical modelling is an iterative process made up of the following components. It deals with data and equipped with mathematical tools to implement and makes the model understandable to others.

An algorithm is a set of step-by-step procedures, or a set of rules to follow, for completing a specific task or solving a particular problem. In the context of computer programming and science, it is a finite set of instructions we feed in the computer typically to solve a class of specific problem or performed data processing. In this particular study it employed algorithms based on machine learning to predict the faculty performance of NEMSU - Tagbina Campus. The Performance of the Decision Tree Algorithm, both ensemble - bagged tree and fine tree and the Support Vector Machine, which are among the machine learning algorithms classification were calculated and compared based on their accuracy results.

Discovering patterns within the massive amounts of explored data requires the use of mathematics such as linear algebra and factorization. In addressing and parsing unmapped, intricate and complex datasets, computing has developed improved matrix factorization algorithm. The results of these factorization allow researched and studies to discover relationship between each data, such as patterns and models. In order to find meaning and purpose within dataset, it applied algorithms that develop from mathematical analysis such as algebra, functions limits, and related mathematical theories such as differentiation and integration and other analytic functions.

Data mining is a collection of techniques used to uncover hidden patterns in massive amounts of existing data. These patterns are valuable for analysis and prediction. These applications steered this study in discovering the patterns in refining the prediction of the faculty performance in North Eastern Mindanao State University – Tagbina Campus. The factors and the parameters in the dataset of the faculty help in the prediction analysis that augment the categorization or prediction. Machine learning such as Decision tree and SVM are employed in this study. Pallathadka et al (2021) Classification and prediction of student performance data using various machine learning algorithms stated. A survey on data mining techniques used in higher education is conducted. They discovered that data mining is a vital tool in the education business since it aids in the discovery of several trends common in educational data relating to various areas such as the teaching learning process.
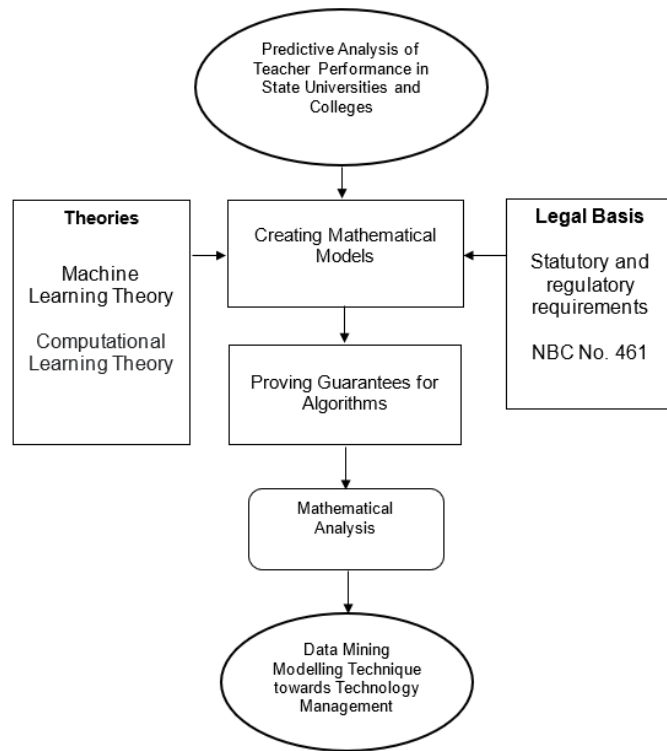
Fig 1. Theoretical and Conceptual Framework of the Study

2. Methodology

This part of the study specifies the methods of research used, the materials, research respondents, research instrument, and data gathering procedure. This model will be developed using the supervised classification methods of Data Mining Techniques. The supervised classification employed several machine learning algorithms including decision tree analysis and other machine learning algorithms which will be implemented using the Matlab R2021B.

In figure 2 Flow of the study, the conceptual paradigm: input, process, and output. The first stage includes the gathering of primary inputs for the creation of the model. The profile of the faculty, the Machine learning algorithm to use to analyze the data which acquired the highest accuracy rate. The second frame is the process stage, in this study, the proponent will assess the inputs such as collection of and the adaptation of the data analysis results which will be interpreted and analyze using Mat lab programming tool aimed to analyze data, develop algorithms, and eventually create models.
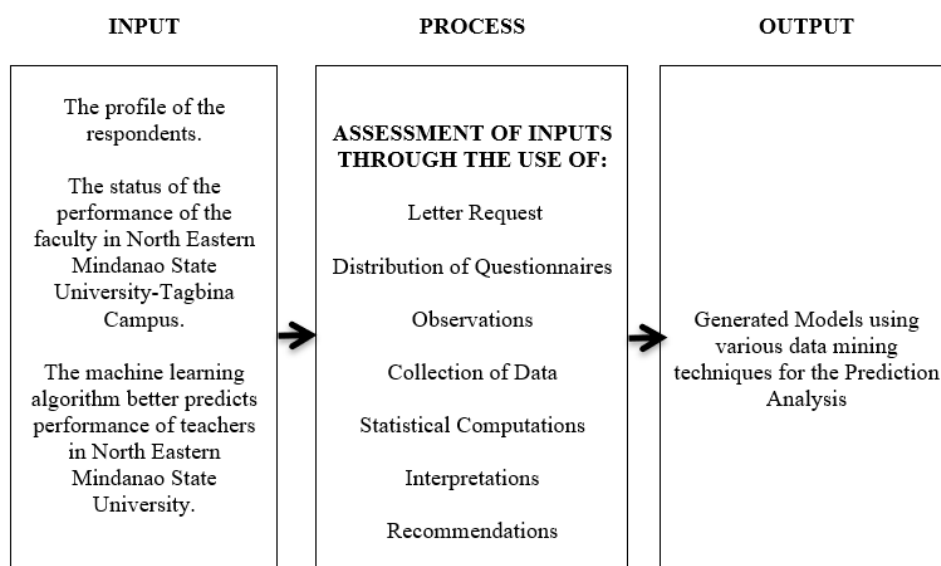
Fig 2. Flow of the Study

The data collected from the office of the Campus Directors with regards to the results of the student's evaluation will be presented and the data gathered from the Office of the Assistant Campus directors with regards

to the teaching load, number of subject preparations and other extra-curricular duties and responsibilities, as well as the data gathered from the office of Human Resource Department for instance, designation, years in service, educational attainment and academic rank. The abovementioned data collected from various offices will then be consolidated and pre-processed used Microsoft excel. The results from pre-processed file will be statistically analyzed with the data requirements of the study using Data Mining Modelling Technique.

Data Mining Technique is also known as Knowledge Discovery in Database (KDD), generally Data mining follow these steps in the treatment of the data; selection of data, cleaning of data, transformation of data, integration of data, mining of data and knowledge evolution of data. Data mining having various of numbers of techniques which have own specialty, such as clustering, classification, data processing, pattern recognition, association, visualization etc. In this study, the researcher will be utilizing the Decision tree analysis for classification model using MATLAB R2021B and python programming language. MATLAB is a computer programming language tool that uses computations and algorithms to analyze large amount of data. Data set is divided into two partitions namely, the training and testing samples. A common split value of training partition is 80% to 20% for testing sample respectively.

Table 1 Data Splitting

No. of data	Ratio	Function	Partition
380	80%	Train the model to fit different parameters.	Training Set
94	20%	Evaluate the trained classification and regression model	Testing Set
237	50% of testing sample	Find optimal patterns of hidden units for classification (5 fold cross validation)	Validation Set

Out of the 100% data that will be included in this study 80% will be used as the Training set while 20% will be used as the test set; nevertheless, (50%) of the data will be used in the validation set.

3. Results and Discussions

Initially, this study focused on the profile of the respondents refers to the demographic information of the faculty members and administrators. This information might probably influence the teaching performance of the faculty members and administrators.

The following tables present the profile of the faculty being assigned to North Eastern Mindanao State University – Tagbina Campus, and the profiles of the administrators. The profile of the respondents was tabulated and computed according to the following: age, gender, marital status, educational attainment, teaching workload, designation, teaching experience, and academic rank.

Age and gender influenced the behavior and role of the respondents as faculty and administrators. Gender is characterized as women, men, girls, and boys that are socially involved in an academic professional group. Age determined the number of years in terms of teaching performance effectiveness. According to Burroughs et.al. 2019, teaching experience refers to how long a teacher has professionally taught.

Table 2. Age of the Respondents

Respondents	Age (years)	Frequency F	Percentage %
	21 – 25	2	4
	26 – 30	5	10
	31 – 35	11	22
Faculty	36 – 40	6	12
	41 - 45	6	12
	46 – 50	3	6
	More than 50	13	26

Administrator	21 – 25	0	0
	26 – 30	0	0
	31 – 35	1	2
	36 – 40	1	2
	41 – 45	0	0
	46 - 50	1	2
	More than 50	1	2
	Total	**50**	100

Table 2 shows the age profile of the respondents both faculty and administrators with a total number of 50 respondents. Based on the result, there were only 8% belonged to administrators, and 92% were faculty members. As to the age bracket, more than 50 years old obtained the highest number which is 13 or 26% for faculty while the four (4) administrators got the same number which is 1 or 2% each. The next highest number of the age bracket for the faculty was 31-35 years old with 11 respondents which is 22% and 4 % belong to the age bracket of 21-25 years old with a total number of 4. This implied that more than 50 years old were likely evaluated compared to 21-25 years old.

Table 3. Gender of the Respondents

Respondents	Gender	Frequency F	Percentage %
Faculty	Male	18	36
	Female	28	56
Administrator	Male	3	6
	Female	1	2
	Total	**50**	100

Table 3 shows the profile of the respondent in terms of gender both faculty and administrators. As the results revealed, there were 28 female faculty members 56% while 18 male faculty members which are 36% evaluated based on their performance. For the administrators, the highest number was male with 3 or 6% while only 1 for female on their performance evaluation. The total number of respondents was 50 wherein 46 of them which is 92% belonged to faculty and 4 respondents 8% belong to administrators. This implied that female faculty members were more likely to be evaluated than male faculty members. However, for the administrator, the highest in term gender was male with the number of 3 which is 6% while the female was only 1 which is 2%.

Marital status was referring to the statement of being single, married, separated, or widow. Male and female married faculty members as well as male single teachers are in the teaching profession. However, as personally observed that married women were most likely to have responsibilities than the other marital status. Based from the study conducted by Osuji et al (2022), teachers' marital status contributes less to enhancement of job performance of teachers.

Table 4. Marital Status of the Respondents

Respondents	Marital Status	Frequency F	Percentage %
	Single	20	40
	Married	23	46
Faculty	Separated	2	4

	Widowed	1	2
Administrator	Single	0	0
	Married	4	8
	Separated	0	0
	Widowed	0	0
	Total	**50**	**100**

Table 4 shows the marital status of the respondents of both faculty members and administrators with a total number of 50. Based on the results, faculty with married status obtained the highest number of 23 which was 46%, and closely followed by the faculty with single status got 20 respondents indicated as 20%. Moreover, separated status had 2 faculty members as respondents which were 4% while widowed got only 1 respondent which was 2% respectively. On the other hand, only 4 respondents from the administrators or all of them were married but the rest of the marital status had no respondent. This implied that most of the married faculty were more likely to be evaluated in terms of teaching performance compared to the faculty with single marital status which was very close in number 23 against 20.

Table 5. Educational Attainment of the Respondents

Respondents	Educational Attainment	Frequency F	Percentage %
Faculty	Bachelor Degree	17	34
	Master's Degree	17	34
	Doctorate Degree	12	24
Administrator	Bachelor Degree	1	2
	Master's Degree	3	6
	Doctorate Degree	0	0
	Total	**50**	100

Table 5 shows the educational attainment of the respondents for both faculty and administrators. Based on the results, faculty got the highest number of 46 and 4 for administrators with a total number of 50. Bachelors and Master's Degrees for the faculty obtained the same number of 17 with 34% each educational attainment. There were 12 faculty respondents which are 24% who graduated with a doctoral degree from a different discipline. On the other hand, there was no doctoral degree holder from the administrators whereas 3 of them were master's degree holders 6%, and only 1 was a bachelor's degree holder indicated as 2%. This implied the interest of the faculty members to pursue their professional growth in terms of educational attainment with teaching performance.

The workload was referring to the number of units and subjects taught assigned to the faculty members with 21 units as the regular load equivalent of 7 subjects which was 3 units each. Overload was also distributed to faculty members of 9 units as an additional workload. The designation was the position assigned to the faculty for specific office functions like program coordinator and head of different offices. The faculty member with designation was deloadedd of 3 - 12 units.

Table 6. The workload of the Respondents

Respondents	Workload (Teaching Load)	Frequency F	Percentage %
Faculty	Regular Load with Overload	43	86
	Regular load with No Overload	2	4
	Deloaded	1	2
Administrator	Regular Load	0	0
	Overload	4	8
	Deloaded	0	0
	Total	**50**	100

Table 6 shows the work teaching load of the respondents both faculty with 46 in number which is 92% and administrators with 4 in number which is 8% with a total number of 50. Results revealed that faculty had a regular load with overload obtained the highest number of 43 which indicates 86% followed by the 3 faculty members who had a regular load with no overload which is 6%. On the other hand, there were 4 administrators with overload which is 8% of the respondents in this study. This implied that the faculty had a regular load with overload affected more on the teaching performance at the highest frequency based on the result presented.

Table 7. Additional Designation of the Respondents (N=46)

Respondents	Additional Designation	Frequency F	Percentage %
Faculty	Designation	19	46
	No Designation	27	54
	Total	**46**	**100**

Table 7 shows the additional designation of the faculty with a total number of 46 respondents. Based on the results, no designation faculty obtained the highest number of 27 which is 54% while the faculty with designation got 19 which is 46%. These faculty members with designation were given additional assignments in different offices which is equivalent to 3 - 12 units to be deloaded from their regular load as faculty. This implied that most of the faculty members with designation may affect the teaching performance of teachers because of the additional extra work to be accomplished at any given time.

Table 8. Teaching Experience of the Respondents

Respondents	Teaching Experience (Year)	Frequency	Percentage (%)
Faculty	More than 15	13	26.0
	11 - 15	2	4.0
	6 - 10	3	6.0
	1 – 5	28	56.0
	Below 1 year		

Administrator	More than 15	1	2.0
	11 - 15	3	6.0
	6 - 10	0	0
	1 – 5	0	0
	Below 1 year		
	Total	**50**	**100**

Table 8 shows the teaching experience of the respondents with a total number of 50 divided into 2 groups. The 46 respondents belong to faculty members and the 4 respondents belong to the administrators. Based on the results, the highest frequency in terms of the number of years in teaching was 28 which 56% belonging to the faculty with 1 - 5 years in experience followed by more than 15 years in experience with the number of 13 which is 26%. Moreover, faculty with 6 - 10 years of experience got a frequency of 3 which is 6% while the lowest number was 11 - 15 years of experience with only 2 respondents which is 4%. There was no respondent belonging to below 1 year of teaching experience. On the other hand, administrators with 11 - 15 years of experience got a frequency of 3 which is 6% while more than 15 years of experience with only 1 respondent indicated as 2%. No respondents also belong to the ranges 6 - 10, 1 - 5, and below 1 year of teaching experience. This implied that faculty members who had 1 - 5 years of teaching

experience were active in the faculty performance evaluation as well as the administrator with 11 - 15 years of experience.

On a study conducted by Rashid, A. S. K. (2022), study confirmed that the quality assurance has progressed, and enhanced the quality of the teacher performance, also reinforces all dimensions of the teaching, academic, and research performance of teachers by applying the K-Means Clustering Algorithm methodology to analyze and assemble a big data according to the teacher academic titles.

Table 9 shows the academic rank of the faculty as respondents with a total number of 46. The results revealed that instructors obtained the highest number of 23 as indicated by 50% of the total number of faculty. This was followed by the assistant professors had 14 respondents 31% while the associate

Table 9. Academic Rank of the Respondents (N=46)

Respondents	Academic Rank	Frequency F	Percentage %
	Professor	1	2.17
	Associate Professor	8	17.40
Faculty	Assistant Professor	14	30.43
	Instructor	23	50.00
	Total	**46**	**100**

Professors got 8 in number interpreted as 17% and the lowest number belong to professors with only 1 respondent which was 2% respectively. This implied that in terms of academic rank instructors were more likely to be evaluated on their teaching performance.

The secondary problem of this study dealt with the status of effectiveness of the faculty in North Eastern Mindanao State University – Tagbina Campus as perceived by the

respondents through student evaluation. Below are the presentations of the gathered data of the faculty members and administrators of North Eastern Mindanao State University in terms of teaching performance. The said respondents were evaluated based on the following criteria, particularly on commitment, knowledge of the subject, teaching for independent learning, and management learning.

Table 10. Summary of the Performance Status of the Respondents

	CRITERIA	AVERAGE	INTERPRETATION
a.	Commitment	4.10	Very Satisfactorily
b.	Knowledge of the Subject	4.06	Very Satisfactorily
c.	Teaching for Independent Learning	4.09	Very Satisfactorily
d.	Management of Learning	3.98	Very Satisfactorily
	MEAN SCORE	**4.05**	**Very Satisfactorily**

Table 10 shows the mean score of the summary of performance status of the 50 respondents both faculty members and administrators. Based on the results, the highest average score of 4.10 belongs to commitment and is closely followed by an average score of 4.09 belonging to teaching for independent learning which both interpreted as very satisfactorily. The performance on knowledge of the subject obtained the average score of 4.06 while the performance on management learning got the lowest average score of 3.94 but both had the same interpretation of very satisfactorily. This implied that the overall teaching performance of the faculty members and administrators was very satisfactorily with an average mean score of 4.05 respectively.

Another problem of this study dealt on the technical requirements for the development of machine learning algorithms. Using the MATLAB R2021a software, and using the Classification Learner and Statistics and Machine Learning Toolbox 12.1 application, the best predictive model determined by the validation of the accuracy was identified. As shown in table 16, the machine learning algorithm that presents the higher model accuracy and cost validation, for classifying the faculty performance is the Ensemble Bagged-Trees algorithm.

Thus, Microsoft Excel was also utilized to pre-process and clean the data, because using the dataset without pre-processing and cleaning will only make the prediction result irrelevant. Nevertheless, the programming flexibility of MATLAB allows it to be used as a key component in measuring the top three algorithms which guided the design of this study.

The Decision Tree specifically the fine tree algorithm, Support Vector Machine (SVM) and another type of Decision Tree which is the Ensemble – Bagged Tree classification approaches implementation is done using the Mat lab programming tool with imported data from the faculty profiling and the results of the student's evaluation datasets. The results are estimated and evaluated, and it is visible that Bagged Trees Approach shows high accuracy for the prediction of the faculty performance when compared to the other classification algorithms Decision tree – Fine Tree and Support Vector Machine (SVM).

The Ensemble – Bagged Tree, a type of decision tree garnered the highest results in model analysis using MATLAB programming in terms of Accuracy and Cost validation, Prediction speed, and training time. The main idea relating to bagged trees is that rather than depending on a single decision tree, we build a single good model by intermixing many models together. According to the study of Atalaya et al, in relation to the results obtained, it is evidenced that the predictive model created which is based on the Ensemble Bagged-Trees algorithm, presents acceptable metrics in terms of precision, sensitivity, specificity and accuracy. It was also pointed out that the predictive model obtained provides security and reliability, contributing to decision making to improve the quality of the course content and instructive methodology.

These are the process of creating the model with the Training Data set. Selecting the Training dataset as the Data Set Variable. Then, choose the predictors that can be used. Then, for the validation, 5-fold cross-validation and split validation were used since the data are limited. 5 folds validations were able to provide the appropriate and higher accuracy ratings. Cross Validation is an essential tool because it allows the researcher to employ the best way to maximize the value of the data both in content and context.
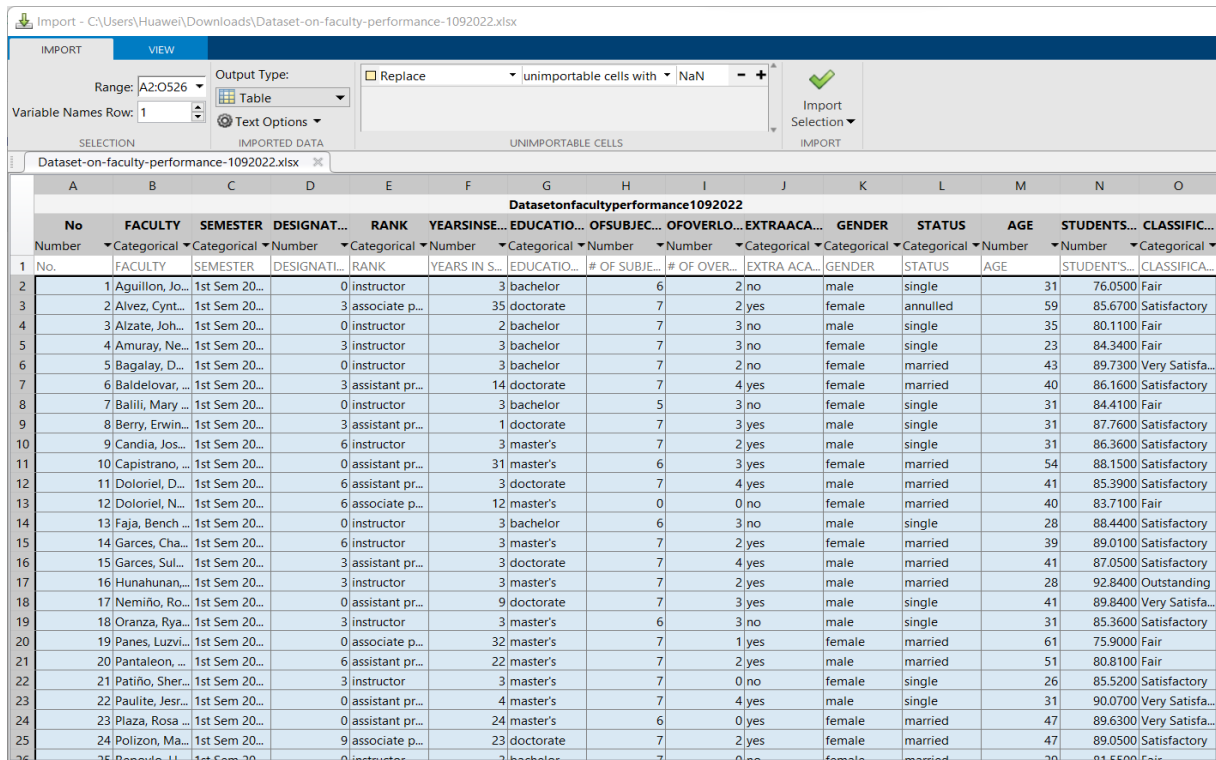
Fig 3. Training Dataset in MATLAB Environment

Figure 3 shows the datasets that the researcher used. These are the factors and their respective datum in each column.

There is a total of 474 entries for faculty profiles and students' evaluations results.

Table 11. Model Summary Results

Model Type		Training Results			
Preset	**Maximum number of splits**	**Accuracy (Validation)**	**Cost (Validation)**	**Prediction speed**	**Training time**
Decision Fine Tree	100	51.0%	257	~440 obs/sec	19.645 sec
Support Vector Machine (SVM)	1000- **Iteration limit**	56.4%	229	~2900 obs/sec	9.5293 sec
Decision Tree (Ensemble – Bagged Trees)	524	56.4	229	~1400 obs/sec	4.914 sec

Table 11 shows that the study utilized MATLAB as a tool for creating a predictive model. Moreover, this tool imports the needed sets of data to be used. The figures above indicated the accuracy results of the tested model with 500 data entries. The model shows two different types of decision trees namely Ensemble-Bagged Tree and Fine Tree and the other model presented was the Support Vector Machine (SVM). In these models, they measured in terms of Accuracy validation, at 56.4% for both Bagged Tree and SVM while Fine tree measured at 51.0%.

It has been shown in a study conducted by Ansar Siddique, et al. Predicting Academic Performance Using an Efficient Model Based on Fusion of Classifiers that the same methods are vital for improving single classifiers and the accuracy of predictive models. Bagging, Boosting and stacking, etc. are different types of ensemble methods that use a blend of models to improve composite models. Among them, bagging is utilized for classification and prediction purposes. The study handled the imbalanced dataset with ensemble classifiers to produce high results. Since every model comprises some limitations, so the ultimate purpose of ensemble methods was to join the

strength of single different models to achieve higher accuracy.
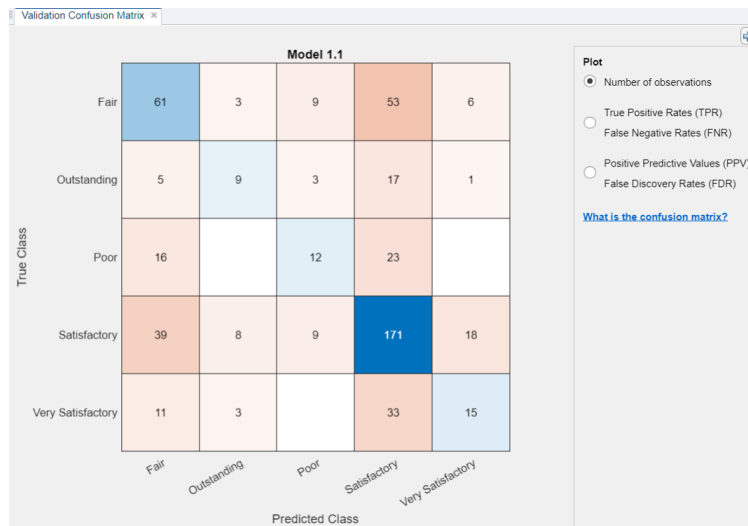
Fig 4. Validation Confusion Matrix

On the confusion matrix plot, the rows correspond to the true class (Target Class) and the columns correspond to the predicted class (Output Class). The diagonal cells correspond to observations that are correctly classified. The off-diagonal cells correspond to incorrectly classified observations. Both the number of observations and the percentage of the total number of observations are shown in each cell.

In figure 4, the diagonal cells show the number of correct classifications by the trained network. For example, 172 entries are correctly classified as satisfactory. This corresponds to 36.2% of all 474 entries. Similarly, 61 entries are correctly classified as fair. This corresponds to 12.8% of all entries.

The confusion matrix analysis shows around 56.4% accuracy for both algorithms. It indicates the validity of the data set for faculty performance. The Confusion matrix and Classification report were used for analysis. It is concluded that the Decision tree is found suitable for these datasets with little compromise in the execution time for predicting the faculty performance of North Eastern Mindanao State University – Tagbina Campus. Since the value of samples is limited to other performances. The values in the confusion matrix plotted in figure 4 show the variation of True Positive (TP) is an outcome where the model correctly predicts the positive class. The total number of True Negative (TN) for a certain class will be the sum of all columns and rows excluding that class's column and row. The total number of False Positive (FP) for a class is the sum of values in the corresponding column while the total number of False Negative (FN) for a class is the sum of values in the corresponding row.

Table 12. Summary Performance Evaluation in Mat lab

Algorithms/Model type	Classification	Precision	Recall	Specificity
Decision Tree – *Bagged Tree*	Fair	0.4621	0.4621	0.8193
	Outstanding	0.3913	0.2571	0.9714
	Poor	0.3636	0.2353	0.9557
	Satisfactorily	0.5757	0.6980	0.55
	Very Satisfactorily	0.375	0.3409	0.9460

Table 12 outcomes of Summary Performance Evaluation in Mat lab have been assessed utilizing the execution estimates, in terms, Precision, Recall, and Specificity of the given data sets of the faculty performance. The researcher presented the results and identify the attributes that contributed most in differentiating the classification of the dataset of faculty performances as per the machine learning model used in this study.

Table 13. Accuracy Results of Classification Models

Models	Accuracy
Decision Tree Ensemble – Bagged Tree	56.4%
Support Vector Machine (SVM)	56.4%
Decision Tree - Fine tree	51.0%

Table 13 presented the accuracy results of the top three models, it can be seen that the higher accuracy value measured was almost 60% only which are the Ensemble–Bagged Tree under Decision Tree Classification Modelling and Support Vector Machine (SVM). Out of the actual 525 data entries predictions, 56.54% are correct and 43.46% are wrong. When the researcher trained a model using the Classification Learner app in MATLAB, the accuracy reported was not that high this was because of the limited data, however, if the model is being fed or imported 1000 or more data, the accuracy could have been reached higher. Moreover, a machine-learning algorithm needs a lot of data to distinguish. For complex problems, it may even require millions of data to be trained. Therefore, in this study, we need sufficient amounts of data to ensure that Machine learning algorithms are trained properly. However, attaining a higher data set that could produce a greater accuracy rate is possible after collecting data after every semester.

Summary of Finding

By using Ensemble – Bagged Trees, the researcher obtained good results for the accuracy rating compared to the two algorithms namely Support Vector Machine (SVM) and Decision tree – fine tree after running in MATLAB. It seems like the model program is able to find a good prediction for each faculty performance. Comparing all the factors in the dataset, the age of the faculty acquired the highest accuracy rating when the factors were measured in the MATLAB individually. It was also found out that the main determinants of the accuracy level of the model for the Prediction of Faculty Performance is the dataset of the factors relating faculty performance.

4. Conclusion

The results after implementing the classification methods particularly Ensemble – Bagged Tree modeling have shown an improvement in teachers' performance evaluation by allowing factors other than student's evaluation to actively predict teacher's performance. This predictive model for faculty's performance utilizes Data Science and Machine Learning Techniques. Based from the results of the developed model, the bagged tree – Ensemble type of decision tree achieved the higher accuracy level than the other classifiers used for the model

evaluation. Moreover, results show that there is significant difference in results either by using only academic characteristics or using them with demographic characteristics. This means that there is slight effect by demographic characteristics on the faculty performance.

Suggestion for Future Research

In future works, the prediction of faculty's performance can be improved by using larger dataset, which will be feasibly attained every semester. Also, the researcher can try to apply new data mining technique or algorithms that may give more accurate results. Also, the researcher may use data from another source and through survey instruments that will allow to dig deeper in learning more about faculty characteristics which can be considered as an important attribute in predicting the faculty performance.

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