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Research Article

Faculty Evaluation Decision Based System with Sentiments Analysis using Naïve Bayes Algorithm

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ABSTRACT

In the educational setting, the core element of education is the quality of instruction. This is truly evident as instruction has been one separate area in terms of educational and program accreditations. The main catalyst of instruction is the performance of teachers in terms of providing quality education. To evaluate faculty members, most academic institutions are using a standard instrument. The evaluation questionnaire consists of quantitative and qualitative questions. The quantitative question is typically answered using the Likert scale model. However, open feedback, typically, is not included in the performance evaluation or appraisal due to a lack of automated text analytics methods. The creation of a Faculty Evaluation Decision Based System with Sentiments Analysis using Naïve Bayes Algorithm provides a more comprehensive understanding of the teacher's evaluation ratings. Evolutionary Prototyping Model was used as a software methodology which provides systematic and controlled procedures for building iterative prototypes. The model consists of four phases, which include, identification, design, construction or building, and evaluation. The overall rating of the respondents using the ISO/IEC 25010, or the Software Product Quality Model Criteria is 4.82 numerical rating with an interpretation of very acceptable. As observed all criteria are rated very acceptable which indicates a high standard has been set in the development of the system. The Naïve Bayes algorithm successfully categorized comments into negative and positive classifications. Mapping Analysis based on the evaluation results of the system was successfully embedded into the System.

Keywords: Faculty evaluation, Machine learning, Naïve Bayes Algorithm, Sentiments analysis

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Introduction

In the educational setting, the core element of education is the quality of instruction. This is truly evident as instruction has been one separate area in terms of educational and program accreditations. The main catalyst of instruction is the performance of teachers in terms of providing quality education. Faculty members have a very important role in achieving the educational vision and mission of an academic institution in promoting a competitive and conducive environment (R.Quratulain, 2016).

The evaluation process for teachers is a method to ensure instruction quality has been delivered to various stakeholders. It is an integral component in providing continuous quality improvement of the quality of instruction. Assessing the performance of faculty members is now an integral part of the educational system as it aims to assess faculty performance using sets of criteria and provide necessary academic intervention programs anchored in the development of a comprehensive faculty development program. In addition, it is also vital as it is often used for the promotion and annual appraisal process of faculty members (Aung & Myo, 2017).

To provide improvement in terms of teaching, it is necessary to determine and convert the students' evaluation into a consolidated report which renders an opportunity to give feedback on the performance of the teacher concerning his or her perspective of instruction, organization, classroom environment, and subject mastery. In addition, the quality of teaching is not only measured by the qualification and knowledge of the teachers, but also by their dedication and commitment in the classroom (J. Sang, & H. Naeem, 2015).

To evaluate faculty members, most academic institutions are using a standard instrument. This instrument consists of different criteria depending on the institution's approved contents and organization. The evaluation is typically implemented in the middle or end of each course. The evaluation questionnaire consists of quantitative and qualitative questions. The quantitative question is typically answered using the Likert scale model. The aggregate of the responses is used as a metric to gauge the teaching quality of the concerned faculty

member. In terms of qualitative, nonetheless, it is collected by open-ended questions as comments and suggestions from students' opinions in textual form.

However, open feedback, typically, is not included in the performance evaluation or appraisal due to a lack of automated text analytics methods (B. Jagtap and V. Dhotre, 2014).

In addition, the textual data can employ substantial insights in terms of subject mastery, communication, behavioral skills, teaching methodology, and classroom management which are vital in improving the quality of teaching. Such information may not be readily extracted from the Likert scale-based feedback. However, getting sense out of the textual feedback manually is a tedious task and, as a result, the textual feedback is not properly utilized (W. Medha et al, 2014).

Also, it is easier to analyze quantitative data in a numerical rating scale with fixed rubrics and indicators using some statistical techniques, but it is difficult to extract results based on the qualitative data provided by the students in the faculty evaluation. Therefore, researchers on teacher evaluation focused on quantitative data but ignored qualitative data. (I4). However, the processing of qualitative data analysis is very important, and it can enhance the teacher evaluation effectiveness (A. Kwin, 2017)

Student evaluations are the most studied form of personnel evaluation. Most of the studies look into quantitative measures gathered in the questionnaires and they rely on the fixed rubric rules, and they take less into account students' opinions (Balajadia et al, 2016)

Addressing this problem is crucial as more meaningful and substantial insights can be extracted based on the comments of the students. These are vital factors to ensure the quality of instructions has been provided. With this, the researcher aims to create a scoring mechanism that combines both qualitative and quantitative faculty evaluation results to provide a more comprehensive understanding of the teacher's evaluation ratings.

The researcher will adopt sentiment analysis using the Naive Bayes Algorithm to identify the negative and positive polarity extracted from textual responses. Naive Bayes is mostly

preferred for classification due to its speed and simplicity (Goel et al, 2016). This research is aimed to create software that can be used by academic institutions as a tool to provide a better understanding of teachers' instructional performance in aid of developing necessary faculty development programs.

Methodology

This chapter presents the techniques and proposed methods in the development of the study. It also presents the sampling and statistical analysis suited based on selected research questions. The instrumentation and technical part of the study are depicted clearly. The data processing methods and statistical observation techniques, applied during the study are described precisely.

Methods and Techniques of the Study

The researcher used two types of research designs which include descriptive and developmental. In terms of descriptive research, the study aims to evaluate the proposed system using sets of criteria and indicators. In terms of developmental type, the study aims to develop a system that enables the automation of the evaluation process of faculty so proper necessary reports can be automatically generated in

aid to improve the instructional competence of faculty members.

The researcher also used mixed research methods quantitative and qualitative in data gathering. Quantitative in the form of collecting and analyzing data to see the effectiveness of the system; and qualitative, based on the comments and suggestions of the respondents.

The evolutionary prototyping model would be used as this serve as an incremental software development approach that aims to provide a process for developing software with incomplete requirements until the system already met the desired functional requirements specifications.

The development model produces multiple numbers of prototype versions as the researcher identifies requirements.

In terms of evolutionary prototyping model (EPM), is a software development lifecycle model by which a software prototype is created for demonstration and requirements elaboration (Chen & Huang, 2002; Laudon & Laudon, 1999). The model consists of several steps which include identifying basic requirements, creating a working prototype, using the prototype, and a validation check to ensure that the functional requirements are met based on the system specification.

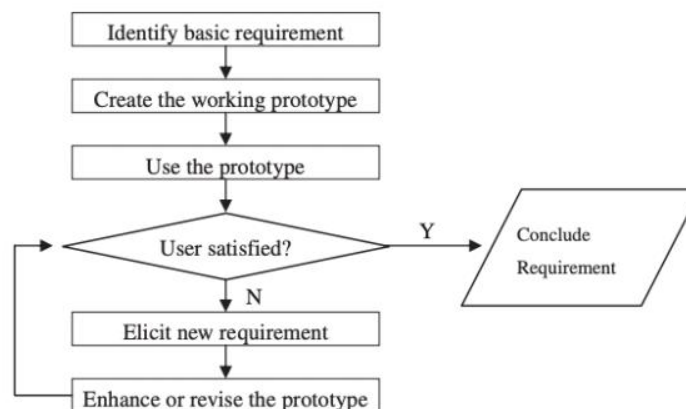


Figure 1.0 Evolutionary Prototyping model (EPM)

Figure 1.0 presents that the model provides an incremental approach and workable prototype system served as the first version that is provided to the potential user. The system developers follow an incremental development approach to improve the second prototype based on users' needs and feedback. Finally,

test the prototype and describe the system requirement. After revision and/or improvement, the prototype will be available to the user. The process will be iterated until the users are satisfied with the system and the system is suitable for the agribusiness external environment. When no more improvement is

required, the tested system becomes mature and operational. The figure below indicates the flow of the evolutionary prototyping model (EPM),

In terms of software evaluation, the researcher will use ISO/IEC 25010 standards. The properties of software can be assessed

using the characteristics of the said quality model which includes functional suitability, performance efficiency, compatibility, usability, reusability, security, maintainability, and portability. The system will be evaluated by respondents who are categorized as experts using these characteristics.

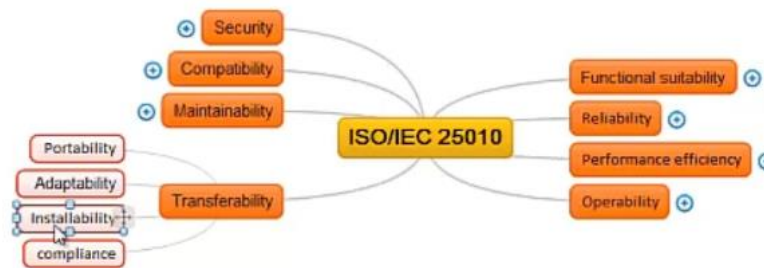


Figure 2.0 Evolutionary Prototyping model (EPM)

To measure the system in a holistic approach, a working system must be evaluated by a certain standard in software development. As gleaned in the table above, the ISO/IEC 25010 consists of the following criteria which include functional suitability, reliability, performance and efficiency, operability, security, compatibility, maintainability, and transferability. Each criterion is provided with sets of indicators to measure the perceptions and evaluation of the respondents.

The IPO conceptual framework provides interaction between the input process and output. The input refers to the different knowledge, software, and hardware requirements specified in developing the applications.

These inputs are essential in creating the system as the process entails presenting the step-by-step process under the extreme prototyping model which includes the following steps such as identification, design, construction, and evaluation. In addition, the Naive Bayes Algorithm will be used to analyze students' sentiments categorizing negative and positive comments. The mapping analysis will be used to integrate and mapped academic interventions based on the result of the evaluation. These processes are essential in developing the system which will provide the faculty evaluation results and combine scores both quantitative thru ratings and qualitative thru comments and feedback.

Evolutionary Prototyping Model

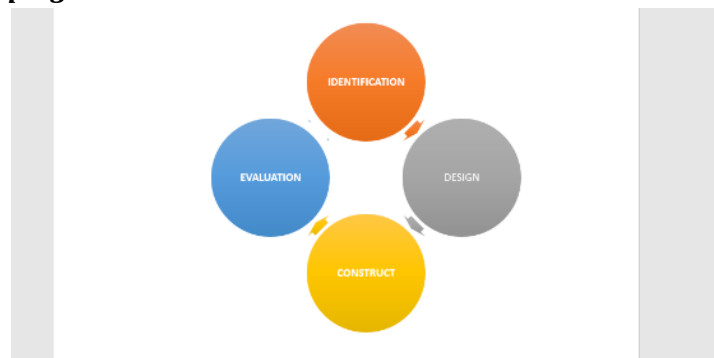


Figure 5.0 Phases of Evolutionary Prototyping Model

To develop the faculty evaluation decision-based system with sentiment analysis using the Naïve Bayes algorithm, EPM was used. The EPM is an iterative software development methodology, which provides systematic and controlled procedures for building iterative prototypes. The model consists of four phases, which include, identification, design, construction or building, and evaluation.

The researcher conducted a series of interviews with the school supervisor to identify the need for a faculty evaluation system. In the design phase, the researcher designed the prototype of the system using Java as the main programming language for API Springboot Framework for the REST Service and Java Script on the Front End together with the construction of a database on MySQL. After the initial development, the researcher presented the system prototype to the school for comments and suggestions for system modification. Then finally, the finished system is presented and evaluated by the respondents.

ISO/IEC 25010 or Software Quality Model

In assessing the performance of the system, the characteristics under the ISO/IEC 25010 or Software Quality Model (ISO, 2005) will be used. The model involved parameters such as functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. ISO 25010, titled "Systems and software engineering – Systems and software Quality Requirements and Evaluation (SQuARE) – System and software quality models", is a software quality standard. It describes the models, consisting of characteristics and sub-characteristics, for both software product quality, and software quality in use together with practical guidance on the use of the quality models. A product quality model is composed of eight characteristics (which are further subdivided into sub-characteristics) that relate to static properties of software and dynamic properties of the computer system.

Functional Suitability

Functional Suitability refers to how well a product or system can provide functions that meet the stated and implied needs.

Reliability

Reliability refers to how well a system, product, or component performs specified functions under specified conditions.

Performance Efficiency

Performance Efficiency refers to the performance related to the number of resources used.

Usability

Usability refers to how well a product or system can be used to achieve specified goals effectively, efficiently, and satisfactorily.

Security

Security refers to how well a product or system protects information and data from security vulnerabilities.

Compatibility

Compatibility refers to how well a product, system, or component can exchange information as well as perform its required functions while sharing the same hardware or software environment.

Maintainability

Maintainability refers to how well a product or system can be modified to improve, correct, or adapt to changes in the environment as well as requirements.

Portability

Portability refers to how well a system, product, or component can be transferred from one environment to another.

Locale of the Study

This study was undertaken within the sphere of operation of Baliuag University. Baliuag University is a for-profit private higher education institution located in the suburban setting of the small city of Baliuag, Central Luzon. Baliuag University (BU) offers courses and programs leading to officially recognized higher education degrees such as bachelor's degrees, master's degrees, and doctorate degrees in several areas of study. BU also provides several academic and non-academic facilities and services to students including a library, sports facilities, financial aids and/or scholarships,

study abroad and exchange programs, as well as administrative services. The system will benefit the university as there is no system used to evaluate faculty members. In addition, the researcher provided a scoring sheet where quantitative and qualitative scores can be combined which then can be used by the management in the development of comprehensive faculty development and training programs.

Result and Discussion

In developing the Faculty Evaluation Decision-Based System with Sentiment Analysis Using the Naive Bayes Algorithm the following are the salient features of the system which include a content management system, faculty evaluation, an instrument for evaluation module development, report generation, faculty evaluation results, and sentiment analysis.

The researcher utilized a built-in Java Naïve Bayes algorithm coming from GitHub repositories ([https://github.com/ptnplanet/Java-](https://github.com/ptnplanet/Java-Naive-Bayes-Classifier/blob/master/)

[Naive-Bayes-Classifier/blob/master/](https://github.com/ptnplanet/Java-Naive-Bayes-Classifier/blob/master/)) that can classify negative and positive comments. The Naïve Bayes Algorithm can be installed using jetpack repositories. The algorithm classifying feature-set results in the highest product of 1) the probability of that category to occur and 2) the product of all the features' probabilities to occur in that category. This is a so-called maximum posterior estimation. This process entails adding knowledge by telling the classifier, that these features belong to a specific category and using the gathered knowledge to classify unknown objects with their features. The classifier will return the category that the object most likely belongs to. The classifier will classify sentences (arrays of features) as sentences with either positive or negative sentiments.

To present the summarized result based on the evaluation of experts, the table below indicates the mean performance per criterion and its corresponding verbal interpretation.

Table 1. System Performance

Indicators	Average Mean	Verbal Interpretation (VI)
Functional Suitability	4.84	Very Acceptable
Reliability	4.83	Very Acceptable
Portability	4.79	Very Acceptable
Usability	4.79	Very Acceptable
Performance Efficiency	4.84	Very Acceptable
Security	4.75	Very Acceptable
Compatibility	4.78	Very Acceptable
Maintainability	4.81	Very Acceptable
Grand Mean	4.82	Very Acceptable

The table above indicates the summary of the evaluation from the respondents. As gleaned in the table, the respondents evaluated the system with a 4.82 numerical rating with an interpretation of very acceptable. As observed all criteria are rated very acceptable which indicates a high standard has been set in the development of the system. This means that the system is ready for deployment.

Conclusion

The overall rating of the respondents using the ISO/IEC 25010, or the Software Product Quality Model Criteria is 4.82 numerical rating with an interpretation of very acceptable. As

observed all criteria are rated very acceptable which indicates a high standard has been set in the development of the system. This means that the system is ready for deployment. In addition, the computed significant value using the ANOVA test explains that no significant difference was recorded in terms of the overall perception in evaluating the system when grouped according to the types of respondents.

Recommendation

After the initial findings and conclusion of the study, the following recommendations can be a reference for future researchers who

intend to develop a system that offers the same service and functionalities

1. Integration of the new algorithm in terms of sentiment analysis
2. Utilizing different algorithms in terms of pre-processing of data.
3. The report generation can be improved further
4. Additional system features which include faculty evaluation result forecasting using historical data.
5. System configurations can be improved to provide flexibility and be suited to the changing needs of academic institutions in terms of faculty evaluation.

References

- Aleamoni, Lawrence. (2015). How to Develop a Fair and Valid Comprehensive Faculty Evaluation System. *Psychology and Cognitive Sciences - Open Journal*. 1. 54-56. 10.17140/PCSOJ-1-108.
- Al-Khatib, A. (2014). Web-Based Teaching Evaluation Systems. *International Journal of Information Technology & Management Information System (Ijitmis)*
- Anido, C. Online Teaching Performance Evaluation System: A Tool for Quality Education. Retrieved from IIS.Org: <http://www.iiis.org/CDs2009/CD2009SCI/EISTA2009/PapersPdf/E573LV.pdf>
- Aung, Khin Zezawar; Myo, Nyein Nyein (2017). [IEEE 2017 IEEE/ACIS 16th International Conference on Computer and Information Science (ICIS) - Wuhan, China (2017.5.24-2017.5.26)] 2017 IEEE/ACIS 16th International Conference on Computer and Information Science (ICIS) - Sentiment analysis of students' comment using the lexicon-based approach. , (), 149-154. doi:10.1109/ICIS.2017.7959985
- B. Jagtap and V. Dhotre, "SVM & HMM-based hybrid approach of sentiment analysis for teacher feedback assessment," *International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)*, vol. 3, no. 3, pp. 229-232, 2014.
- Balahadia, Francis F.; Fernando, Ma. Corazon G.; Juanatas, Irish C. (2016). [IEEE 2016 IEEE Region 10 Symposium (TENSYP) - Bali, Indonesia (2016.5.9-2016.5.11)] 2016 IEEE Region 10 Symposium (TENSYP) - Teacher's performance evaluation tool using opinion mining with sentiment analysis. , (), 95-98. doi:10.1109/TEN-CONSpring.2016.7519384
- Boyko, N., & Boksho, K. (2020, November). Application of the Naive Bayesian Classifier in Work on Sentimental Analysis of Medical Data. In *IDDM* (pp. 230-239).
- García-Díaz, V., Espada, J. P., Crespo, R. G., Pelayo G-Bustelo, B. C., & Cueva Lovelle, J. M. (2018). An approach to improve the accuracy of probabilistic classifiers for decision support systems in sentiment analysis. *Applied Soft Computing*, 67, 822-833. doi:10.1016/j.asoc.2017.05.03
- Goel, Ankur; Gautam, Jyoti; Kumar, Sitesh (2016). [IEEE 2016 2nd International Conference on Next Generation Computing Technologies (NGCT) - Dehradun, India (2016.10.14-2016.10.16)] 2016 2nd International Conference on Next Generation Computing Technologies (NGCT) - Real-time sentiment analysis of tweets using Naive Bayes. , (), 257-261. doi:10.1109/NGCT.2016.7877424
- Irfan, M., Uriawan, W., Kurahman, O. T., Ramdhani, M. A., & Dahlia, I. A. (2018, November). Comparison of Naive Bayes and K-Nearest Neighbor methods to predict divorce issues. In *IOP Conference Series: Materials Science and Engineering* (Vol. 434, No. 1, p. 012047). IOP Publishing.
- J. Sang, H. Naeem (2015) . A Generic Feedback System for Better Evaluation of Teacher Performance.
- J.Ren, S.D. Lee, X.Chen, B.Kao, R.Cheng, D.Cheung, "Naive Bayes Classification of Uncertain Data", Ninth IEEE International Conference on Data Mining, 2009. *ICDM '09*, pp. 944 - 949
- Janpla, S., & Wanapiron, P. (2018). System framework for an intelligent question bank and examination system, 8, 488-494 [PDF file]. Retrieved from http://www.ijmlc.org/vol8/734-L0156.pdf?fbclid=IwAR0j1DZpL0EBmItjdZW-q9Ey_mMLmLj_IlpSXchGxPHpVhF7hpdGUGpwC3E

- Kumar, Alok & Jain, Renu. (2018). Faculty Evaluation System. *Procedia Computer Science*. 125. 533-541. 10.1016/j.procs.2017.12.069.
- Laguador J., Deigero, C. (2015). Students' Evaluation On The Teaching Performance Of Tourism And Hospitality Management Faculty Members. *Asian Journal of Educational Research* Vol. 3, No. 3, 2015 ISSN 2311-6080
- Malyal, M., Sudheshna, & Soniya, D. (2015). E-Learning: An approach to evaluate subjective questions for online examination system using data similarity: Research paper, 8(11), 1-5 [PDF File].
- Marucci-Wellman, H. R., Lehto, M. R., & Corns, H. L. (2015). A practical tool for public health surveillance: semi-automated coding of short injury narratives from large administrative databases using Naïve Bayes algorithms. *Accident Analysis & Prevention*, 84, 165-176.
- Mauricio, J.Q., Cagayan, K.B., Serrano, J.R., Balahadia, F.F. (2017). Centralized learning and assessment tool for the department of education – Division of Laguna's Araling Panlipunan Subjects, 1, 21-35 [PDF file].
- Nandini, V., & Maheswari, P.U. (2018). Automatic assessment of descriptive answers in an online examination system using semantic relational features. Retrieved from <https://link.springer.com/article/10.1007/s11227-018-2381-y?fbclid=IwAR2lDpqAhKNDYdh6TzsuxP9rKsrjkGVrMb-Av7OZVējuMBNSDI-s4oqL-FA>
- Pattekari, A. Parveen, a Prediction system for heart disease using Naïve Bayes, *Int. J. Adv. Comput. Math. Sci.* 3 (3) (2012) 290–294.
- Rahman, C. M., Farid, D. M., & Rahman, M. Z. (2011). Adaptive intrusion detection based on boosting and naïve Bayesian classifier.
- Rajput, Quratulain; Haider, Sajjad; Ghani, Sayeed (2016). Lexicon-Based Sentiment Analysis of Teachers' Evaluation. *Applied Computational Intelligence and Soft Computing*, 2016(), 1–12. doi:10.1155/2016/2385429
- Reyes, Vicente. (2017). Faculty Evaluation by Faculty. 10.13140/RG.2.2.30947.14882.
- Shaikh, Naim & Kumari, Sneha & Kasat, Kishori. (2018). Exploring E-Governance of Faculty Evaluation System: Using a Total Interpretive Structural Modeling Approach. *Journal of Cases on Information Technology*. 20. 36-47. 10.4018/JCIT.2018070103.
- Triayudi, A., & Widyarto, W. O. (2021, June). Comparison J48 and Naïve Bayes Methods in Educational Analysis. In *Journal of Physics: Conference Series* (Vol. 1933, No. 1, p. 012062). IOP Publishing.
- W. Medhat, A. Hassan, and H. Korashy, "Sentiment analysis algorithms and applications: a survey," *Ain Shams Engineering Journal*, vol. 5, no. 4, pp. 1093–1113, 2014. View at: Publisher Site | Google Scholar.
- Xia, X., & Yan, J. (2021). Construction of music teaching evaluation model based on weighted Naïve Bayes. *Scientific Programming*, 2021