World Conference on Computer and Information Technology

Berlin, Germany 11-12 Aug 2023

Sentiment Analysis of Students' Feedback on Faculty Online Teaching Performance using Machine Learning Techniques

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Abstract

The pandemic has caused difficulty and paved way to challenges in various areas including the educational institutions. Instruction delivery has been transformed from face to face to flexible learning that caused anxieties and distress to most role players including teachers, parents and students. Continuous spread of diseases causes face to face classes to remain not viable. Even if limited face to face classes will be allowed, online teaching is deemed to remain a practice to support instructional delivery to students. As such, learning the issues and problems being faced in online teaching especially by students is necessary to provide supervisors and administrators insights to help them plan on intervention measures to help their teachers deliver better online teaching performance for their students.

Sentiment Analysis has been an interesting and popular research area encouraging researchers and practitioners to adopt this tool in various fields such as the government, health care and education. In education, instruction evaluation is one of the activities that sentiment analysis has served. Though, it is a common practice that educational institutions periodically evaluate their teachers' performance, students' comments which are rich in insights are not easily taken into account because of lack of automated text analytics methods. In this study, supervised machine learning algorithms were used. Experiments were conducted to evaluate base models employing naïve bayes, support vector machines, logistic regression and random forest in comparison to ensemble combining the four. Machine learning techniques such as term-frequency – inverse document frequency (TF-IDF) and ngram were also explored to devise a model with the highest possible F1 score. Results show that ensemble of the four outperformed the base models. Ngram vectorization applied with

ensemble yielded highest F1 score as compared to count and tf-idf. Ngram vectorization applied with ensemble also obtained highest Cohen's Kappa and Matthews Correlation Coefficient (MCC) and lowest Cross-Entropy indicating that it is the preferred model in sentiment classification. Meanwhile, Count vectorization applied with ensemble yielded highest Cohen's Kappa and Matthews Correlation Coefficient (MCC) and lowest Cross Entropy Loss. Visualization techniques showed that 65.4% of the student responses were positively classified while 25.5% were negatively classified. On the other hand, 47% of the students responses were predicted to talk about instructional design/delivery, 45.3% described personality/behavior of teachers, 3.4% focused on use of technology, 2.9% on content and 1.5% on students assessment.

In future work the model with highest performance measures found can be embedded in a sentiment analysis tool for students' feedback on teaching performance. More advanced transformation techniques and other ensemble techniques may be explored to further improve performance in sentiment analysis.

Keywords: Ensemble, Ngram, TF-IDF, Vectorization