Abstract

The concept of Bloom’s taxonomy cognitive domain has been broadly used as a guideline in preparing a reasonable examination paper that consists of questions belonging to various cognitive levels which are helpful in evaluating different capabilities of students. Currently, academicians identify Bloom’s taxonomy cognitive level manually, but that is a tedious and a time-consuming task. Therefore, the use of automatic classification technique based on Bloom’s taxonomy cognitive levels is highly needed. Several studies have been carried out to fulfill this task, but most of these studies have failed to address the overlapping keyword problem among Bloom’s taxonomy cognitive levels, and most of these studies have not considered the semantic structure of the examination questions. To overcome these problems, this study proposes a question classification model using an ensemble classifier approach by combining four different classifiers; namely rule based, support vector machine, k-nearest neighbor and Naive Bayes. The results of four different classifiers are integrated to derive the final corresponding Bloom’s taxonomy cognitive level, using majority voting and WordNet similarity values. WordNet similarity is used to explore the semantic structure of the examination questions. A sample of
first year programming examination questions of University of Colombo School of Computing was used for the evaluation. Four domain experts confirmed identified Bloom’s taxonomy cognitive levels of the questions in the dataset. The experimental results indicate that the proposed ensemble classifier approach yields much better accuracy than the accuracy of the individual classifiers.

References


Index Terms

Computer Science

Information Sciences

Keywords

Bloom’s taxonomy, Ensemble Classifier, k-nearest neighbor, Naive Bayes, Natural Language Processing, Rule based, Support Vector Machine