

A Study of Comment Data Mining to Predict Student Performance

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論 文 内 容 の 要 旨

Predicting student performance (PSP) is an important task in the educational environment. To accomplish this objective, we would like to know whether students correctly solve a given set of problems (tasks) and to grasp their situations, tendencies and attitudes so that we can understand how the students learn. We would also like to provide simultaneous feedback which will help the students to become better at studying. This thesis introduces several approaches mainly based on comment data mining techniques for PSP and building understandable and interpretable prediction models

First, we formulate the current PSP problems and discuss the benefits of collecting comment data. For example, we introduce the problems concerning how to understand students' behaviors, attitudes and activities and discuss how students can express themselves by freely writing comments after every lesson. Furthermore, we demonstrate how to map these problems for rating the prediction and tool up feedback to the students.

Second, we propose several approaches that are employed to establish strong relations between words extracted from student comments and their grades.

Third, we introduce different comment formats and conduct several experiments to understand students' characteristics and the unique features of each group.

Fourth, because the predicted results may vary across several types of characteristics in lessons (e.g., the difficulty of the lesson subject, the student's learning attitude, and the approach to teaching), we propose various methods to record each student's learning situation based on multiple consecutive lessons and evaluate the reliability of the predicted results.

Fifth, to discover the characteristics of student performance data, we propose an attribute-based method that classifies students' comments into various attributes (e.g., attitudes (positive or negative), finding, cooperation, review of the lesson, understanding, and next activity plan) and assists in establishing a practical and understandable prediction model.

Sixth, a new approach based on Multiple Instance Learning (MIL) is proposed to address all available comment data of each student to more deeply understand his behavior and situations. The result is compared to the most popular techniques of traditional supervised learning based on each lesson.

Seventh, to improve the quality of student comments and thus the prediction results, we introduce Teacher Interventions (TIs) that are conducted during comment collection. We present our experience of collecting comment data from Arab students and discuss how to improve the quality of comment data and the effect of TIs.

Finally, we experimentally validate the proposed methods by comparing them with other baseline methods and empirically show that, in most cases, the proposed methods can improve the prediction results. Therefore, we conclude that our approaches represent reasonable choices in predicting student performance and note some open issues for future research in this area.