

Enhancing Grade Prediction via Course Attribute-Aware Student Similarity in Collaborative Filtering

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Abstract

Collaborative filtering has been used in predicting personalized students' grades in courses at higher educational institutions. The traditional collaborative filtering through student-to-student correlation is based on similarity between students with respect to their grades in all courses that they have taken. However, courses are not completely independent each other. Given a course, the grades of its prerequisite, corequisite and similar courses will affect the grade of the course more than the grades of other unrelated courses will.

We propose a course attribute-aware student-to-student collaborative filtering-based grade prediction method that incorporates course-relevant attributes such as prerequisite courses, corequisite courses and similar courses for enhanced grade prediction. To predict the grade of a target course C for a target student S , we identify all direct and indirect prerequisite and corequisite courses of C and compute two types of similarity values between C and other courses, i.e., a) the collaborative course-to-course-based similarity values via the Pearson correlation coefficient (PCC) and b) the semantic textual course content description-based similarity values via the Cosine similarity on the numeric vector representations of the course content descriptions via Doc2Vec. The course attribute-aware student similarity between S and other students for C is computed as a weighted similarity measure such as the Weighted Pearson correlation coefficient (WPCC) by assigning appropriate weights on each direct/indirect prerequisite course of C , each direct/indirect corequisite course of C , and each course based on two types of similarity values between C and the course. The weights can be adjustable and tuned for optimization.