

A Radial Basis Function Neural Network Prediction Model Based on Association Rules

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Abstract: As a rapidly growing field of learning analysis technology, learning prediction has been developed by many researchers from different angles and educational environments. Different prediction models have their own characteristics and have produced different results. However, each model has their limitations in adaptability and generalization. In this concept paper, we proposed a radial basis function neural network prediction model based on association rules. The predictors of the model are not pre-determined. They are selected by mining the items with a strong correlation between the predicted results.

Keywords: Prediction model, artificial neural network, association rules, learning analytics

1. Introduction

With the vigorous development of the Internet and computers, learning analysis technology is developing at a rapid pace. One important direction in learning analytics is to predict and intervene, which plays an important role in the process of learning and teaching. It can help teachers and educational institutions to provide students with prompt and responsive personalized learning strategies. Many different kinds of prediction models have their own characteristics and excellent results. However, there are limitations in adaptability and generalization. Therefore, this paper proposes an optimized radial basis function (RBF) neural network prediction model based on association rules to improve the adaptability and accuracy.

2. Literature Review

Recently, artificial neural network (ANN) is widely used in educational prediction because it has a strong nonlinear problem processing ability and nonlinear approximation performance, and can approach almost any nonlinear function.

Guo (2010) established a number of dynamic models to analyze and predict students' satisfaction with the curriculum. The methods used in the model included the ANN algorithm and the statistical analysis technology. Sarafraz et al. (2015) designed a scholarship allocation model to enable the school admission office to maximize student motivation. ANN is also

used to predict students' learning behavior. Kardan (2013) used artificial neural network to predict college students' behavior of online course selection. In terms of predicting students' academic performance, ANN has obvious advantages over other methods. Chen and Do (2014) studied the prediction ability of the two recent heuristic algorithms, cuckoo search and gravity search algorithm. However, existing work only aims at the prediction of a certain project and strictly controls the input and parameters of the model, which is the main obstacle to the application of the model.

3. RBF Neural Network Prediction Model

3.1 General Method for Designing a Learning Prediction Model

By analyzing the research literature, Figure 1 is a general method for designing a learning prediction model. Based on the experience accumulated from daily teaching and observation by education experts or first-line educators, we can decide whether the items can be included in the prediction of the results.

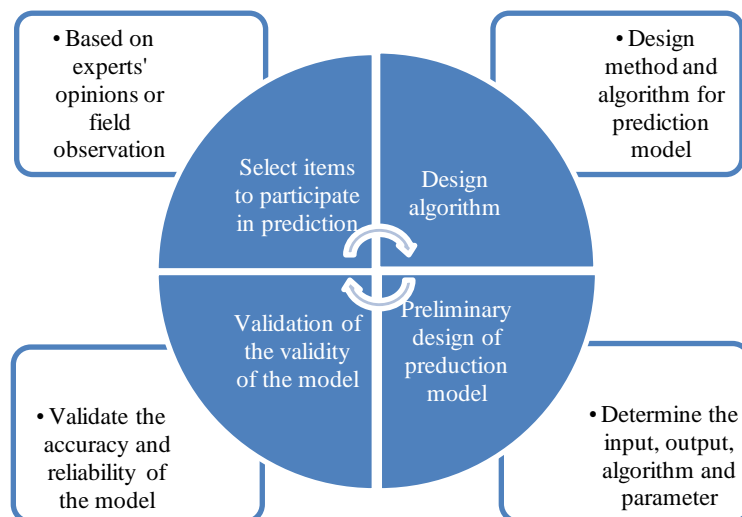


Figure 1. The general design method of a learning prediction model

This method is simple and quick, but its accuracy and reliability are not as high as it needs to be tested by experiments. If the experiment shows that the accuracy of the prediction is not ideal, then the impact factor should be selected again, or changed by addition or deletion, and a new prediction experiment will need to be carried out for verification. In this way, the efficiency of model design becomes much lower.

3.2 Prediction Model Based on Association Rules

This paper proposes a prediction model which is based on association rules. Figure 2 shows the design method of the proposed prediction model. The model presented in this study is different from the traditional ones. After selecting the related items based on expert analysis or field observation, it does not predict directly with these items. Instead, the association rules

between these items and the predicted results will be mined. The association rules, the data of support and confidence will also be known. Then, the items with a high correlation between the prediction results will be selected as the inputs for prediction. The accuracy of this selection method is higher, which greatly improves the efficiency of model design. The following figure is a specific model framework.

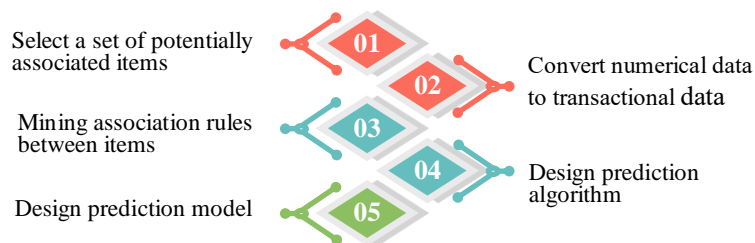


Figure2. Design method of the proposed prediction model based on association rules

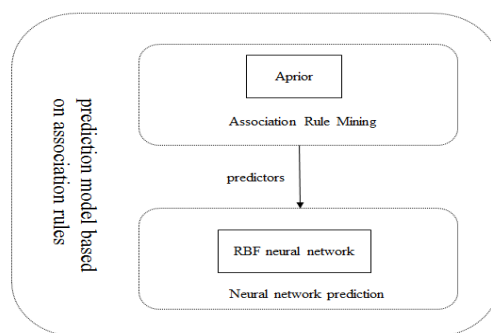


Figure3. Prediction model based on association rules

3 Conclusion and Future Work

After the analysis of the existing learning prediction models, a new RBF network model based on association rules mining is proposed. The predictors are selected by mining the items with strong correlation between the predicted results. The model can be adapted to different prediction problems for the inputs are not established. The model will be applied to the student learning management system to predict student achievement and learning behavior.

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