An Educational Funding Mechanism Based on Data Insight.

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- **Abstract:** In recent years, Big Data has become increasingly popular and the guidance of Big Data is required in many fields, including philanthropy. We construct a new return on investment (ROI) evaluation system for a charitable organization, using data mining methods to process data, using which we succeed in determining an optimal investment strategy for the Good grant Foundation. First, we operate on the data. We do data screening, deleting data with information less than a threshold and merging different attributes using linear fitting and principal components analysis (PCA). For the reserved attributes and schools that are kept, we do data imputation to fill in missing data, based on k-means clustering. Then we normalize all the data to make them comparable in the following analysis. Second, we construct an ROI evaluation criterion, which is a ratio of output and input multiplied by an adjustment coefficient, named "urgency." The ratio reflects the benefits related to the cost, while urgency reflects the demand for funding, an important factor considered by charitable organizations. We use PCA to select attributes, letting salary, educational quality, and some other aspects represent output, while tuition represents input and federal loan, debt, and some other factors represent urgency. Then we use the Analytical Hierarchy Process (AHP) to measure the importance of different factors and allocate weights. Third, we put forward two models: a basic model for one year, and a time series model for five years. Seeing the ROI as benefits from investment, we introduce the fluctuation of output as "risk," imitating the concept of modern portfolio theory in the financial sector to solve the problems. In the basic model, we apply a mixed integer linear programming (MILP) algorithm and succeed in finding 14 schools to invest in. Further, we model the time factor and improve the model into a time series model, using MILP and Grey prediction to determine the long-term investment strategy. Sixteen schools are chosen, with different time duration and different amounts of money. Finally, we do sensitivity analysis for our model, changing the number of schools, the funding restrictions, whether to allocate the money equally or not, and so on, to analyze the results and to find better parameters for ideal results. Our model is a feasible and reasonable model with technical and data support. Because of the subjectivity, this model can be used flexibly after data training.

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