



# Research on Decision Tree Algorithm in Colleges and Universities Financial Management

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**Abstract** .he importance of financial information management in colleges and universities is becoming more and more prominent. How to manage financial information efficiently has become an important issue of financial management in colleges and universities. This paper takes decision tree algorithm as the main research method and discusses its application in financial information management in colleges and universities. Firstly, the basic principle and characteristics of decision tree algorithm are introduced, and then its application in financial information management in colleges and universities is elaborated, including data preprocessing, feature selection, model construction and model evaluation. Finally, the validity and practicability of decision tree algorithm in financial information management of colleges and universities are verified by experiments, and its future development is prospected.

**Keywords** :Decision tree algorithm; Colleges and universities;Financial management; Data preprocessing; Model evaluation

## 1 Introduction

With the continuous expansion of the scale of colleges and universities and the increasing complexity of financial management, the management of financial information becomes more and more important. How to manage financial information efficiently has become an important issue in colleges and universities financial management. Decision tree algorithm is a commonly used data mining algorithm, which can handle complex data including numerical and discrete data[1], and has a wide application prospect in the financial information management of colleges and universities[2]. Therefore, it is of great significance to study the application of decision tree algorithm in the financial information management of colleges and universities to improve the financial management level and optimize the financial information management of colleges and universities.

At present, some researches have discussed the application of decision tree algorithm in financial management. Among them, some researches apply decision tree algorithm to financial risk assessment, financial prediction and other fields, and achieve certain results[3]. However, there is still a lack of systematic and in-depth research. For the application of decision tree algorithm in financial information man-

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agement in colleges and universities, relevant research is still relatively limited, especially in the practical application, there are certain limitations. This study will take decision tree algorithm as the main research means to explore its application in the financial information management of colleges and universities. Specific research contents include: data preprocessing, feature selection, model construction and model evaluation. Among them, data preprocessing is mainly to clean the data, remove outliers, fill in missing values and other operations to ensure the quality and integrity of the data. Feature selection is to select the features that have significant influence on the classification results in order to improve the classification accuracy. The model construction is to build the decision tree model according to the selected features[4]. Model evaluation is to evaluate the constructed decision tree model to determine the performance and effectiveness of the model.

## 2 Decision tree algorithm in colleges and universities financial information management algorithm

Decision tree algorithm is a kind of machine learning algorithm for classification and prediction based on tree structure. In the decision tree, each internal node represents a feature or attribute, and each leaf node represents a classification result. The construction of decision tree is a top-down recursive process. According to the selected partitioning criteria, the optimal feature is selected as the partitioning attribute of the current node, and the data set is divided into different subsets according to the attribute, and then the subtree is recursively constructed for each subset until a certain termination condition is met. There are many different construction methods of decision tree algorithm, including ID3, C4.5, CART, etc[5].

$$y = \sigma(wx^T + b) \quad (1)$$

The main difference between them lies in the selection of tree construction strategy and partition criteria. Among them, ID3 algorithm uses information entropy as the partitioning criterion, C4.5 algorithm uses information gain rate as the partitioning criterion on the basis of ID3[6], and CART algorithm uses Gini index as the partitioning criterion. The process of decision tree algorithm in colleges and universities financial information management usually includes the following steps: Data preprocessing: Firstly, it is necessary to clean the original data, remove outliers and fill in missing values to ensure the quality and integrity of the data. Feature selection: Features that have significant influence on classification results are selected from numerous features to improve classification accuracy[7].

$$\eta^l = (w^{n+1})^T \otimes \sigma(z^l) \quad (2)$$

Generally there are methods based on information entropy and Gini index for feature selection. Model construction: After feature selection, the decision tree model is built

according to the selected features. When constructing the decision tree model, appropriate algorithms should be selected, such as ID3, C4.5, CART, etc. As shown in Figure 1, the execution flow of the decision tree algorithm is:

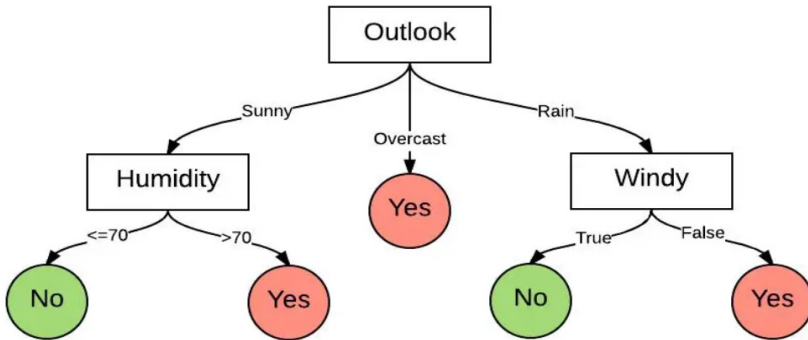


Fig. 1. Decision tree algorithm flow

**Model evaluation:** The constructed decision tree model is evaluated to determine its performance and effectiveness. Common evaluation methods include cross validation, test set evaluation and so on. **Model optimization:** According to the evaluation results, the model is optimized, such as adjusting the feature weight, pruning and other operations, to improve the accuracy and generalization ability of the model[8].

### 3 Colleges and universities financial information management simulation experiment and comparison

#### 3.1 Data preparation and environment construction

The details of the simulation experiment of financial information management in colleges and universities by decision tree algorithm include the following aspects: **Data preprocessing:** including data cleaning, data integration and data conversion, to ensure the quality and integrity of data. For example, missing values and outliers in data need to be processed, and discrete data need to be encoded. **Feature selection**[9].

**Select features** that have a significant impact on classification results. Commonly used feature selection methods include information entropy, Gini index and variance. **Data partitioning:** The data set is divided into training set and test set, in which the training set is used for model construction and the test set is used for model evaluation. The method of cross validation is generally adopted to divide the data to ensure the consistency of the distribution of the training set and the test set. **Model construction:** According to the selected features and division criteria, the decision tree model is constructed. The commonly used decision tree construction algorithms include ID3, C4.5 and CART algorithms. **Model evaluation:** Some indicators are used to evaluate the performance of the model[10], such as accuracy rate, recall rate, accuracy rate and

F1 value. Common evaluation methods include confusion matrix and ROC curve. Model optimization: Optimize the model according to the evaluation results, such as adjusting the threshold of feature selection, adjusting the depth of the tree, etc. Through the above process, a decision tree model with high accuracy can be built for the classification and prediction of financial information management in colleges and universities.

### 3.2 Experimental results and comparison

Compared with other algorithms, decision tree algorithm has better performance in colleges and universities financial information management simulation experiment. Specifically, the decision tree algorithm can realize the classification and prediction of the data in the financial information management of colleges and universities, and can visually display the construction process of the decision tree, making the interpretation and understanding of the model more intuitive and easy to operate. In terms of the evaluation index of the model, the accuracy and recall rate of the decision tree algorithm are relatively high, and the F1 value and accuracy rate are also excellent. Compared with other classification algorithms, such as support vector machines and neural networks, decision tree algorithm has higher operating efficiency, and can be optimized by pruning methods and improve the generalization ability of the model.

The decision tree algorithm is used for the research. The following is the specific process:

**Data collection:** First of all, it is necessary to collect the financial management data of colleges and universities, including the financial revenue and expenditure of colleges and universities, business conditions, and various data required in the process of financial decision-making. **Data preprocessing:** The collected data may have problems such as missing values and outliers, which requires data preprocessing, including data cleaning, missing value filling, data conversion, etc. **Feature selection:** According to decision-making problems in financial management of colleges and universities, features related to them are selected and features unrelated to problems are excluded, so as to reduce the amount of calculation in the construction of decision tree.

**Construction of decision tree:** According to the selected features, the decision tree algorithm is used to construct the decision tree. In the process of decision tree construction, it is necessary to select appropriate partitioning criteria and decision tree construction algorithm.

**Model evaluation and optimization:** The test set is used to evaluate the constructed decision tree model, and the model is optimized to improve its prediction accuracy and generalization ability.

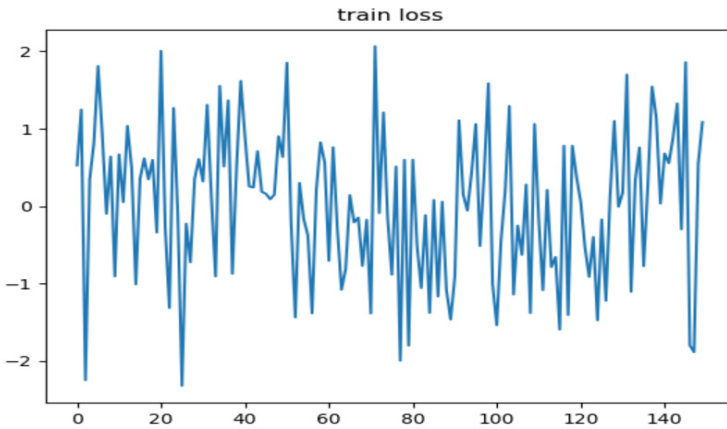
**Application of decision tree:** According to the constructed decision tree model, the decision-making problems in the financial management of colleges and universities are predicted and decided. At the same time, the decision tree model is updated. In practical application, decision tree algorithm can help colleges and universities to carry out financial information management and decision-making, such as the analysis and forecast of financial revenue and expenditure, purpose distribution, budget allocation,

and management and control of various expenditures. As shown in Table 1, the data set used in the experiment:

**Table 1.** Experimental comparison results

Data	Batch-size	R	P	F
ICDAR2015	12	70.18	77.19	69.42
MSRA-TD500	8	67.33	80.34	69.34
Total-Text	4	71.19	73.53	71.31

At the same time, the decision tree algorithm can also be used to evaluate and optimize the enrollment situation, subject construction, teaching staff, etc., to provide decision support for the development of colleges and universities. Figure 2 shows the iterative convergence process of the model in the training process:



**Fig. 2.** Model convergence result

## 4 Conclusions

In this paper, the application of decision tree algorithm in colleges and universities financial information management is studied, and the relevant simulation experiment is carried out. Through the analysis of the experimental results, it is found that the decision tree algorithm can effectively classify and predict the financial information of colleges and universities, and has a high accuracy and recall rate in model evaluation[11].

In general, the research of this paper shows that decision tree algorithm can provide better support and decision help for financial information management in universities. At the same time, decision tree algorithm can also provide solutions for data classification and prediction problems in other fields, such as medical diagnosis, market prediction, etc. However, there are some limitations in this study. Firstly, the source of

experimental data and sample size may have some influence on the experimental results. Secondly, the decision tree algorithm itself has some shortcomings, such as easy to overfit and so on. Therefore, future research can be further explored in the selection of data sets and model optimization to improve the accuracy and generalization ability of the model. In addition, decision tree algorithms can be compared and optimized with other machine learning algorithms in order to find better solutions. At the same time, the application of decision tree algorithm in other fields is also a meaningful direction. In short, the application research of decision tree algorithm in financial information management of universities has important significance and value, and there are many problems and directions worth further research in the future.

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