New Personal Tax Collection Management System Based on Artificial Intelligence and Its Application in the Middle Class

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Abstract. Personal income tax is a kind of tax that is generally collected by all countries in the world, and it is also one of the important sources of fiscal revenue in China. With the increasing diversity of people's income, there is a large tax gap under the same income. The purpose of this paper is to study the new personal tax collection management system based on artificial intelligence and its application in the middle class. This paper first introduces the meaning of personal income tax and the new content of the new personal income tax law, and studies the application of the new personal income tax collection system in the middle class. Then this paper studies the algorithm of SVM. Based on this theory, this paper designs and implements a new personal tax collection management system. The system is mainly divided into three functional modules: data source, risk identification, response and query statistics. In this paper, the performance of the system is tested, and the experimental results show that the system designed in this paper can meet the actual needs. When the number of concurrent transactions reaches 200, the average response time of the transaction does not exceed 3 seconds.

Keywords: Artificial Intelligence, New Personal Income Tax, Middle Class, Support Vector Machine, Applied Research

1. Introduction

On August 31, 2018, the fifth meeting of the Standing Committee of the 13th National People's Congress adopted the decision on Amending the individual income tax law. The contents of this revision include: in combination with the actual situation of the society, with the purpose of reducing the tax burden of the low-income level, establishing the comprehensive income of residents, improving the deduction standard of funds, adding special deductions, and adjusting the tax rate structure [1-2]. Under the constantly updated policy of personal income tax, the research field of personal income tax planning is facing new challenges [3].

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The leaders of various industries in China have begun to study the combination of their own industry and artificial intelligence technology, and more and more enterprises begin to use artificial intelligence on a large scale [4]. The era of using computers for information processing and electronation has passed. At present, the most valuable and great change is the analysis of data and the development of artificial intelligence [5]. Under the general trend of vigorously developing artificial intelligence management in all walks of life, the combination of tax and artificial intelligence is inevitable [6]. The national tax collection and management department must have the tax collection and management technology of all walks of life above the social average level, otherwise the tax collection and management supervision of some high-tech enterprises can not accurately judge the authenticity of the relevant tax related businesses of enterprises, which challenges the tax collection and management of China [7-8]. In the era of vigorously developing artificial intelligence in all industries, the national tax collection and management departments must keep up with the trend, and even use strong artificial intelligence technology to help themselves more efficiently supervise the market subjects, can the relevant costs of tax collection and management be reduced, as well as effectively supervise the relevant tax risks, and reduce the loss of national tax sources [9-10].

This paper first analyzes the new content of the new personal income tax law, and studies the application of the new personal income tax collection system in the middle class, then studies the algorithm content of support vector machine. Based on this theory, this paper designs and implements a new personal tax collection management system. By testing the performance of the system, the experimental results show that the system can meet the actual needs.

2. Method

2.1. New Income Tax and Middle Class

Personal income tax is a kind of tax that takes the income obtained by individuals as the tax object. Its function is gradually transformed from a single collection of fiscal revenue to a complementary regulation of fiscal revenue collection and income distribution. Now, there are two types of middle class in China. One is the level of professional manager, the other is the information centralized organization.

The relationship between the new tax and the middle class is as follows: first, the basic deduction is increased to 5000 yuan / month, and the original basic deduction is 3500 yuan / month. Reduced middle-class taxes. Second, six special deductions, including severe medical treatment, continuing education, children's education, housing rent, housing loans, and support for the elderly, reduced the burden on the middle class. Third, change the monthly comprehensive income into annual tax, including wage income, labor income, original income and patent fee. Fourth, the 7-level excess progressive tax rate (3% - 45%) of the low-income tax rate. Fifth, improve the tax collection and management system. The realization of taxpayer information sharing by relevant departments and tax authorities. Therefore, the tax authorities can track the source of the taxpayer's declaration information, at the same time, they can check the application of individual compliance with the credit information system, and jointly implement rewards or penalties. This protects the rights and interests of the middle class.

2.2. Support Vector Machine
SVM (support vector machine) is a kind of supervised learning algorithm, which can be used for classification or regression. Its essence is to find a hyperplane with the largest interval in the feature space.

Suppose \( p(x_1, x_2, \ldots, x_n) \) is one of the samples in the sample set, where \( x_i \) is the ith characteristic variable of the sample. Then the calculation equation of the distance \( d \) from the sample to the hyperplane is shown in formula (1):

\[
d = \frac{|w_1x_1 + w_2x_2 + \ldots + w_nx_n + b|}{\sqrt{w_1^2 + w_2^2 + \ldots + w_n^2}} = \frac{|W^T + b|}{\|W\|}
\]

Where \( \|W\| \) is the norm of hyperplane and the constant \( B \) is the intercept.

How to find the optimal hyperplane: if the hyperplane is determined, then all the support vectors can be found, and then the interval \( Z \) can be calculated. Each hyperplane corresponds to a \( Z \), so the problem of finding the optimal hyperplane becomes to find the maximum value of \( Z \). The objective function can be written as formula (2):

\[
\arg \max_{w,b} \left\{ \min_{x} (y(w^T x + b)) \frac{1}{\|W\|} \right\}
\]

3. Experiment

3.1. Data Collection

This paper takes desensitization user data set published by a company as the research sample. This user data set contains user data of more than 220 fields, including 80000 samples of training set and 20000 samples of test set. The main information is shown in Table 1.

| Variable               | Value |
|------------------------|-------|
| The amount of data     | \( n \) |
| The complexity         | \( y \) |
| Initial data set partition | \( m \) |
| The size of each small data set | \( n/m \) |

3.2. System Architecture

This system is divided into the following three functions: data source, risk identification, response and query statistics. The data source contains two components (Taxpayer initialization and risk indicator setting). Because these two components need to contain more content, we have added three and two
sub modules under these two components.

3.3. Test Indicators

The main performance indicators of the system include: throughput, service CPU utilization, transaction average response time. The content of performance test is to increase the concurrent number of system operation. Among them, throughput refers to the number of transactions per second. The average transaction response time means the saving time of the taxpayer declaration business system. Invoicing and declaration saving are each a transaction.

4. Discussion

4.1. Experimental Results

As can be seen from the test results in the table, when the number of concurrent servers is 200 after the first round of server configuration, the CPU utilization efficiency of servers, web servers and app servers reaches a stable level, and the average transaction response time does not increase significantly at this time. The test results show that the new personal tax management system runs well on the server and works smoothly. The test results are shown in Table 2 and figure 1.

| Concurrent number | Throughput | Server CPU utilization | Average transaction response time | APP CPU utilization | WEB CPU utilization |
|-------------------|------------|------------------------|----------------------------------|---------------------|---------------------|
| 200               | 52         | 38                     | 0.32                             | 41                  | 2.6                 |
| 150               | 50         | 26                     | 0.21                             | 40                  | 2.8                 |
| 100               | 47         | 21                     | 0.15                             | 30                  | 2.3                 |
| 50                | 19         | 7                      | 0.09                             | 10                  | 2.1                 |

Table 2. Test results
4.2. Suggestions on Improving the Efficiency of New Personal Income Tax

(1) Improve the collection and management system of personal income tax

First of all, it is necessary to further improve the tin system. First, it is necessary to expand the scope of the use of taxpayer's number and give full play to the statistical information of taxpayer's number. Specifically, the law can explicitly require the signing of contracts, the signing of contracts, the payment of social insurance premiums, the registration of real estate, the use of taxpayer identification number and other tax related information. Second, accelerate the integration of taxpayer number and existing social security number, effectively collect social security information and transfer it to the tax department.

Second, the third-party tax information provision system needs to be further improved. First of all, expand the scope of the third party providing tax related information, and clearly include the third party such as financial institutions, online trading platforms, payment platforms into the scope of the third party providing tax related information. Secondly, the law clearly stipulates the legal responsibility that the third party should perform according to the obligation of providing tax related information, which improves the binding force of the system.

Third, establish a relatively complete third-party tax related information and data sharing platform, so that the third party can timely forward the tax related information to the tax authorities. Ensure the information security and privacy protection of taxpayers, and specify the time limit and form of information sent by the third party. Finally, it is necessary to further improve the tax control system for natural persons. On the one hand, we should explore the establishment of a taxpayer credit information database for natural persons and improve the taxpayer credit files for natural persons. On the other hand, in order to make regulations on the objectives, implementation methods, disciplinary and incentive measures and the implementation units of Joint Disciplinary awards, detailed rules need to be published as much as possible. According to the laws and regulations, taxpayers are divided into different grades, and various countermeasures are implemented for different grades of taxpayers.

(2) Perfect the information system of personal tax collection and management

First, at the national level, we need to further optimize the collection and management information system and accelerate the full sharing of information within the tax system. By optimizing the system, the local taxation departments can not only query the information about individual income tax in the taxation and management information system under their jurisdiction, but also fully grasp the income of taxpayers in other regions. Second, the third-party tax related information sharing platform needs to be established as soon as possible. The establishment of the third party tax related information sharing platform provides convenient conditions for the third party to provide tax related information, and also facilitates the management of tax authorities. Third, we will continue to improve the tax management system for natural persons and provide a safe and efficient system for taxpayers to declare and pay taxes and withholding agents. Finally, we should strengthen the tax collection and administration by using big data, “Internet+” and other technical means, and improve the ability of the tax authorities to examine the reliability and accuracy of taxpayers and tax deduction declarations.
5. Conclusion

In general, the implementation of the new individual income tax law reduces the comprehensive tax rate of the individual income tax, making the design of the tax system more complex. Because low tax rate and strict tax collection and management are more equitable tax system arrangements, at the same time, when the tax system design is more complex, if the tax collection and management can not keep up, it may cause tax loopholes, not conducive to the protection of income, but also damage fairness. Therefore, in order to adapt to the implementation of the new individual income tax law, the efficiency of individual income tax collection and management should also be improved objectively. Generally speaking, the application of artificial intelligence technology will play an important role in tax risk management. The application of artificial intelligence technology in tax risk analysis can play an important role in discovering abnormal business behaviors. The analysis of individual income tax management is not limited to the previous work mode. It needs to better apply artificial intelligence technology. In the near future, artificial intelligence technology will bring irreplaceable advantages to tax risk analysis and promote the healthy development of the financial sector.

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