

Research on Social Stability Risk Assessment Method

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Abstract. The social stability risk assessment system of major decisions projects will directly affect the evaluation results. Therefore, the design of evaluation model is a problem to be considered comprehensively, and a scientific and reasonable evaluation index system is the premise of objective and accurate evaluation of social stability risk. In this paper, the evaluation model is proposed based on learning strategy. Firstly, we use a dimensionality reduction method based on labeled information and unlabeled information to extract effective evaluation information. Then we use support vector machine to get the evaluation result of social stability risk.

Keywords: Social Stability Risk; Machine Learning; Dimensionality reduction; Support Vector Machines.

1. Introduction

Our country has achieved remarkable results in economic development, but with social transformation and institutional transition, the contradictions in various fields of society have become increasingly prominent, and various social risk factors have been increasing. Especially in recent years, mass incidents caused by land acquisition and demolition, environmental pollution, safe production, food safety, and judicial injustice have frequently occurred. When the interests of the losers are not responded, they will initiate rights activists to major decision-making responsibilities, resist or even undermine major decision-making, and cause instability such as public opinion pressure and social disorder. Economic risks, security risks, environmental risks, and social stability risks are all negative social impacts caused by major decisions, and all three will eventually erupt in the form of social stability risks.

The risk of social stability refers to the accumulation of risk factors in the process of social development to a certain extent, leads to the disorder of the social system and the disharmony of the social environment, which in turn leads to a possibility of social conflict. Since major decisions involve the adjustment of stakeholder interests, they are more sensitive to the impact of interests. Therefore, among all types of social risks in major decisions, social stability risks are the highest level of social risk types. Especially compared with the general technical risk, the social stability risk is not only constructive, but also has uncertain properties. That is, the social stability risk is a secondary, comprehensive, social risk, and the factors that trigger it are diverse. It is the scientific uncertainty of the major decision-making itself, or it may be caused by the ignorance of the stakeholders, or it may be the distrust of the government, especially its relationship with the risk perception of the stakeholders.

2. Related Work

There is a lack of public participation in major decision-making processes. Public participation in the public decision-making process can effectively express their own needs, preferences and interests, resolve social stability risk factors, and prevent social conflicts. When local governments exclude public participation in public decision-making, public decision-making cannot fully reflect the public's interests, the public will be dissatisfied with or even fight against the outcome of the decision. Therefore, local governments can effectively prevent the occurrence of mass incidents only by changing the concept of public decision-making, smoothing the channels of public participation, and fully absorbing public opinion in the process of public decision-making.

So many scholars believe that it is necessary to establish a social stability risk assessment system for major decision projects, in which we can use modern science analysis methods to predict the possible impact of decision projects. According to the predicted results, the relevant departments can adjust the corresponding risk response plan. Specifically, scholar believes that the key to build an effective social stability risk assessment system for major decision-making projects is to design reasonable evaluation indicators. At the same time, the design of the index must consider the legitimacy, rationality, feasibility and controllability of the risk assessment system. Scholar constructed a social stability risk assessment system with the external environment based on the project itself and organically integrate development environment. Some scholar constructed a stakeholder oriented risk assessment model, in which we can effectively correct the adverse tendencies of valuing the past [1-5].

These methods are subjective and the accuracy is not very high, which can not reflect index important degree reasonable, and easily lead to a distortion results for the risk assessment. The analytic hierarchy process combines the advantages of qualitative and quantitative analysis, and transforms complex problems into relatively simple hierarchical problems, which is suitable for projects with more risk factors and strong levels. This method has higher comprehensive requirements for experts, and has strong dependence on consistency test results [6-9]. In the evaluation method, we generally treat each index numerically, and then use a variety of mathematical methods to make the assessment results in quantitative form.

3. Extract Effective Index Characteristics

Each risk assessment index has a certain correlation, which will lead to the overlap of input information, and reduce the accuracy of risk assessment model. The commonly used principal component analysis method maintains some structural information of data in the process of dimensionality reduction, which ignore the class information. In fact this information can often provide reference for this assessment. In the process of actual risk assessment, in order to reflect the fairness principle of evaluation, we need not only to compare the evaluation indicators with the known data over the years, but also to make a horizontal comparison with other unknown data. In this paper, we propose a semi supervised dimensionality reduction method based on labeled information and unlabeled information, and use this method to extract effective evaluation indicators for the final risk assessment [10-11]. The general form of linear dimensionality reduction as follows:

Given a set

$$X = \{x_1, x_2, \dots, x_n\}, x_i \in R^D \quad (1)$$

Find a transformation matrix A that maps the n points into another set

$$Y = A^T X \quad (2)$$

By using the semi-supervised dimensionality reduction method in the field of pattern recognition, the essential features of social stability risk assessment can be extracted. Suppose there are m labeled samples and n unlabeled sample, the goal of semi-supervised dimensionality reduction is find the matrix. The term Q_u is defined to describe as

$$Q_u = \sum_{i,j} (a^T x_i - a^T x_j)^2 W_{ij}^u = 2a^T X (D^u - W^u) X^T a \quad (3)$$

$$W_{ij}^u = \begin{cases} 1 & \text{if } x_i \in kNN(x_j) \text{ or } x_j \in kNN(x_i) \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

The term Q_c is defined to describe as

$$Q_c = \sum_{i,j} (a^T x_i - a^T x_j)^2 W_{ij}^u = 2a^T X(D^c - W^c)X^T a \quad (5)$$

$$W_{ij}^c = \begin{cases} 1 & \text{if } z_i = z_j \\ 0 & \text{otherwise} \end{cases} \quad (6)$$

Firstly, we can solve the following generalized eigenvalues problem:

$$X(L^c + \alpha L^u)X^T a = \lambda X(D^c + \alpha D^u)X^T a \quad (7)$$

Let the column vectors a_1, a_2, \dots, a_d be the solutions, ordered according to their eigenvalue $\lambda_1, \lambda_2, \dots, \lambda_d$. Thus, the embedding of locality preserving projections is as follows:

$$x_i \rightarrow y_i = A^T x_i, A = [a_1, a_2, \dots, a_d] \quad (8)$$

4. Experiments

In order to verify the classification effectiveness of social stability risk assessment model, the risk assessment model of social stability is constructed with support vector machines model [12], and the effective index features extracted in the earlier stage are input into the evaluation model. The output of the evaluation model is based on the evaluation results of experts, and the knowledge and experience of experts are continuously learned through learning algorithm. In this paper, the social stability risk assessment indicators mainly include economic environment, ecological environment, political environment, values and social public opinion and other functional modules, and each function module also contains several indicators. In the process of social stability risk assessment, the selection of support vector machine kernels is very important. Different kernels get different results of social stability risk assessment. This paper uses several commonly used kernels to test the performance. At the same time, in order to verify the effectiveness of the above feature reduction extraction methods, the principal component analysis method is used to carry out comparative experiments, and the results are shown in Fig.1.

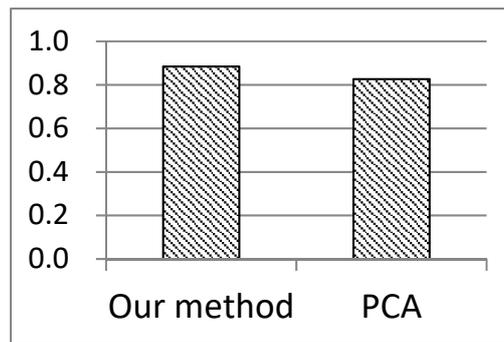


Figure 1. The accuracy of two methods

The accuracy of social stability risk assessment based on principal component analysis method is lower than that of this method, because too many social stability risk assessment indicators exist, and they interfere with each other, which has a certain negative impact on the evaluation results. This model can extract effective information to describe the characteristics of social stability risk through dimensionality reduction method, so it is necessary to use this model to extract effective information to describe the characteristics of social stability risk. Better results of social stability risk assessment were obtained. At the same time, through comparison, it is found that different kernel functions have a certain impact on the evaluation results, and RBF function has the best performance. There are many evaluation indicators, which interact with each other and have a certain degree of repetition. As a result, the relationship between teaching quality grade and index is complex and non-linear. Therefore, dimensionality reduction method is a good choice.

5. Conclusion

Social stability risk assessment is a multi-factor complex system. This paper presents a risk assessment model for social stability based on machine learning theory. Through learning theory, a risk assessment model of social stability with the best parameters is constructed. Experts only need to evaluate the typical samples comprehensively, and does not need to set the weight of each evaluation index manually. It avoids the influence of subjective factors to the greatest extent, ensures that the assessment results can truly reflect the social stability risk level of major decision-making projects, and is conducive to improving the risk assessment conclusion. In the process of social stability risk assessment, the parameters of support vector machine have a certain impact on the evaluation results. How to determine the most appropriate parameters needs further study and discussion. The authenticity of the results, further research work is to cooperate with relevant units to verify the actual effect of social stability risk assessment model and constantly revise it.

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