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University reputation crisis warning research on the new media environment by the use of BP neural network

Jianhong Miao*, Junwen Feng, Liulu Zhou, Ziran Xia
School of Economics & Management, Nanjing University of Sci&Tech, Nanjing
210094, (CHINA)
E-mail : 21478888@sina.com

ABSTRACT

With the deepening of social change and the rapid development of information and communication industries, the social environment is becoming more and more complex, which not only brings some opportunities but also some uncertain factors at the same time. And these uncertain factors can lead to the crisis, and disrupt the university reputation. To reduce the harm the crisis brings, we should focus on the construction of crisis warning system, so that we can spend a small amount of money to prevent, rather than spend a lot of money to treat. Based on the existing literature, this paper tries to utilize the data mining techniques to study how to prevent the university crises on the new media environment by the use of BP neural network method, and thus explore the establishment of universities crisis warning system.

KEYWORDS

BP neural network; Universities crisis; The crisis warning.



INTRODUCTION

With the further reformation of society and rapid development of information communications industries, micro-blog and other new medias popularize in crowd by virtue of immediacy, interactivity and broad influence. Social scientists generally convince that the social environment is increasingly complex with full of potential crises. At present, China is in a critical period of social transformation and upgrading, and the rapid development of society and the changes make colleges and universities' external environment has become increasingly complex. Besides, the transformation and upgrading of education and social reform organic add more uncertainty to the construction development and daily management of domestic universities. Colleges and universities are a gathering place for young students, and they are group of sensitive, passionate, impulsive paying full attention to the society and the pursuit of ideals. They are the main force network groups, and the promoter of new media age. According to "The 32nd China Internet Network Development Statistics Report" released by China Internet Network Information Center (CNNIC), by the end of June 2013, the scale of China's Internet users reached to 591 million, of which student groups are the largest occupational group users with the total ratio of 26.8%^[1]. The special nature of the university student body determines that the university campus is prone places all kinds of crisis^[2]. Many social problems such as unemployment, social contact, poverty and other phenomena are reflected to student groups, making some students' psychological pressure too much stress to resolve, and ultimately lead to a crisis.

The appearance of Chinese universities crises is inevitable for the rapid development of Chinese society, the economy and higher education itself. We recognize that colleges and universities not only pay attention to students' daily lives and learning management, but also guard against all kinds of crises and formulate effective solutions. Based on this, prevent and respond to crises have become important issues for colleges and universities administrators. This paper adopts the BP neural network method to explore the establishment of universities crisis early warning system, so as to provide timely warning information, and achieve ahead feedback information, then colleges and universities are able to promptly arrange to face the crisis, and lay risk prevention foundation in the first place.

LITERATURE REREVIEW

Literature review of reputation crisis warning

According to current status of research, the research on reputation or credibility crisis is unfolding around the crisis of corporate, that is profit organization, or on universities preventive crisis management system. However, there are few of documents of this two. At present, almost no attention has been paid to the reputation of crisis management of universities and other nonprofit organizations in the field of reputation crisis warning, and the literature of this field is blank.

The first time of the study of public crisis early warning can be traced back to the World War II, in which the effectiveness of the military early warning theory still has considerable reference value in today. Countries then launched a number of extensive, in-depth researches on social phenomena to meet social problems that may arise during the war. After World War II, Western academic study of the crisis management has been deepened, and research tentacles gradually spread to the crisis early warning.

Li Ming, Zhou Xuming, Ye Zhenbin^[3] discussed the basic concepts from the crisis, stability and early warning, they pointed that the predictive of sudden crises can be divided into four types, and proposed the quantitative prediction model using fuzzy mathematical methods, eliminating subjective and arbitrary, so as to make an accurate and reasonable crisis judgment^[3].

Zhang Jing^[4] took crisis management theory as the theoretical tools, established prevention system and part of a working model of prevention aiming at the existing problems in university crisis prevention and with the use of cases for empirical analysis, ultimately arrived at The prevention system of crisis management of sound module^[4].

Wang Zhuokai^[5] proposed from his own experience that building a crisis early warning system is a key ring in crisis management colleges. He also make full use of data mining, mobile Internet and other technical means to obtain information, and deepen the university crisis management early warning system, through real-time, dynamic warning, to minimize the likelihood of crises^[5].

It is undeniable that college crisis management researches, especially how to accurately and efficiently perform early warning universities before the crisis are a very important link. For any organization, crises are inevitable. When the bigger size of the organization, the more complex the structure of organization, and the more potential crisis. How to avoid a crisis? The most important thing is to establish a sense of crisis, and prepare in advance. Of course, preparation does not means putting an end to the crisis, but when danger strikes, it can turn the danger considered by others into their own development and growth opportunities. Since the crisis is inevitable, what we need to do is prepare, prepare, then prepare, and try our best to predict a crisis, and do well in advance in prevention measures, then beat it before the crisis. Besides, we can get positive public support.

Classification of university's reputation crisis

Although the university's reputation crisis varies because of its formation reasons, it can still be classified according to certain criteria. In the university's reputation crisis classification, the paper refers to Gao Pingping^[6], who compiled the university emergency management and case analysis. According to the book on the classification of universities crisis, it can be divided into six categories in order to have targeted response and crisis management for colleges and universities.

First is natural disasters crisis, which is natural disasters taking place in the university resident, and then threaten universities. While university population is density, once the location of colleges and universities occur natural disasters, it is inevitable a serious impact on student life and university teaching order, which launch a test of the effectiveness of the emergency management system in colleges and universities.

Second is accidents, disasters crisis, a crisis event in the college occurring all kinds of accidents and disasters, mainly including fires, traffic accidents, public facilities and equipment accident, public services fault accidents and safety incidents around the campus. On April 30, 2013, in an abandoned laboratory of Nanjing University XX, there was a sudden explosion, causing houses collapse, and affecting nearby residential area. This incident caused one death and three people injured. The incident was not only caused serious casualties and property losses, but the school 's reputation also adversely affected.

Third is public health crisis. it is the sudden onset of the major infectious diseases cause or may cause serious damage to university teachers and health, mass unexplained diseases, food poisoning and other serious incidents affecting the health of students and teachers. According to Health Ministry statistics, in 2012 China reported a total of 35 students of food poisoning events and 2754 persons were poisoned, four people dead. The number of students food poisoning report, the number of persons being poisoned and deaths accounting for the annual total are 20.1%, 41.2% and 2.7 %m respectively^[7].

Fourth is university security crisis, which is emergencies that the safety of teachers and students is infringed and the normal order of the school is destroyed, including two types: campus crime, campus terrorist attacks. In recent years, the Dutch act events and hurt others cases have occurred from time to time in colleges and universities. And the students feeling out of control and feelings of hunger become the dominant factor in crime in such event. The case of Ma Jiajue of Yunnan University in 2004 and the case of Yao Jiabin in 2010 and other cases have a serious adverse impact on the reputation of colleges and universities.

Fifth is university population crisis, which is the student collective illegal rallies, petitions, marches, demonstrations, collective strike meal, strikes, petitions, rioted and other events. Such type of crisis an be divided into two kinds: political and interests events. Due to internal university student groups concerning about social issues, they are passionate and impulse. And in the event of a group

classes crisis of directivity consistent, strong linkage capabilities can easily lead to worsen and induce crisis.

Sixth is university management crisis, mainly referring to the daily management of crisis events in the university, such as student fighting events, faculty credibility crisis events.

Classifications of university crisis are not over unrelated, and intersect and influence each other, and certain types of crisis and other crises may occur simultaneously, and also may lead to secondary events or alternative derivative event^[8]. This article will follow the above categories, calculates the incidence of various types of university crisis, and adopts BP neural network technology to predict college crisis management.

BP NEURAL NETWORK METHOD

BP (Back Propagation) neural network is a commonly used artificial neural networks, and its learning rule is to use the steepest descent method, through the back-propagation network to continuously adjust the weights and thresholds, so that network can be the minimum square error^[9]. Shown in Figure 1, BP neural network consists of input layer, hidden layer and output layer. Hidden layer can contain multiple layers, and adding additional layer increases the complexity of network computing.

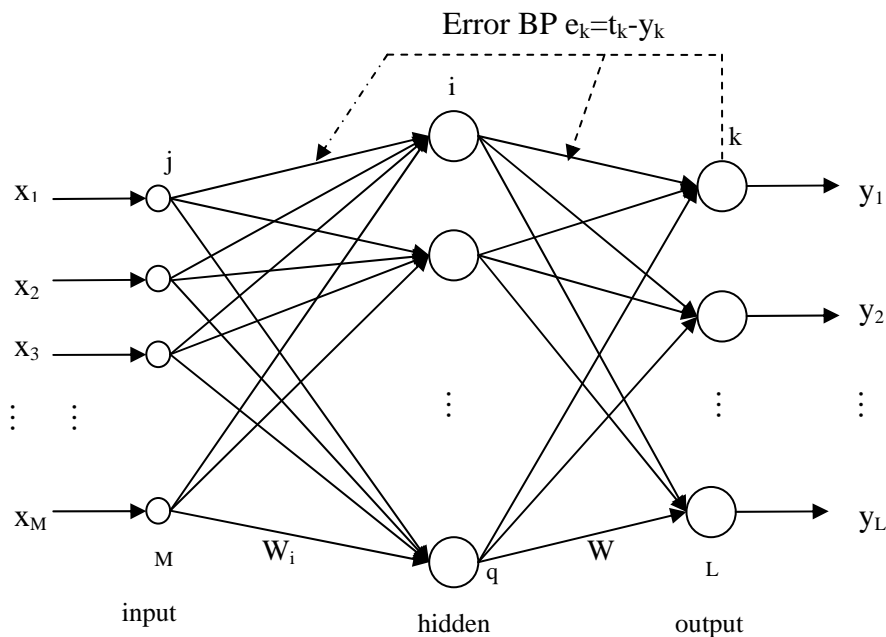


Figure 1 : BP neural network structure

BP neural network information transform from the input layer to the output layer, which is a feedforward neural network, and the transfer function is a nonlinear function. The most commonly used functions are logsig and tansig, and there is also a linear function of the output layer (purelin).

BP neural network feasibility analysis

The features of BP neural network gives it a certain advantage in crisis early warning applications. University reputation crisis occurs with a certain fuzziness, randomness and uncertainty. It is non-linear relationship between input and output, and artificial neural network is a strong ability to handle non-linear, highly adaptive learning system, and has strong fault tolerance, and it can find the law

through learning from a lot of complex data. Specifically, BP neural network model has the following characteristics^[10]:

(1) Information distributed storage: when BP neural network simulates of the human brain stores information, it use changes in synaptic efficacy to adjust the stored content, so that the information in the form of connection weights distributes throughout the network.

(2) Information parallel processing: parallel processing system makes it possible to do quick judgments, decisions and deal with the many problems, greatly improving the energy and the processing speed of the network.

(3) fault tolerant : BP neural network height connectivity means that a small number of errors may not result serious consequences, and some neuronal damage does not destroy the whole, so that it can automatically correct errors.

(4) self-learning, self-organizing, adaptive capacity: BP neural network has initially adaptive and self-organizing capacity. It can extract regularity of knowledge from the input and the output data, recall the network weights with continuous learning to improving their capabilities, and it has the ability of using this group weights in the general situation.

BP neural network specializes in function approximation, pattern recognition, classification and solving data compression problem. From the mapping relationship between crisis indicators and warning degree, reputation crisis early warning is a function approximation process. If the BP neural network is used in universities reputation crisis warning, it has higher precision and better science and objectivity, then it can provide a good guide for colleges and universities reputation crisis early warning and prevention.

APPLICATION OF REPUTATION CRISIS EARLY WARINING

This paper is aiming at colleges and universities reputation crisis early warning. This paper conducted previous visits, interviews and research, and selected the number of crisis occurred in Nanjing University XX between 2003-2012 as the survey data, using Matlab software based on BP neural network algorithm to make early warning analysis of the six crisis' impact on the reputation of universities, which is a new method of exploring the reputation of colleges and universities reputation crisis early warning.

This paper uses the version of MATLAB2009a, with a neural network toolbox. The toolbox provides a series of multiple neural network initialization, design, training, simulation function, and we programmed through this toolbox.

Data description

Counts the number of six kinds of crises occurring each year in one college in Nanjing in the years 2003-2012. The situation as shown in the following table:

TABLE 1 : One university in nanjing in nanjing, six types of crises statistics from 2003 to 2012

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
natural disasters crisis	0	0	0	0	0	1	0	0	0	0
accidents, disasters crisis	1	1	2	1	1	1	2	3	1	1
public health crisis	0	0	0	0	0	0	0	0	0	0
university security crisis	1	2	11	5	7	10	8	26	38	33
university population crisis	0	1	0	1	0	0	0	2	2	1
university management crisis	2	2	2	4	3	4	4	9	7	8

This paper uses the As used the number of six kinds of crises affecting the reputation of the university occurring each year in one college in Nanjing in 2003-2012 as a training set. That is to say, the paper takes the number of six crisis affecting the reputation of the university occurring in 2003-2012 as a training input; he number of six crisis affecting the reputation of the university occurring in 2011 as a training output. Simultaneously, it also uses the number of six kinds of crises affecting the reputation of the university occurring in 2004-2012 as a test set. Namely, the paper takes the number of six crisis affecting the reputation of the university occurring in 2004-2012 as a training input; he number of six crisis affecting the reputation of the university occurring in 2012 as a training output.

The construction of early warning model

This paper is based on the number of six kinds of crises affecting the reputation of the university occurring in one college in Nanjing in 2003-2012 to determine the input variables of the number of occurrences of the crisis in the eight consecutive year, so that the input layer neurons is 8; and output variables is the number of occurrences of the crisis in the first nine years, so the output neuron layer is 1.

In the establishment of the BP neural network, in order to reduce the number of errors, the hidden layers can be increased, but it also makes the network more complex. In general, the more the number of hidden layers, the slower the speed of neural network learning. And by increasing the number of neurons in the hidden layer can also get a lower error, and the training effect is easier to implement than the increase of the number of hidden layers. Thus, in the early warning model in this article, we select one BP neural network with only three hidden layers, and determine the number of hidden layer neurons in accordance with the following formula^[11]:

$$N = \sqrt{m + n} + a$$

Wherein m is the number of input neurons, n is the number of output layer neuron, and a is a constant between 1 to 10.

TABLE 2 : Training parameters of this article

The Hidden layer transfer function	tansig
The output layer transfer function	Purelin
Training function	Traingdx
Learn Property	Learngdm
The maximum number of training	net.trainParam.epochs=20000
The Target error	net.trainParam.goal=0.05
Interval Display	net.trainParam.show=500
Network Learning Rate	net.trainParam.lr=0.05

BP neural network prediction of MATLAB

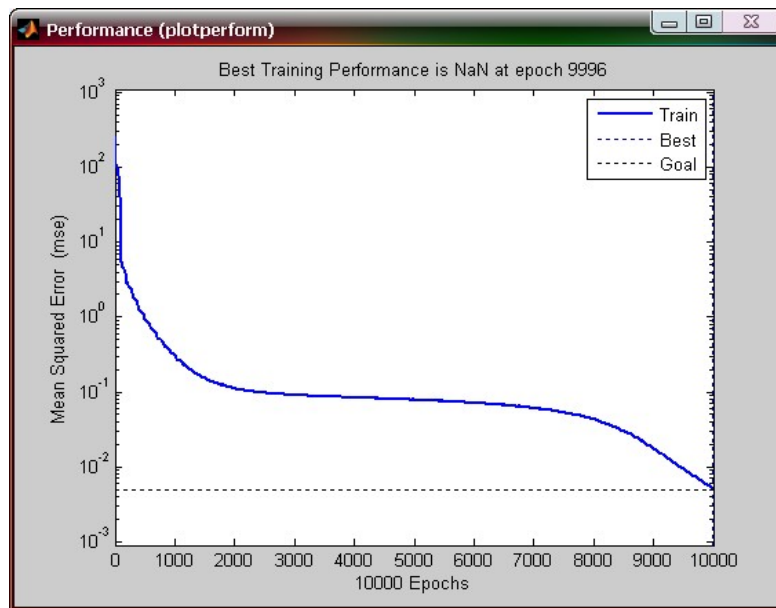


Figure 2 : BP neural network training convergence

As shown in Figure 2, when the network learning iterates to 9996 times, the accuracy of their learning reaches to objectives, and BP neural network appears convergence, then the training is success. We save this network and using 2004-2011 data samples for testing, and ultimately get the predicted results

This paper compares the number of occurrences various types crisis affecting the reputation of colleges and universities in 2012 with the number of actual occurrence. It can be found that the predicted values of natural disasters, accidents, disasters crisis public, health crisis and university population crisis are more consistent with the actual figures. While, the regulation of occurrence of university security crisis and university management crisis is hard to trace with large errors. The experimental results shows that BP neural network has a certain of effectiveness when it is used to predict regularity crisis of natural disasters, accidents, disasters, public health and group events. With respect to sudden human security and management crisis universities prediction, error exists for the following reasons:

(1) Natural disasters, accidents, disasters and public health events have a certain regularity, and their existence and occurrence is out of man's subjective will, which is the natural evolution of social events and inherent in the development process, so its occurrence can be predicted by the occurrence of the previous years;

(2) College group class crisis caused mainly by groups of students gathered, and such incidents usually occur with the hot social events closely with a certain regularity, and because such an event initiated by the group, rather than individuals, therefore its development of a certain group behavior law, and can have rules to follow in prediction.

(3) University security crisis and university management crisis with great personal nature, are mostly caused by human factors, and are highly correlated with the quality of the university students and university administrators. There is uncertainty, so it is difficult to form the law in the forecast.

TABLE 3 : The number of all kinds of in 2012

Types of crisis	All kinds of actual occurrence times of crisis in 2012	The prediction	All kinds of crisis Prediction of occurrence in 2012(rounded off)
natural disasters crisis	0	0.1557	0
accidents, disasters crisis	1	1.1201	1
public health crisis	0	-0.0723	0
university security crisis	33	37.9418	37

university population crisis	1	1.1220	1
university management crisis	8	1.1198	1

CONCLUSIONS

This paper analyzes on the basis of colleges and universities' reputation crisis theory, takes the number of crisis occurred in 2004-2012 in one university in Nanjing as the sample, using BP neural network to predict crises. The results shows that the designed BP neural network has some ability to adapt to the crisis early warning mechanism of reputation of colleges and universities. Specific conclusions are as follows:

(1) This article's early warning systems has Prediction of high efficiency for natural disasters, accidents, disasters crisis public, health crisis and university population crisis, and is an effective forecasting method, while for university security crisis and university management crisis, these two is more biased subjective will of man-made crisis with relatively low accuracy in forecast.

(2) This differences arises because some crisis is inevitable. For example, facing such crisis as natural disasters, the major prepared work of colleges and universities is to deal promptly and effectively treated, improve the follow-up public relations, thereby improve the reputation of universities; and some crisis can be effectively controlled through a comprehensive and effective preventive measures and management mechanisms, such as accidents, disasters crisis public, health crisis and university population crisis. The university should do regular inspections of facilities, establish a sound and reasonable rules and regulations to improve the safety management awareness, make clear lines of responsibility, which means responsibility refers to one people, so there is no opportunity to develop a crisis; while for university security crisis and university management crisis, colleges and universities should pay attention to personal qualities when selecting appraisal management personnel, do good job in students work, establish and improve psychological counseling agencies and enhance students' psychological counseling, and provide places and methods for students psychological counseling to improve students' resiliency and self-regulation.

It is thus clear that with the development of computer networks and the socio-economy and politics, colleges and universities, as an integral part of social organization gathering crowd, has a lot of potential pitfalls crisis. It is especially important to know how to effectively predict and control potential crises. Based on the literature study, this paper mixtures BP neural network into crisis early warning systems in an innovative way, and through data mining, mobile Internet and other technical means to predict future probability of occurrence of colleges and universities crisis, then colleges and universities can guard in advance, and make the appropriate management measures. This paper predicted the number of crisis occurred in one university in Nanjing annual. On the basis of this, the follow-up study will do a monthly statistical crisis, and make timely dynamic forecast, identify a variety of potential or actual the risk factors among the student group, and then get early warning information, evaluate the extent of the crisis, finally determine whether to issue an alert. In addition, we will also be combined with other procedures for crisis management, establish a comprehensive crisis management system as the direction of the university crisis management standard, to reduce the frequency of crises from the university in general, finally to build a harmonious, safe, beautiful campus environment.

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