The development of inference machine model for vocation psychology based on rough set theory

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Abstract

In the paper the inference machine model for vocation psychology was build and developed by a rule-based rough set theory. At first, the rough set is used to optimize the rules for career psychological identification, by which the complexity of the neural network can be avoided. Second, the features used by the questionnaires are selected for input parameters of the classifier to incorporate more human like decision-making, whereas in other works, only a few of features or different characteristic options on the questionnaire, are used as deterministic parameters. A knowledge base of the behaviour characteristics and questionnaire analysis is developed from the feedbacks of some reputed career guides. These features are extracted from the carefully designed questionnaire. A rule-based rough set decision system is developed from these features to make an inference engine for career psychological identification.

Keywords: career, rough set theory, decision system, knowledge base, questionnaires, career psychological

1 Introduction

The education and employment guidance has developed decades years in the developed countries of the west in the world, e.g. the United States, Briton, Canada, Japan, Russia, etc. From the national, the state to the regular college have specialized and professionalized, part-time personnel responsible for vocational guidance. With the development of economic globalization, the whole world is full of uncertainty, the career development is an ongoing process, uncertainly is increasing. For example, the growing working variability of people, career development path more difficult to define and forecast factors influencing greater diversity, increases the complexity of the interrelationship. Increase dependent on the dynamism and creativity of the individual career development; an unexpected event or opportunity has become more and more apparent, personal career development needs of lifelong learning.

Human life is a new career pattern in the time of globalization and the information, some say the pattern is boundary less career [1], also some people call it is protean career [2]. The end of the 20th century, psychologists Bloch began to research using chaos theory to explain the possibility of human career psychological [3].

By the beginning of the 21st century, the chaos theory of career was formally proposed by pryor and bright [5-6]. In view of the story and the construction of understanding the role of career psychology and behavior Amund-son, Savickas made use of narrative guidance technology for career education counselling to improve the understanding of career movement process tools [7-9].Abraham, M (2005) proposed the match to the individual ability, ideal and vision of the career development path model to describe the details of gradually progressive process in the career path and from the correct career planning [10].

Cook P (2006) proposed a strategy to enhance the flexibility of career planning [11] by targeted guidance on career development and training. Humberston, Shane (2009) put forward the use of the Internet for online college career planning advice and guidance services, and knowledge of applied psychology through an online questionnaire design [12]. At present, the relevant research career in China are concentrated in the areas of knowledge and decision-making level, such as professional self, career decision-making difficulties, the integration model career decisions [13-17], studies on professional values only be examined from a static perspective. From the key to building a harmonious society is to promote harmony and human development point of view, Liu Zhaoping (2007) suggested that career education mainly through career planning, teaching guides, take part in social practice and cultural activities on campus, and several active [18].

Exists for career planning process with career planning awareness is not strong, weak capacity of self-awareness, university career counseling and other issues are not in place, Wu Wei (2009) proposed strategies and recommendations to improve the status of career planning, college students, through a questionnaire survey form from the student career planning and college career counseling [19]. Li Chao(2009) thorough analysis of the planning, analysis, design, implementation in college students' career planning and put forward practical solutions and recommendations [20]. From the perspective of college graduates counseling and professional values, Ding Lei (2012) discusses the occupational values of college graduates and career coaching strategy, hoping for employment guidance to students, schools, social agencies, providing a meaningful experience in order to better promote the University graduates' employment [21].

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Zhu Ping (2007) discussed the relationship between personality type and university graduates employment guidance through Holland questionnaire [22]. Jiang Fei Yue (2007) considered a career in psychology is a dynamic open complex system, the static structure of fractal characteristics [23]. System process of change is not linear, sensitive dependence on initial conditions, but in the complex changes in contains a certainty. In career counseling, the theory advocates a narrative-based approach. Compared with the classical theories of psychology career, career chaos theory increasingly showing its theoretical and practical value, can compensate for the lack of psychosomatic theory classical career. He Changping (2009) argues that career is spiritual yearnings beyond the spiritual realities, is to rebuild the spiritual pillar choose career goals, it helps to rebuild lifelong individual development and overall development objectives, contribute to the reconstruction of individual self-growth regulating development mechanisms [24]. Revelation by Australian's career "butterfly model" Tang Zhenhua (2011) propose and build a career education system with local characteristics; innovative ways and means of career education; improve career education teachers professional level.

Existing literature mainly involves one or some aspects of career planning: the evolution of career, significance, theoretical commentary, philosophical reflection, implementation of the principles, strategic analysis, impact factors, the survey reports, etc.

The core idea is that his career is generated with the society, with social progress and development. Under different historical conditions, people's awareness of career planning is a separate question, we must use a development perspective, dialectical thinking encountered in career planning. Distinct career planning is personal, generally requires the following steps: self-analysis, career opportunity assessment, career goals and route settings, correction and feedback career goals.

In recent years, considerable research has been conducted to assist vocational trainer with their task of diagnosing the job seekers type. The most interested research of them is the automatic classification of job seekers in order to provide tailor-made training for job seekers. How accurate classification career type is a key issue in career counseling. Existing article is skewed narrative, career objective quantitative classification of almost no one studied. Classification of vocational orientation difficulty is its vagueness, not by logic and variability. Rough set (RS) theory, proposed by Pawlak can be seen as a new mathematical approach for vague questions [25]. RS have been applied mainly in mining tasks like classification, clustering and feature selection. The clustering operation is required in a number of data analysis tasks, such as unsupervised classification and data summation, as well as segmentation of large homogeneous data sets into smaller homogeneous subsets that can be easily managed, separately modeled and analysed [26]. A well-known way for data clustering is using rough set theory [27].

The main contribution of this paper is the development of a rule-based rough-set decision system to generate an inference engine for vocational orientation classification of different standard questionnaire features.

The rest of this paper is structured as follows. Section 2 describes the notion of RS theory, classifier base on RS and variable precision rough set model. Section 3 describes the study's questionnaire datasets. The results and visualization are achieved in Section 4. Finally, the conclusion of this work is presented in section 5.

2 Rough set theory

Rough set theory is first described by Pawlak who is a computer scientist in 1982. It has emerged as an important mathematical tool for fuzzy questions and it is inaccurate, noisy, or incomplete information. It is an important step forward in the development of artificial intelligence and cognitive science, especially in the representation of reasoning with vague or imprecise knowledge, data classification, rule generation, machine learning, data mining, and knowledge discovery. The theory has sizable influence in many other areas of applications. A brief description of the rough-set theory and its utilize as a classifier is given below.

2.1 MATHEMATICAL BASICS OF ROUGH-SET THEORY

Rough sets are defined through their dual set approximations in an information system. It provides a systematic method for dealing with vague concepts cased by indiscernibility in situations with incomplete information or a lack of knowledge. An information system is a data table, whose columns are labeled by attributes. Rows are labeled by objects of interest, and entries of the table are attribute values. The pair $S = (U, A)$ are called a Pawlak approximation space, where U and A are finite nonempty sets called the universe of discourse and set of attributes, respectively.

The pair *S* table is the following tuple,
$S = (U, A\{\mathrm{V}_\alpha \mid \alpha \in A\}, \{I_a \mid \alpha \in A\})$,
V_a is a non-empty set of values of $a \in A$, every attribute $a \in A$ is associated with a set V_a,. $I_a : U \to V_a$ is an information function that maps an object in U to exactly one value in V_a. Any subset B of A determines a binary relation $I(\mathrm{B})$ on U, which will be called an indiscernibility relation.

In classification problems, the information table can be conceded a form
$S = (U, A = C \cup \{D\}, \{V_a\}, \{I_a\})$,
where C and D are disjoint sets of condition and decision attributes, respectively. In general, a table with multiple decision attributes can be easily transformed into a table with a signal decision attribute by considering the Cartesian product of the original decision attributes.

Let us suppose an information system $S=(U,A)$, $X\subseteq U$,and $B\subseteq A$. In the domain of U arbitrary subset X, X may not be used in a knowledge to accurately describe that X may is non-defined set, then X can be described by the lower approximation $R_*(X)$ and the upper approximate $R^*(X)$, and are defined as follows:

$$R_*(X)=\bigcup_{x\in U}\{R(x):R(x)\in X\}, \tag{1}$$

$$R^*(X)=\bigcup_{x\in U}\{R(x):R(x)\cap X\neq\varnothing\}. \tag{2}$$

For all $x\in A$. The operators R_* and R^* are called the lower and upper rough approximation operators. The set $PN_P(X)=P^*(X)-P_*(X)$ will be referred to as the boundary region of X .If the boundary region X is the empty set,i.e. $PN_P(X)=\varnothing$, then X is exact with respect to the boundary. In the opposite case, i.e. $PN_P(X)\neq\varnothing$, X is referred to as rough with respect to P.

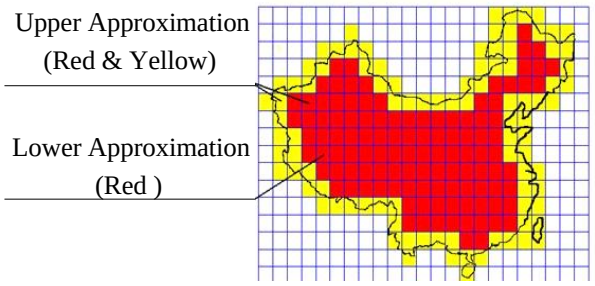

FIGURE 1 The schematic of rough sets

Figure 1 graphically shows the difference of the equivalent class, lower approximation, upper approximation, positive region, negative region and boundary region in the rough set. (*X* depends on positive regions of *R*) can be interpreted as a collection of objects belonging to *X* according to available knowledge judgments; (*X* depends on negative regions of *R*) can be interpreted as a collection of objects that do not belong to x in accordance with existing knowledge to judge. The upper approximate is the maximum definable set, the lower approximation is the minimum definable set.

2.2 CLASSIFICATION METHODS BASED ON ROUGH SETS

Rough set theory is used primarily to determine the optimal number of rules in the design of classifier. From every information system, a subset of minimal attributes is generated, which is known as reduct. Decision table is a special kind of information table, which can be used to generate decision-making rules and to solve the question classification. Let $S=(U,R,V,F)$ be a decision table. Where U is an object set, also call the universe of discourse, $R=C\cup D$, is an attribute set, subset *C* and *D* are respectively called condition attribute set and results attribute set.

The term $\mathrm{supp}_x(C,D)=|C(x)\cap D(x)|$ is called a support of the decision rule $C\rightarrow_x D$, and the number $\Omega_x(C,D)=\mathrm{supp}_x(C,D)/|U|$ will be called the strength of the decision rule. The decision rule $C\rightarrow_x D$ is associated with the certainty factor $\Theta_x(C,D)$ and defined as follows:

$$\Theta_x(C,D)=\frac{\mathrm{Supp}_x(C,D)}{|C(x)|}=\frac{\Omega_x(C,D)}{\hbar(C(x))}, \tag{3}$$

where

$$\hbar(C(x))=\frac{|C(x)|}{|U|}. \tag{4}$$

The decision rule $C\rightarrow_x D$ called a certain rule in *S*. if the decision rule is an uncertain decision rule in *S*, a coverage factor of decision rule can be defined as:

$$\Psi_x(C,D)=\frac{\mathrm{Supp}_x(C,D)}{|D(x)|}=\frac{\Omega_x(C,D)}{\hbar(D(x))}, \tag{5}$$

where

$$\hbar(D(x))=\frac{|D(x)|}{|U|}. \tag{6}$$

2.3 ATTRIBUTE REDUCTION ALGORITHM

A sample of the decision table is representative of a decision rule, if this entire decision rule enumerate out, it can get a decision rules set. However, and such decision rules set only record one sample mechanically. Do not get optimized and can not adapt to the changes in the situation. In order to extract rules which have big adaptability from the decision table, reduced decision table is representative of characteristics of the sample with the same rule; such decision rules have high adaptability. Attribute reduction problem is an NP problem, there some specific researcher for attribute reduction, which is more classic and procedure is followed:

Step 1. Compute equivalence classes using the indiscernibility relation on each attribute.

Step 2. Determine the error classification of attributes a_i with respect to all a_j, where $i\neq j$.

Step 3. Select in the β_lower and β_upper approximations of attribute a_j, with respect to all a_j, where $i\neq j$.

Step 4. Calculate the mean accuracy of attribute a_j, with respect to all a_j, where $i\neq j$.

Step 5. Select a clustering attribute based on the maximum mean accuracy of attribute.

3 Materials and method

The block diagram of the developed system is given in Figure 2. The different steps for developing the system are described below in sequential order.

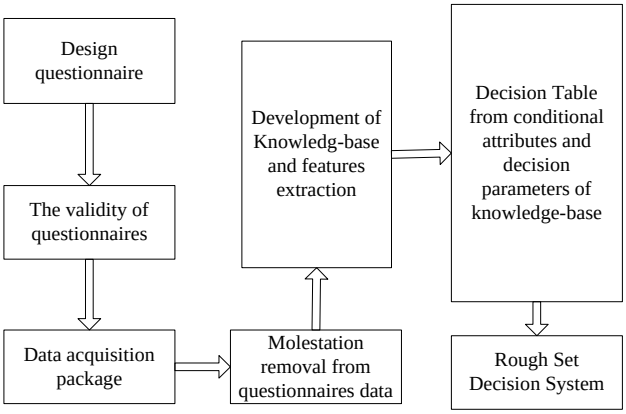

FIGURE 2 Block diagram of the proposed system

Design a questionnaire to collect more complete information as possible and reach closer to the studied subject is the key to survey. The survey is to study the phenomenon in general, is borne by those who want to gather information data, is the beginning of the survey questionnaire design, for general survey will encounter different levels of respondents, their educational level, professional background, personal preferences and other different and thus the understanding of the questionnaire will also vary, their questionnaire design will be different. The general principles of questionnaire design are as follows: First, the same survey topics, will differ for different respondents to its survey projects. Secondly, the same survey topics, different survey questions and their answers will be different ways, therefore, prior to designing the questionnaire, we must first find out the characteristics of the survey. Its essence is to enable designers to express the meaning and the meaning understood by visitors will reach a consistent.

In order to know the psychology of college graduates, we design the following questionnaire. We hand out 270 questionnaires, take back qualifying 223 questionnaires. Questions topics and preliminary analysis results are as follows:

TABLE 1 Your gender? (Question 1)

A (man)	B (woman)
204	19
91%	9%

Table 2's preliminary statistical analysis: the vast majority of students preferred the campus recruitment, results suggest that schools need to do campus recruitment, but also need to encourage students to actively explore other avenues for employment, prevent waiting at the Plaza.

TABLE 2 What is the way you find a job(Question 2)

A	B	C	D	E
67	196	26	39	20
30%	88%	12%	17%	9%

Note: A: Talent Market; B Campus Recruiting; C: media;
D: Relatives and Friends; E: Volunteered

TABLE 3 What type of companies is your choice (Question 3)

A	B	C	D	E	F
117	30	48	33	13	52
52%	13%	22%	15%	6%	24%

Note: A: State-owned enterprises; B: private enterprise; C: foreign;
D: Joint ventures; E: own businesses; F: indifferent

Table 3's preliminary statistical analysis: despite private and foreign enterprises grew rapidly, but most students will choose state-owned enterprises because of good pay, benefits high, stable.

TABLE 4 What is most important when your job search? (Question 4)

A	B	C	D	E	F
22	125	111	84	17	5
10%	56%	50%	38%	8%	2%

Note: A: corporate reputation; B: business prospects; C: Personal future;
D: wages, benefits; E: job stability; F: Other

Table 4's preliminary statistic analysis: most of the students pay more attention to companies and personal future development prospects, the students were able to show that a more long-term perspective to deal with employment.

TABLE 5 What area is your choice? (question 5)

A	B	C	D	E	F
64	106	68	9	19	18
29%	48%	30%	4%	9%	8%

Note: A: capital cities; B metropolitan; C: small cities; D: township;
E: Yangtze River Delta; F: Pearl River Delta

Table 5's preliminary statistic analysis: while the employment pressure is very great in the first-tier cities, but the students still preferred to consider metropolitan areas of employment, which may be an obstacle you employment.

TABLE 6 Do you want to the grassroots or tough jobs? (Question 6)

A	B	C
54	144	25
24%	65%	11%

Note: A: willing: B can be considered; C: reluctant

Table 6's preliminary statistical analysis: many students can consider going to the grassroots or the tough job, which will promote employment

TABLE 7 How much are you able to accept starting salaries (Question 7)

A	B	C	D	E
7	142	59	6	12
3%	64%	26%	2%	5%

Note: A: 800-2000 CNY; B:2001-3000 CNY; C: 3001-5000 CNY;
D: >5000 CNY; E: others

Table 7's preliminary statistical analysis: most of the students starting salary requirement is 2001-3000 yuan, which can be seen in most of the students is quite realistic, does not blindly demand high wages, high benefits, which are more favorable employment.

TABLE 8 In order to increase their competitiveness, what you are more likely to (Question 8)

A	B	C	D	E	F
39	51	20	135	31	3
17%	23%	9%	61%	14%	1%

Note: A: further education; B: learning skills (such as language); C: test certificate; D: accumulated work experience; E: student activity exercise; F: other

Table 8's preliminary statistical analysis: Most of the students or the first value of work experience, which shows it is quite realistic, practical to work, not to blindly participate in postgraduate examinations.

TABLE 9 What is one's own advantage? (Question 9)

A	B	C	D	E	F	G	H
58	118	48	24	33	81	37	5
26%	53%	22%	11%	15%	36%	17%	2%

Note: A: learn good grades; B: a practical capacity; C: student cadres; D: the Chinese Communists; E: Honors; F: interpersonal relations; G: family background; H: others

Table 9's preliminary statistic analysis: Most students believe they have a strong practical ability and good interpersonal skills, but these should be the lack of college students, which explains the many students more confident; But there is a very small part of the students think they do not have any advantage, for this part of the students, counselors should be more communication with them and help them restore confidence.

TABLE 10 What do you think is your personal weaknesses? (Question 10)

A	B	C	D
103	62	75	34
46%	28%	33%	15%

Note: A: professional knowledge and skills is not strong; B: poor communication skills; C: practical ability is not strong; D: Other

Table 10's preliminary statistical analysis: Most of the college students think that their expertise is not strong, and then the actual operation ability, communication skills. From this we can see that many students do not learn specialized courses, need to work to develop their self-learning ability and strengthening supervision.

TABLE 11 The professional and working relationship in the future? (Question 11)

A	B	C	D
11	116	90	6
5%	52%	40%	3%

Note: A: professional counterparts; B: be employed first, and then find another good job; C: Do What You Love; D: starting a business

Table 11's preliminary statistical analysis: 52% of graduates are employment and re-career, only 3% of the students chose entrepreneurship, which shows the employment outlook graduates are correct, this means that more types of work can be arranged for students to choose.

TABLE 12 What do you think school graduates employment guidance and services should be strengthened or improved? (Question 12)

A	B	C	D	E	F	G	H	I
77	103	85	59	72	40	114	22	9
34%	46%	38%	26%	32%	18%	51%	10%	4%

Note: A: Policy explained and situation analysis; B: skills guidance; C: publish information on graduate; D: personality/ability career tests; E: career planning guidance; F: individually conversation; G: collect and provide employment information; H: employment counseling; I: simplify the procedures

Table 11's preliminary statistical analysis: Most students hope that colleges should provide more employment information, job candidate's skills guidance to the community, and information about the situation of graduates, policy interpretation, formal analysis.

Although the above analysis can analyze the employment situation of college students in general, but it does not meet the requirements of individual adaptive tutoring and not know the relationship between the various factors, e.g. the relationship between the employment concepts with additional factors.

Caused by the above reasons there is no in-depth analysis of the questionnaire, some of the information is ignored, let's try to analyze the questionnaire utilizing rough sets to expect to find the relationship between the factors in the questionnaire. If the logical relationships between the various factors can be found by questionnaire, which is an important guiding value for career counseling. Next, we briefly describe the rough set of software tools.

The most popular and widely used rough-set software toolbox is ROSETTA, the URL for downloading this is http://www.idi.ntnu.no/~aleks/rosetta/rosetta.html. This software supports different options of generating decision tables, reducts, discretization techniques, classification, and decision algorithms. For this reason, we used this software for this paper. Here, learning samples are processed in the following way. First, a knowledge base is acquired for the data set, and in this particular case, they are the features that are listed above. The knowledge base consists of objects, which are represented using conditional attributes and decision parameters. All the features acquired their specific attributes according to different conditional attributes and decision parameters of the knowledge base developed from questionnaire's opinion. They are used as the input parameters of the decision table, a portion of which is given in Table 1-11.

4 Experimental results

In this paper, a total of 21 rules (partly shown in Table 13) are generated. Intuitively, a "strong" rule is both accurate and has a high coverage. The accuracy of a rule reflects how trustworthy its consequence is. A portion of the generated rule set and the confusion matrix, generated using standard voting classifiers, are given below in Tables II. We consider both left-hand side (LHS) and right-hand side (RHS) coverage factors for the selection of the optimum rule set.

TABLE 13 Portion of Generated rule set (Que11B)

Rule
Que1(A) AND Que3(F) AND Que6(A) => Que11(B)
Que5(C) AND Que10(A) AND Que7(B) => Que11(B)
Que1(A) AND Que5(C) AND Que9(H) => Que11(B)
Que1(A) AND Que4(B) AND Que5(C) => Que11(B)
Que2(B) AND Que3(F) AND Que4(B) => Que11(B)
Que4(C) AND Que9(H) => Que11(B)
Que6(B) AND Que10(D) AND Que7(B) => Que11(B)
Que4(B) AND Que5(A) AND Que7(B) => Que11(B)
Que10(A) AND Que8(B) => Que11(B)
Que3(A) AND Que5(C) AND Que6(B) AND Que10(A) => Que11(B)
Que5(C) AND Que6(B) AND Que9(H) => Que11(B)
Que5(C) AND Que10(A) AND Que9(H) => Que11(B)
Que1(A) AND Que3(F) AND Que10(A) AND Que7(B) => Que11(B)
Que2(B) AND Que3(F) AND Que6(A) => Que11(B)
Que4(B) AND Que6(B) AND Que10(D) => Que11(B)

TABLE 14 Portion of Generated rule set (Que11B)

	LHS Support	RHS Support	RHS Accuracy	LHS Coverage	RHS Coverage
	11	11	1.0	0.052381	0.1
	10	10	1.0	0.047619	0.090909
	9	9	1.0	0.042857	0.081818
	8	8	1.0	0.038095	0.072727
	8	8	1.0	0.038095	0.072727
	8	8	1.0	0.038095	0.072727
	7	7	1.0	0.033333	0.063636
	7	7	1.0	0.033333	0.063636
	6	6	1.0	0.028571	0.054545
	6	6	1.0	0.028571	0.054545
	6	6	1.0	0.028571	0.054545
	6	6	1.0	0.028571	0.054545
	6	6	1.0	0.028571	0.054545
	6	6	1.0	0.028571	0.054545

For example, rule 1 in Table 13 gives the decision according to LHS supports number that 11 samples of the graduate having questionnaire, where an indifferent attitude and willing to work hard place, are employed first, and then find another suitable job. From the inverse decision rule, considering RHS coverage factor, it can be possible to conclude that 100% of the graduate is belongs to the type of employment and re-career.

Intuitive meaning of Rule 2 is the option of the 11th questions must be B. If the option of the 10th questions is A and the option of the 7th questions is B. Combined with the specific object of that rule can be understood as the work of the graduates chooses locations for small cities and their expertise is not strong, and income requirements are relatively low (2001-3000CNY), the type is employment and re-career.

The meaning of the rule 3 and 4 as if the graduates are men and her work place is a small town and not know own advantage or business prospects of the most important indicators, so his choices tend to be employed, after careers.

TABLE 15 Portion of Generated rule set (Que11A)

	Rule
1	Que1(A) AND Que2(B) AND Que3(C) AND Que4(B) => Que11(A)
2	Que3(AB) AND Que8(BD) => Que11(A)
3	Que2(B) AND Que4(CD) AND Que8(ABD) => Que11(A)
4	Que2(AB) AND Que4(C) AND Que8(BD) => Que11(A)
5	Que3(F) AND Que4(CD) AND Que7(C) => Que11(A)
6	Que2(B) AND Que4(CD) AND Que9(BF) => Que11(A)
7	Que2(B) AND Que3(F) AND Que7(C) AND Que9(BF) => Que11(A)
8	Que2(B) AND Que3(F) AND Que10(A) AND Que7(C) => Que11(A)
9	Que2(B) AND Que3(B) AND Que10(A) AND Que7(B) => Que11(A)
10	Que5(ABE) => Que11(A)
11	Que5(BCD) => Que11(A)
12	Que3(AB) AND Que4(C) => Que11(A)
13	Que3(AB) AND Que4(CDE) => Que11(A)
14	Que3(CD) AND Que4(BC) => Que11(A)
15	Que3(CD) AND Que8(D) => Que11(A)
16	Que4(C) AND Que9(ABCF) => Que11(A)
17	Que4(CDE) AND Que9(A) => Que11(A)
18	Que4(BC) AND Que9(BCF) => Que11(A)
19	Que3(AB) AND Que9(ABCF) => Que11(A)
20	Que3(AB) AND Que9(A) => Que11(A)

Rules of graduates with professional counterparts in the concept as shown in Table 15. Seemingly unrelated things with a professional can be combined with professional knowledge, thinking, perspectives, action intact, theory with practice, the actual professional guidance, practice rich theory, innovation expertise, such work is professional counterparts in the true sense.

Although graduates with professional counterparts characteristics have the potential to work hard, but they lack the flexibility, the following rules in Table 15 as an example.

Rule 1 indicates male graduate tends to find work on campus recruiting, working the foreign enterprise, and attention on the professional foreground, then he is a tendency to find their counterparts in professional work. Rule 2 reveals that graduates think if you can choose between working in state-owned enterprises and private enterprises, and that the accumulated practical experience and learning the language is very important, and that he still hopes to engage their counterparts in professional work.

A questionnaire survey of the enterprising psychology of the students from Xi'an University of Science and Technology shows that they all pay attention to and have interest in self-employment and have a clear understanding of academic learning and enterprising practice, their enterprising motivation is diversified, and that they have a strong will to start a business and have clear expectation of self-employment. Based on the results of the survey, the present paper suggests that an employment guidance course should be conducted to improve college students' structure of enterprising knowledge, their enterprising motivation should be enhanced to arouse their desire for self-employment, and that conditions should be created to support enterprising projects.

TABLE 16 Portion of Generated rule set (Que11D)

	Rule
1	Que5(A) AND Que8(E) => Que11(D)
2	Que4(F) AND Que10(A) => Que11(D)
3	Que7(D) AND Que8(E) => Que11(D)
4	Que7(D) AND Que8(B) => Que11(D)
5	Que7(D) AND Que9(BF) => Que11(D)
6	Que8(E) AND Que9(BF) => Que11(D)
7	Que8(B) AND Que9(BC) => Que11(D)
8	Que4(F) AND Que9(BF) => Que11(D)
9	Que4(F) AND Que6(B) => Que11(D)
10	Que4(F) AND Que8(E) => Que11(D)
11	Que2(B) AND Que4(F) AND Que7(D) => Que11(D)
12	Que3(F) AND Que10(A) AND Que7(D) => Que11(D)
13	Que3(A) AND Que10(D) AND Que7(D) => Que11(D)
14	Que2(B) AND Que3(F) AND Que7(D) => Que11(D)
15	Que1(A) AND Que3(F) AND Que8(E) => Que11(D)
16	Que1(A) AND Que10(A) AND Que8(E) => Que11(D)
17	Que2(B) AND Que3(F) AND Que6(B) AND Que9(BF) => Que11(D)
18	Que2(B) AND Que3(F) AND Que5(A) AND Que10(A) => Que11(D)
19	Que2(B) AND Que3(F) AND Que5(A) AND Que9(BF) => Que11(D)
20	Que4(C) AND Que7(D) => Que11(D)

Rules of graduates with self-employment in the concept as showed in Table 16. For example, rule 1 in Table 16 shows that like working in a big city, love the university graduates practice has a desire for self-employment.

Rule 2 is a very interesting result, it shows that if the graduates for corporate reputation, business prospects, personal future, wages, benefits, job stability do not care, and that their lack of professional knowledge and ability, so students should be poor students, it is surprising that they tend to on entrepreneurship, this phenomenon shows that such students should be rogue who be focused on in the daily management.

5 Conclusions

The suitability of rough-set theory in career development analysis has been tested in this paper. To do so, an anonymous questionnaire is designed to extract the feature from college graduates. The creation of these questionnaires is essential because our final goal is to build a features database for subjects of different graduates in the Chinese college students.

A knowledge base about the behaviours characteristics and questionnaire analysis is developed from the feedbacks of some reputed career guides. These features are extracted from the carefully designed questionnaire. A rule-based rough set decision system is developed from these features to make an inference engine for career psychological identification.

The paper is unique basically for two reasons. First, the rough set is used to optimize the rules for career psychological identification, by which the complexity of the neural network can be avoided. Second, the features used by the questionnaires are selected for input parameters of the classifier to incorporate more human like decision-making, whereas in other works, only a few of features or different characteristic options on the questionnaire, are used as deterministic parameters.

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