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APPLICATION OF SOFT SETS IN DECISION MAKING VIA ROUGH TOPOLOGY

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Abstract

The aim of this paper is to apply soft sets in decision making via rough topology. An algorithm is defined in terms of soft rough topology to find the key factors in a soft set information system. It is used to analyse real life problems.

Keywords: soft sets, rough topology, soft rough topology

1. Introduction

Molodtsov introduced soft set in the year 1999 to deal with problems of incomplete information. Soft set is a completely generic mathematical tool for modeling uncertainties. The concept of soft sets enhanced the application potential of the different generalization of crisp sets due to the additional advantage of parametrization tools. It is also be noted that the soft set theory has applications in different real life problems including decision making problems. The concept of soft rough topology is used to find the core factor for soft set information system.

2. Preliminaries

Definition 2.1

Let X be an universe set, $P(X)$ be the power set of X and A a set of parameters. A pair (F, A) where F is a map from A to $P(X)$ is called a soft set [1] over X. We denote the family of all soft sets (F, A) over X by $SS(X, A)$.

Definition 2.2

Let X be an universe set, A a set of parameters and $\tau \subseteq SS(X, A)$. The famil defines a soft topology on X if the following axioms are true.

1) $0_A, 1_A \in \tau$

2) If $(G,A),(H,A) \in \tau$, then $(G,A) \cap (H,A) \in \tau$

3) If $(G_i,A) \in \tau$ for every $i \in I$, then $\cup\{(G_i,A) : i \in I\} \in \tau$

The triplet (X,τ,A) is called a soft topological space or soft space [1]. The members of τ are called soft open sets in X. Also a soft set (F,A) is called soft closed if the complement $(F,A)^c$ belongs to τ. The family of soft closed sets is denoted by τ^c.

Definition 2.3

Let U be a non-empty set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. The pair (U,R) is called the approximation space [4]. Let X be a subset of U.

a. The lower approximation of X with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$ [4]. That is, $L_R(X) = \bigcup_{x \in U}\{R(x) : R(x) \subseteq X\}$ where $R(x)$ denotes the equivalence class determined by x.

b. The upper approximation of X with respect to R is the set of all objects, which can be possibly classified as X with respect to R and it is denoted by $U_R(X)$ [4]. That is, $U_R(X) = \bigcup_{x \in U}\{R(x) : R(x) \cap X \neq \phi\}$.

c. The boundary region of X with respect to R is the set of all objects, which can be classified neither as X nor as not-X with respect to R and it is denoted by $B_R(X)$. That is, $B_R(X) = U_R(X) - L_R(X)$ [4].

Definition 2.4

Let U be the universe of objects, R be an equivalence relation on U and $\tau_R = \{U, \phi, L_R(X), U_R(X), B_R(X)\}$ where $X \subseteq U$. τ_R satisfies the following axioms:

i. U and $\phi \in \tau_R$

ii. The union of the elements of any sub collection of τ_R is in τ_R

iii. The intersection of the elements of any finite sub collection of τ_R is in τ_R.

τ_R forms a topology on U called as the rough topology [2] on U with respect to X. We call (U, τ_R, X) as the rough topological space.

Definition 2.5

If τ_R is the rough topology on U with respect to X, then the set $\beta_R = \{U, L_R(X), B_R(X)\}$ is the basis [2] for τ_R.

3. Algorithm

Step 1: Given a finite universe U, input the soft set (F, E).

Step 2: Input the set P of choice parameters of Mr. X which is a subset of E.

Step 3: Define a suitable relation. According to that a finite set F of attributes is divided into two classes, C of condition attributes and D of decision attribute, an equivalence relation R on U corresponding to C and a subset X of U, represent the data as an information table, columns of which are labeled by attributes, rows by objects and entries of the table are attribute values.

Step 4: Find the lower approximation, upper approximation and the boundary region of X with respect to R.

Step 5: Generate the soft rough topology τ_R on U and its basis β_R.

Step 6: Remove an attribute x from C and find the lower and upper approximations and the boundary region of X with respect to the equivalence relation on $C - \{x\}$.

Step 7: Generate the rough topology $\tau_{R-(x)}$ on U and its basis $\beta_{R-(x)}$.

Step 8: Repeat steps 6 and 7 for all attributes in C.

Step 9: Those attributes in C for which $\beta_{R-(x)} \neq \beta_R$ form the Core (R).

4. Application of soft set in decision making via rough topology

In this section we present application of soft sets in decision making problems with the help of the notion of rough topology. For this study the following problem is formulated.

4.1. Problem: Let U = {S₁, S₂, S₃, S₄, S₅, S₆, S₇} be a set of seven students in a college and E the set of six attributes {e₁, e₂, e₃, e₄, e₅, e₆} where e₁ denotes the participation and winning prizes in inter-collegiate sports meets, e_2 denotes securing more than 90% of marks in the semester examinations, e_3 denotes winning prizes in drawing competitions, e_4 denotes participation and winning prizes in inter-collegiate cultural events, e_5 denotes good behavior in all the sessions, e_6 denotes wining prizes in handwriting are the parameters. Let (F, P) be a soft set representing the "the best student in the final year" given by $(F, P) = \{e_1 = \{S_1, S_2, S_3, S_4, S_6\}, e_2 = \{S_4, S_5\}, e_3 = \{S_1, S_2, S_3, S_4, S_5, S_6, S_7\}, e_4 = \{S_3, S_4, S_6, S_7\}, e_5 = \{S_2, S_6\}$ and $e_6 = \{S_1, S_3, S_4, S_7\}\}$.

Suppose that the Principal wants to select the best out going student from the college in a particular year, consisting of only the parameters e_1, e_2, e_3, e_4, e_5 which is a subset $P = \{e_1, e_2, e_3, e_4, e_5\}$ of the set E.

The problem is to study the selection of best out going student of the college in a particular year, in a particular college which is suitable with the choice parameters set by the Principal.

Solution

Let us first make a tabular representation of the problem. Consider the soft set (F, P) where P is the choice parameter of the Principal. Suppose $S_{ij} = \begin{cases} 1 & \text{if } S_i \in F(p_j) \\ 0 & \text{if } S_i \notin F(p_j) \end{cases}$ where S_{ij} are the entries in Table 4.1.1.

Attri. / Stu.	e_1	e_2	e_3	e_4	e_5
S_1	1	0	1	0	0
S_2	1	0	1	0	1
S_3	1	0	1	1	0
S_4	1	1	1	1	0
S_5	0	1	1	0	0
S_6	1	0	1	1	1
S_7	0	0	1	1	0

Table 4.1.1

Define a relation that S_i is selected if and only if $\sum_{j=1}^{5} S_{ij} \geq 4$.

Stu. \ Attri.	a_1	a_2	a_3	a_4	a_5	Sum
S_1	1	0	1	0	0	2
S_2	1	0	1	0	1	3
S_3	1	0	1	1	0	3
S_4	1	1	1	1	0	4
S_5	0	1	1	0	0	2
S_6	1	0	1	1	1	4
S_7	0	0	1	1	0	2

Table 4.1.2

Here a_1, a_2, a_3, a_4, a_5 are the condition attributes.

Case 1: Let $X=\{S_1,S_6\}$, the set of selected students. $U/I(R)=\{\{S_1\},\{S_2\},\{S_3\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$. The lower and upper approximations of X with respect to R are given by $L_R(X)=\{S_1,S_6\}$ and $U_R(X)=\{S_1,S_6\}$. Therefore, $B_R(X)=\phi$. The nano rough topology on U is $\tau_R=\{U,\phi,\{S_1,S_6\}\}$ and its basis $\beta_R=\{U,\{S_1,S_6\}\}$. If the attribute '$a_1$' is removed from the set of condition attributes then $U/I(R-a_1)=\{\{S_1\},\{S_2\},\{S_3\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$, $L_{R-a_1}(X)=\{S_1,S_6\}$, $U_{R-a_1}(X)=\{S_1,S_6\}$ and $B_{R-a_1}(X)=\phi$, hence $\tau_{R-(a_1)}=\{U,\phi,\{S_1,S_6\}\}$ and its basis $\beta_{R-a_1}=\{U,\{S_1,S_6\}\}=\beta_R$. If the attribute '$a_2$' is removed from the set of condition attributes, then $U/I(R-(a_2))=\{\{S_1\},\{S_2\},\{S_3,S_6\},\{S_4\},\{S_5\},\{S_7\}\}$, $L_{R-(a_2)}(X)=\{S_1\}$, $U_{R-a_2}(X)=\{S_1,S_3,S_6\}$ and $B_{R-a_2}(X)=\{S_3,S_6\}$, hence $\tau_{R-(a_2)}=\{U,\phi,\{S_1\},\{S_1,S_3,S_6\},\{S_3,S_6\}\}$ and its basis $\beta_{R-a_2}=\{U,\{S_1\},\{S_3,S_6\}\}\neq\beta_R$. If the attribute '$a_3$' is removed, then $U/I(R-(a_3))=\{\{S_1\},\{S_2\},\{S_3\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$, $L_{R-(a_3)}(X)=\{S_1,S_6\}$ and $U_{R-(a_3)}(X)=\{S_1,S_6\}$. Therefore, $\tau_{R-(a_3)}=\{U,\phi,\{S_1,S_6\}\}$ and its basis $\beta_{R-(a_3)}=\{U,\{S_1,S_6\}\}=\beta_R$. If the attribute '$a_4$' is removed from the set of condition attributes, then $U/I(R-(a_4))=\{\{S_1,S_3\},\{S_2\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$, $L_{R-(a_4)}(X)=\{S_1,S_6\}$, $U_{R-(a_4)}(X)=\{S_1,S_6\}$ and hence $\tau_{R-(a_4)}=\{U,\phi,\{S_1,S_6\}\}$ and its basis $\beta_{R-(a_4)}=\{U,\{S_1,S_6\}\}=\beta_R$. If the attribute '$a_5$' is removed from the set of condition attributes, then $U/I(R-a_5)=$

$\{\{S_1,S_2\},\{S_3,S_5\},\{S_4\},\{S_6\},\{S_7\}\}$. $L_{R-\{e_1\}}(X)=\{S_4\}$; $U_{R-\{e_1\}}(X)=\{S_3,S_5,S_4\}$, $B_{R-\{e_1\}}(X)=\{S_3,S_5\}$, and hence $\tau_{R-\{e_1\}}=\{U,\phi,\{S_4\},\{S_3,S_4,S_5\},\{S_3,S_5\}\}$ and its basis $\beta_{R-\{e_1\}}=\{U,\{S_3,S_5\},\{S_4\}\}\neq\beta_R$. If $M=\{e_2,e_3\}$, then $U/I(r)=\{\{S_1,S_2,S_3\},\{S_5,S_6\},\{S_4,S_7\}\}$, $L_r(X)=\phi$ and $U_r(X)=\{S_1,S_2,S_3,S_4,S_7\}$ where r is the equivalence relation on U with respect to M. Then the basis for the soft rough topology corresponding to M is given by $\beta_M=\{U,\{S_1,S_2,S_3,S_4,S_7\}\}\neq\beta_{R-\{e_2\}}\neq\beta_{R-\{e_3\}}$. Therefore, Core(R) $=\{e_2,e_3\}$.

Case 2: Let $X=\{S_1,S_2,S_3,S_5,S_7\}$, the set of students who were not selected. $U/I(R)=\{\{S_1\},\{S_2\},\{S_3\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$. The lower and upper approximations of X with respect to R are given by $L_R(X)=\{S_1,S_2,S_3,S_5,S_7\}$ and $U_R(X)=\{S_1,S_2,S_3,S_5,S_7\}$. Therefore, $B_R(X)=\phi$. The soft rough topology on U is $\tau_R=\{U,\phi,\{S_1,S_2,S_3,S_5,S_7\}\}$ and its basis $\beta_R=\{U,\{S_1,S_2,S_3,S_5,S_7\}\}$. If the attribute 'e1' is removed from the set of condition attributes, then $U/I(R-\{e_1\})=\{\{S_1\},\{S_2\},\{S_3\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$. $L_{R-\{e_1\}}(X)=\{S_1,S_2,S_3,S_5,S_7\}$; $U_{R-\{e_1\}}(X)=\{S_1,S_2,S_3,S_5,S_7\}$ and $B_{R-\{e_1\}}(X)=\phi$, hence $\tau_{R-\{e_1\}}=\{U,\phi,\{S_1,S_2,S_3,S_5,S_7\}\}$ and its basis $\beta_{R-\{e_1\}}=\{U,\{S_1,S_2,S_3,S_5,S_7\}\}=\beta_R$. If the attribute 'e2' is removed from the set of condition attributes, then $U/I(R-\{e_2\})=\{\{S_1\},\{S_2\},\{S_3,S_4\},\{S_5\},\{S_6\},\{S_7\}\}$. $L_{R-\{e_2\}}(X)=\{S_1,S_2,S_5,S_7\}$; $U_{R-\{e_2\}}(X)=\{S_1,S_2,S_3,S_4,S_5,S_7\}$ and $B_{R-\{e_2\}}(X)=\{S_3,S_4\}$, hence $\tau_{R-\{e_2\}}=\{U,\phi,\{S_1,S_2,S_5,S_7\},\{S_1,S_2,S_3,S_4,S_5,S_7\},\{S_3,S_4\}\}$ and its basis $\beta_{R-\{e_2\}}=\{U,\{S_1,S_2,S_5,S_7\},\{S_3,S_4\}\}\neq\beta_R$. If the attribute 'e3' is removed, then $U/I(R-\{e_3\})=\{\{S_1\},\{S_2\},\{S_3\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$, $L_{R-\{e_3\}}(X)=\{S_1,S_2,S_3,S_5,S_7\}$ and $U_{R-\{e_3\}}(X)=\{S_1,S_2,S_3,S_5,S_7\}$. Therefore, $\tau_{R-\{e_3\}}=\{U,\phi,\{S_1,S_2,S_3,S_5,S_7\}\}$ and its basis $\beta_{R-\{e_3\}}=\{U,\{S_1,S_2,S_3,S_5,S_7\}\}=\beta_R$. If the attribute 'e4' is removed from the set of condition attributes, then $U/I(R-\{e_4\})=\{\{S_1,S_3\},\{S_2\},\{S_4\},\{S_5\},\{S_6\},\{S_7\}\}$, $L_{R-\{e_4\}}(X)=\{S_1,S_2,S_3,S_5,S_7\}$; $U_{R-\{e_4\}}(X)=\{S_1,S_2,S_3,S_5,S_7\}$ and hence $\tau_{R-\{e_4\}}=\{U,\phi,\{S_1,S_2,S_3,S_5,S_7\}\}$ and its basis $\beta_{R-\{e_4\}}=\{U,\{S_1,S_2,S_3,S_5,S_7\}\}=\beta_R$. If the attribute 'e5' is removed from the set of condition attributes, then $U/I(R-(e_5))=\{\{S_1,S_3\},\{S_2,S_6\},\{S_4\},\{S_5\},\{S_7\}\}$, $L_{R-(e_5)}(X)=\{S_1,S_3,S_5,S_7\}$; $U_{R-(e_5)}(X)=\{S_1,S_2,S_3,S_5,S_6,S_7\}$, $B_{R-(e_5)}(X)=\{S_2,S_6\}$, and hence $\tau_{R-(e_5)}=\{U,\phi,\{S_1,S_3,S_5,S_7\},\{S_1,S_2,S_3,S_5,S_6,S_7\},\{S_2,S_6\}\}$ and its basis $\beta_{R-(e_5)}=\{U,\{S_1,S_3,S_5,S_7\},\{S_2,S_6\}\}\neq\beta_R$. If $M=\{e_2,e_5\}$, then $U/I(r)=\{\{S_1,S_3,S_5\},\{S_2,S_6\},\{S_4,S_7\}\}$, $L_r(X)=\{S_1,S_3,S_5\}$ and $U_r(X)=\{S_1,S_2,S_3,S_4,S_5,S_6,S_7\}$ where r is the equivalence relation on U with respect to M. Then the basis for the soft rough topology corresponding to M is given by $\beta_M=\{U,\{S_1,S_3,S_5\},\{S_2,S_4,S_6,S_7\}\}\neq\beta_{R-(e_2)}\neq\beta_{R-(e_5)}$. Therefore, Core(R) $=\{e_2,e_5\}$.

Observation

Since the Core(R) has e_2 and e_5 as its elements, c_2 and c_5 are the key attributes to select the best out going student in a particular year.

Conclusion

In the problem of selecting the best out going students in a particular year, it is not necessary to discuss many attributes. But it is enough to select the best out going student based on only the Core(R).

Problem 4.2

Consider the problem defined by Maji[3]

Let U = {h_1, h_2, h_3, h_4, h_5, h_6} be a set of six houses, E = {expensive, beautiful, wooden, cheap, in green surroundings, modern, in good repair, in bad repair} be a set of parameters.

Consider the soft set (F,E) which describes the 'attractiveness of the house', given by (F,E) = {expensive houses $=\varphi$, beautiful houses = {h_1, h_2, h_3, h_4, h_5, h_6}, wooden houses = {h_1, h_2, h_6}, modern houses = {h_1, h_2, h_6}, in bad repair houses = {h_2, h_4, h_5}, cheap house = {h_1, h_2, h_3, h_4, h_5, h_6}, in good repair houses = {h_1, h_3, h_6}, in the green surroundings houses = {h_1, h_2, h_3, h_4, h_5, h_6}}.

Suppose that Mr. X is interested to buy a house on the basis of his choice parameters 'beautiful', 'wooden', 'cheap', in the surroundings', 'in good repair', etc., which constitute the subset P = {beautiful, wooden, cheap, in the green surroundings, in good repair} of the set E. That means out of available houses in U, he is to select that house which qualifies with all (or with maximum number of) parameters of the soft set P.

Suppose that another customer Mr. Y wants to buy a house on the basis of the sets of choice parameters $Q \subset E$, where Q = {expensive, beautiful, in green surroundings, in good repair} and Mr. Z wants to buy a house on the basis of another set of parameters $R \subset E$.

The problem is to select the house which is most suitable with the choice parameters of Mr. X. The house which is most suitable for Mr. X need not be most suitable for Mr. Y or Mr. Z as the selection is dependent upon the set of choice parameters of each buyer.

To solve the problem we do some theoretical characterizations of the soft set theory of Molodtsov which we present below.

4.2.1 Tabular Representation of a Soft Set

Tabular representations of soft sets were done by Lin and Yao earlier. We present an almost analogous representation in the form of a binary table. For this consider the soft set (F, P) above on the basis of the set P of choice parameters of Mr. X. We can represent this soft set in a tabular form as shown below. This style of representation will be useful for storing a soft set in a computer memory. If $h_i \in F(e_j)$ then $h_{ij} = 1$, otherwise $h_{ij} = 0$, where h_{ij} are the entries in Table 1 of [3].

U	e_1	e_2	e_3	e_4	e_5
h_1	1	1	1	1	1
h_2	1	1	1	1	0
h_3	1	0	1	1	1
h_4	1	0	1	1	0
h_5	1	0	1	0	0
h_6	1	1	1	1	1

Table 4.2.1

Thus a soft set now can be viewed as a knowledge representation system where the set of attributes is to be replaced by a set of parameters.

Define a relation that h_i is selected if and only if $\sum_{j=1}^{5} h_{ij} \geq 5$.

U	e_1	e_2	e_3	e_4	e_5	Sum
h_1	1	1	1	1	1	5
h_2	1	1	1	1	0	4
h_3	1	0	1	1	1	4
h_4	1	0	1	1	0	3
h_5	1	0	1	0	0	2
h_6	1	1	1	1	1	5

Table 4.2.2

Here beautiful, wooden, cheap, in the green surrounding and in good repair are the condition attributes.

Case 1: Let $X = \{h_1, h_6\}$, the set of selected. $U/I(R) = \{\{h_1, h_6\}, \{h_2\}, \{h_3\}, \{h_4\}, \{h_5\}\}$. The lower and upper approximations of X with respect to R are given by $L_R(X) = \{h_1, h_6\}$ and $U_R(X) = \{h_1, h_6\}$. Therefore, $B_R(X) = \phi$. The soft rough topology on U is $\tau_R = \{U, \phi, \{h_1, h_6\}\}$ and its basis $\beta_R = \{U, \{h_1, h_6\}\}$. If the attribute '$e_1$' is removed from the set of condition attributes, then $U/I(R-(e_1)) = \{\{h_1, h_6\}, \{h_2\}, \{h_3\}, \{h_4\}, \{h_5\}\}$. $L_{R-(e_1)}(X) = \{h_1, h_6\}$; $U_{R-(e_1)}(X) = \{h_1, h_6\}$ and $B_{R-(e_1)}(X) = \phi$, hence $\tau_{R-(e_1)} = \{U, \phi, \{h_1, h_6\}\}$ and its basis $\beta_{R-(e_1)} = \{U, \{h_1, h_6\}\} = \beta_R$. If the attribute '$e_2$' is removed from the set of condition attributes, then $U/I(R-(e_2)) = \{\{h_1, h_3, h_6\}, \{h_2, h_4\}, \{h_5\}\}$. $L_{R-(e_2)}(X) = \{h_1, h_3, h_6\}$; $U_{R-(e_2)}(X) = \{h_1, h_3, h_6\}$ and $B_{R-(e_2)}(X) = \phi$, hence $\tau_{R-(e_2)} = \{U, \phi, \{h_1, h_3, h_6\}\}$ and its basis $\beta_{R-(e_2)} = \{U, \{h_1, h_3, h_6\}\} \neq \beta_R$. If the attribute '$e_3$' is removed, then $U/I(R-(e_3)) = \{\{h_1, h_6\}, \{h_2\}, \{h_3\}, \{h_4\}, \{h_5\}\}$. $L_{R-(e_3)}(X) = \{h_1, h_6\}$ and $U_{R-(e_3)}(X) = \{h_1, h_6\}$. Therefore, $\tau_{R-(e_3)} = \{U, \phi, \{h_1, h_6\}\}$ and its basis $\beta_{R-(e_3)} = \{U, \{h_1, h_6\}\} = \beta_R$. If the attribute '$e_4$' is removed from the set of condition attributes, then

$U/I(R-\{e_1\})=\{\{h_1,h_6\},\{h_2\},\{h_3\},\{h_4,h_5\}\}$, $L_{R-\{e_1\}}(X)=\{h_1,h_6\}$, $U_{R-\{e_1\}}(X)=\{h_1,h_6\}$ and hence $\tau_{R-\{e_1\}}=\{U,\phi,\{h_1,h_6\}\}$ and its basis $\beta_{R-\{e_1\}}=\{U,\{h_1,h_6\}\}=\beta_R$. If the attribute '$e_2$' is removed from the set of condition attributes, then $U/I(R-\{e_2\})=\{\{h_1,h_2,h_6\},\{h_3,h_4\},\{h_5\}\}$, $L_{R-\{e_2\}}(X)=\{h_1,h_2,h_6\}$; $U_{R-\{e_2\}}(X)=\{h_1,h_2,h_6\}$, $B_{R-\{e_2\}}(X)=\phi$, and hence $\tau_{R-\{e_2\}}=\{U,\phi,\{h_1,h_2,h_6\}\}$ and its basis $\beta_{R-\{e_2\}}=\{U,\{h_1,h_2,h_6\}\}\neq\beta_R$. If $M=\{e_2,e_3\}$, then $U/I(r)=\{\{h_1,h_6\},\{h_2,h_4\},\{h_3\},\{h_5\}\}$, $L_r(X)=\{h_1,h_6\}$ and $U_r(X)=\{h_1,h_6\}$ where r is the equivalence relation on U with respect to M. Then the basis for the soft rough topology corresponding to M is given by $\beta_M=\{U,\{S_1,S_2,S_3,S_4\}\}\neq\beta_{R-\{e_1\}}\neq\beta_{R-\{e_3\}}$. Therefore, Core(R) $=\{e_2,e_3\}$.

Case 2: Let $X=\{h_2,h_3,h_4,h_5\}$, the set of houses which are not selected. $U/I(R)=\{\{h_1,h_6\},\{h_2\},\{h_3\},\{h_4\},\{h_5\}\}$. The lower and upper approximations of X with respect to R are given by $L_R(X)=\{h_2,h_3,h_4,h_5\}$ and $U_R(X)=\{h_2,h_3,h_4,h_5\}$. Therefore, $B_R(X)=\phi$. The soft rough topology on U is $\tau_R=\{U,\phi,\{h_2,h_3,h_4,h_5\}\}$ and its basis $\beta_R=\{U,\{h_2,h_3,h_4,h_5\}\}$. If the attribute '$e_1$' is removed from the set of condition attributes, then $U/I(R-\{e_1\})=\{\{h_1,h_6\},\{h_2\},\{h_3\},\{h_4\},\{h_5\}\}$, $L_{R-\{e_1\}}(X)=\{h_2,h_3,h_4,h_5\}$, $U_{R-\{e_1\}}(X)=\{h_2,h_3,h_4,h_5\}$ and $B_{R-\{e_1\}}(X)=\phi$, hence $\tau_{R-\{e_1\}}=\{U,\phi,\{h_2,h_3,h_4,h_5\}\}$ and its basis $\beta_{R-\{e_1\}}=\{U,\{h_2,h_3,h_4,h_5\}\}=\beta_R$. If the attribute '$e_2$' is removed from the set of condition attributes, then $U/I(R-\{e_2\})=\{\{h_1,h_3,h_6\},\{h_2,h_4\},\{h_5\}\}$, $L_{R-\{e_2\}}(X)=\{\{h_2,h_4\},\{h_5\}\}$; $U_{R-\{e_2\}}(X)=\{\{h_1,h_3,h_6\},\{h_2,h_4\},\{h_5\}\}$ and $B_{R-\{e_2\}}(X)=\{h_1,h_3,h_6\}$, hence $\tau_{R-\{e_2\}}=\{U,\phi,\{\{h_2,h_4\},\{h_5\}\},\{\{h_1,h_3,h_6\},\{h_2,h_4\},\{h_5\}\},\{h_1,h_3,h_6\}\}$ and its basis $\beta_{R-\{e_2\}}=\{U,\{h_1,h_3,h_6\},\{\{h_2,h_4\},\{h_5\}\}\}\neq\beta_R$. If the attribute '$e_3$' is removed, then $U/I(R-\{e_3\})=\{\{h_1,h_6\},\{h_2\},\{h_3\},\{h_4\},\{h_5\}\}$, $L_{R-\{e_3\}}(X)=\{h_2,h_3,h_4,h_5\}$ and $U_{R-\{e_3\}}(X)=\{h_2,h_3,h_4,h_5\}$. Therefore, $\tau_{R-\{e_3\}}=\{U,\phi,\{h_2,h_3,h_4,h_5\}\}$ and its basis $\beta_{R-\{e_3\}}=\{U,\{h_2,h_3,h_4,h_5\}\}=\beta_R$. If the attribute '$e_4$' is removed from the set of condition attributes, then $U/I(R-\{e_4\})=\{\{h_1,h_6\},\{h_2\},\{h_3\},\{h_4,h_5\}\}$, $L_{R-\{e_4\}}(X)=\{h_2,h_3,h_4,h_5\}$, $U_{R-\{e_4\}}(X)=\{h_2,h_3,h_4,h_5\}$

and hence $\tau_{R-\{e_1\}} = \{U, \phi, \{h_1, h_2, h_4, h_5\}\}$ [illegible] and its basis $\beta_{R-\{e_1\}} = \{U, \{h_1, h_2, h_4, h_5\}\} \neq \beta_R$. If the attribute '$e_2$' is removed from the set of condition attributes then [illegible] and hence $\tau_{R-\{e_2\}}$ = [illegible] and its basis $\beta_{R-\{e_2\}}$ = [illegible] $= \beta_R$. If $M = \{e_1, e_3\}$, then [illegible] $L(X)$ = [illegible] and $U_R(X)$ = [illegible] where $\sim$ is the equivalence relation on U with respect to M. Then the basis for the soft rough topology corresponding to M is given by β_M = [illegible] $= \beta_{R-\{e_1\}} \neq \beta_{R}$. Therefore, $Core(R) = \{e_1, e_3\}$.

Observation

Since the Core(R) has e_1 and e_3 as its elements, wooden and in gold retained houses are the key attributes to select the best house.

5. Conclusion

In this paper we have shown that the concept of soft rough topology has been applied to find the key factors of selection of the best out going student from the particular year and selecting the suitable house problem using the algorithm. By this method we need not to compare all the given attributes but it is enough to compare only the core(R). The key factors for the recruitment process of a software concern can be found using the proposed algorithm.

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