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Research Article

APPLYING ROUGH SET THEORY IN FEEDBACK ANALYSIS

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ABSTRACT

Feedback analysis is a main procedure of discriminate analysis of faculty feedback. Rough set theory provides a tool to analyze feedback and also offers the algorithm based upon the hidden pattern in data which adequately increases the efficiency of the organization.The paper describes the feedback analysis of the members of faculty in a teaching institute.

KEY WORDS: Feedback Analysis, Rough Set Approximations, Educational system, Attribute Reduction

INTRODUCTION

In day to day life, we come across with the incomplete or imprecise information or knowledge to understand our surroundings, to learn new things, and to make plans for the future. Rough Set has been introduced by Pawlak in 1982[1,2] as a tool to deal with, uncertain knowledge. Its philosophy is based on the assumption that, in contrast to the classical set. This theory uses different approach to uncertainty. The main concept of this Theory is Lower and Upper Approximations.The main advantage of this theory is that it doesn't need any base about data like probability in statistics or grade of membership in fuzzy set theory[1].

The theory has found many interesting applications in medicine, pharmacology, business, banking, market research, engineering design, conflict analysis, image processing, decision analysis, and other fields[3,4].Advantage of this theory is that it allows analyzing both quantitative and qualitative feature and also it gives straight forward interpretation of result[4].

ROUGH SETS

Information System

Information system is nothing but Data table. Data table IS = (U,A), where A is attributes and let U be a finite set of objects. These objects of the universe U are characterized by a finite set of attributes A.

Indiscernibility Relation

Equivalence classes are called indiscernible. If the values of conditional attributes of some objects are same, those objects are declared as indiscernible.Indiscernibility relation is starting point to study of Rough set theory and is generated by information about object of interest. Any subset B of A determines a binary relation on U which will be called an indiscernibility relation

Let IS=(U,A) be an information system, then with any $B \subseteq A$ there is an associateequivalence relation $IND_{IS}(B)=\{(x, y) \in U: \text{ for all } a \in B, a(x)=a(y)\}$ where $IND_{IS}(B)$ is called the B-indiscernibility relation.

Decision Table

A decision table is a special case of information system, $S=(U,A\cup\{d\})$, where attributes in A are called condition attributes and d as decision attributes

Approximation

Equivalence classes are called indiscernible. If the values of conditional attributes of some objects are same, those objects are declared as indiscernible. Let S= (U,A,V,f) be an Information System, Let B be any subset of A and *IND(B)* is any indiscernibility relation generated by B on U.

Lower Approximation

The lower Approximation contains all objects which surely belongs to the set,

$R_*(x)=\{R(x): R(x)\subseteq X\}$

Upper Approximation

The Upper Approximation contains all objects which possible belong to the set,

$R^*(x)=\{R(x): R(x) \cap X \neq \emptyset\}$

Boundary Region

The difference between Upper and Lower Approximation is called Boundary Region.

$RN_R(X) = R^*(x) - R_*(x)$

Reduct and Core

The concepts of core and reduct are two fundamental concepts of the rough set theory. The reduct is the essential part of an IS, which can discern all objects discernible by the original IS. The core isthe common part of all reduct. Simplification of the IS can be achieved bydropping certain values of attributes, which areunnecessary for the system, i.e., by eliminating someof these values in such a way that we are still able todiscern all elementary sets in the system. Theprocedure of finding core and reducts of the attribute values is similar to that of finding core and reducts of the attributes[5,6,7].

ROUGH SET IN FEEDBACK ANALYSIS

Presently, there is a practice in most of the teaching institute, to take feedback of each faculty from their students. This data which is received from the feedback process not only gives clear picture of students opinion about their faculty, but also tells about other information like whether the teaching methodology use by faculty is relevant for the students, tells about punctuality of faculty, their behavior towards student's etc. And depending on the analysis of this feedback, performance of the faculty is decided. Point of the feedback on which data is received may vary institute to institute.

In this research paper, we have considered feedback data of 9 faculty members of an institute, which are dependent on 9 conditional attributes.

Table 1 consists of 9 faculty feedback analysis. The columns and rows in this table are attributes and objects, respectively;every row consists of a feedback summary. In table II, the set {F1, F2,F3,F4, F5,F6,F7,F8,F9} representsFaculty members as object and the set {C1,C2,C3,C4,C5,C6,C7,C8,C9} represents condition attributes. The description of condition attributes is shown in Table 1.

Table 1: Condition Attributes

S.no.	Condition	Description
1	C1	Teaching course material and lecture preparation
2	C2	Presentation skills and effectiveness
3	C3	Reference to real life application in theory classes
4	C4	Coverage of syllabus
5	C5	Interaction with students
6	C6	Ability to answer students queries
7	C7	Teaching competence/ core Knowledge
8	C8	Punctuality/ Regularity
9	C9	Personal Counseling and guidance

INDISCERNIBILITY RELETION

In Table 2, it is clear that the set {F1,F3,F4,F7,F8,F9} is indiscernible in terms of C2, {F1,F2,F5,F6,F7,F9}is indiscernible in terms of C3. In this table C4,C5,C6,C7,C8 and C9 generate indiscernibility element sets: {F1,F2,F5,F6,F7} and {F4,F8}.

LOWER AND UPPER APPROXIMATION

Then the lower and upper approximation is follows:

R_* (x)= {F2,F3,F4,F5,F6,F8,F9}

R*(x)= {F1,F2,F3,F4,F5,F6,F7,F8,F9}

RN_R(x)={F1,F7}

Table 1 classifiesentities into two equivalence classes, called decisionclasses.

DECISION1={F1,F2,F5,F6,F9}=[E].

DECISION2={F3,F4,F7,F8}=[VG].

The equivalence relationIND(C) classifies entities into four equivalence classes, called condition classes.

CASE1={F2,F5,F6}, CASE2={F3},

CASE3={F4, F8}, CASE4={F9}

Four decision rules are:

CASE1 ⇒ DECISION1; CASE2 ⇒DECISION2; CASE3 ⇒ DECISION2; CASE4 ⇒DECISION1.

Inference Rules: The relationship induces inferencerules:

1. If C1=E, C2=E, C3=VG, C4=E, C5=E, C6=E, C7=E, C8=E, C9=E then Result=E
2. If C1=A, C2=VG, C3=A, C4=VG, C5=VG, C6=VG,C7=VG,C8=VG,C9=VG then Result=VG
3. If C1=VG, C2=VG, C3=A, C4=VG, C5=VG, C6=VG,C7=VG,C8=E,C9=VG then Result=VG
4. If C1=VG, C2=VG, C3=VG, C4=VG, C5=E, C6=E, C7=E,C8=E,C9=VG then Result=E

ATTRIBUTES REDUCTION

If attribute C2 is removed, it is found that result i.e. decision is not changed.

Table 2: Information System

Object	Condition Attributes									Decision Attributes
	C1	C2	C3	C4	C5	C6	C7	C8	C9	
F1	VG	VG	VG	E	E	E	E	E	E	E
F2	E	E	VG	E	E	E	E	E	E	E
F3	A	VG	A	VG	VG	VG	VG	VG	VG	VG
F4	VG	VG	A	VG	VG	VG	VG	E	VG	VG
F5	E	E	VG	E	E	E	E	E	E	E
F6	E	E	VG	E	E	E	E	E	E	E
F7	VG	VG	VG	E	E	E	E	E	E	VG
F8	VG	VG	A	VG	VG	VG	VG	E	VG	VG
F9	VG	VG	VG	VG	E	E	E	E	VG	E

(A: average, VG: very good, E: excellent)

Table 3

Object	Condition Attribute								Decision Attribute
	C1	C3	C4	C5	C6	C7	C8	C9	
F1	VG	VG	E	E	E	E	E	E	E
F2	E	VG	E	E	E	E	E	E	E
F3	A	A	VG	VG	VG	VG	VG	VG	VG
F4	VG	A	VG	VG	VG	VG	E	VG	VG
F5	E	VG	E	E	E	E	E	E	E
F6	E	VG	E	E	E	E	E	E	E
F7	VG	VG	E	E	E	E	E	E	VG
F8	VG	A	VG	VG	VG	VG	E	VG	VG
F9	VG	VG	VG	E	E	E	E	VG	E

Similarly if attributes C1, C4, C5, C7, C9, are removed, then also decision is not impacted.

Table 4

Object	Condition Attributes			Decision Attribute
	C3	C6	C8	
F1	VG	E	E	E
F2	VG	E	E	E
F3	A	VG	VG	VG
F4	A	VG	E	VG
F5	VG	E	E	E
F6	VG	E	E	E
F7	VG	E	E	VG
F8	A	VG	E	VG
F9	VG	E	E	E

The optimized result in table 4 can design as a decision algorithm.

DECISION ALGORITHM

If (C3=VG), (C6=E) and (C8=E) then (decision= E)

If (C3=VG), (C6=E) and (C8 =E) then (decision= VG)

If (C3=A), (C6=VG) and (C8=VG) then (decision= VG)

If(C3=A), (C6=VG) and (C8 =E) then (decision= VG)

Instead of considering all 9 attributes, if only 3 attributes are considered then also the result is same. So less time is consumed without any impact on final result

CONCLUSION

In the paper theRough Set Theory is applied in feedback analysis through the use of reducts. After collecting relevant data from the institute, thedata is reduced by reducing the number of attributes, and attributing values without disturbing theaccuracy

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