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Decision Making Using Rough Topology and Indiscernibility Matrix for Corona Virus Diagnosis

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ABSTRACT

Rough set theory is a new mathematical tool for dealing with vague, imprecise, inconsistent and uncertain knowledge. In recent years the research and applications on rough set theory have attracted more. In this paper, we have introduced and analyze the Rough set theory and also decide the factors for corona virus diagnosis by using Indiscernibility matrix.

Keywords : Rough sets, Set Approximation, Basis, Indiscernibility Matrix

I. INTRODUCTION

Zdzislaw I. pawlak introduced the theory of rough set as an extension of set theory for the study of intelligent systems characterized by insufficient and incomplete information. Rough sets Theory is one of many mathematics approaches to handle imprecision and uncertainty. Rough set theory is efficient model to capture uncertainty in data using rough set techniques is easy and convincing.

II. PRELIMINARIES

2.1 ROUGH SET

Rough set constitutes a sound basis for KOD (Knowledge Discovery is Databases).If offers mathematical tools to discover patterns hidden is data.

It can be used for feature selection, feature extraction, data reduction and decision rule generation, pattern extraction.

Basic concepts of Rough sets:

- ✓ Information system/Tables
- ✓ Indiscernibility
- ✓ Set Approximation
- ✓ Deducts and core
- ✓ Rough Membership
- ✓ Depending of attribute

2.2 INDISCERNIBILITY:

It is a relation between two objects or more where are the values are identical is relation to a subset of considered attributes.

The same or indiscernible objects may be represented several times, or some of the attributes may be superfluous. A binary relation R(x) ⊆ X×X which is reflexive (if an object is in relation with itself xRx), symmetric (if xRy then yRx) and transitive (if xRy and yRz then xRz) is called an equivalence relation. The equivalence class of an element x∈X consists of all objects y∈X such that xRY. Let A = (U, A) be an

information system, then with any B ⊆A there is associated an equivalence relation I(B):

$$I(B)=\{(x,x')\in U^2 | \forall a \epsilon B a(x)=a(x')\}$$

I(B) is called the indiscernibility relation.

2.3 ROUGH SET:

Rough set concept can be defined by means of topological operations, interior and closure, approximations. Let U be a non-empty finite set of objects called the universe and R be an equivalence relation on U named as the indiscernibility relation. Then U is divided into disjoint equivalence classes. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair (U,R) is said to be the approximation space. Let X⊆U.

2.4 SET APPROXIMATION:

2.4.1 Lower Approximation(R_L(X)):

Lower Approximation of objects which can be classified which full certainty as members of set X, using attribute sub B, Its denoted by R_L (X).

$$\underline{B}(X) \text{(or) } R_L(X) = \{X:R(X) \subseteq X\}.$$

2.4.2 Upper Approximation(R_U(X)):

Upper Approximation of X is collection of objects that may possible by classified as member of set X,

$\overline{B}(X)$ (or) $R_U(X) = \{x : R(x) \cap X \neq \emptyset\}$, its denoted by $R_U(X)$.

2.5 BOUNDARY REGION(RN_R(X)):

Comprises objects that cannot be classified with certainty to be weather inside X nor outside X, using attribute set B.
Boundary Region of X (or) it's denoted by $RN_R(X)$

$BNB(X) = \overline{B}(X) - \underline{B}(X)$ (or) $RN_R(X) = R_U(X) - R_L(X)$
Boundary outside region of X , U- $\overline{B}(X)$

III. ALGORITHM

Step:1
Given a finite universe U, a finite set A of attributes that is divided into two class, condition attributes and decision attributes, an equivalence relation on finite set. Corresponding to condition attributes and a subset X of finite set, represent the data as an information table, columns by attributes then rows by objects and entries of the table are attribute values.

Step:2
Find the lower approximation, upper approximation and boundary region.

Step:3
Generated by Rough topology and Basis.

Step:4
Form the Indiscernibility Matrix.

Step:5
Find the indiscernibility function which gives the Core. Applying indiscernibility matrix I(B) for the basis of the rough topology.

IV. CORONA VIRUS DIAGNOSIS

Table 1

Patients	A	B	C	D	E	F	Corona Virus
P_1	Yes	Yes	Yes	No	No	Very High	Yes
P_2	Yes	Yes	No	Yes	Yes	High	Yes
P_3	No	Yes	Yes	Yes	No	Medium	No
P_4	Yes	Yes	Yes	No	No	High	Yes
P_5	Yes	No	Yes	Yes	Yes	Very High	Yes
P_6	Yes	No	Yes	No	Yes	Medium	No
P_7	Yes	No	No	No	Yes	Medium	No

A-Upper respiratory infection
B- Coughing
C-Sore Throat
D-Headache
E-Runny Nose
F-Temperature (or) High Fever

Rows of the tables $\{P_1, P_2, P_3, P_4, P_5, P_6, P_7\}$ are called examples **(objects).**

Then **Conditional attributes**{ Upper respiratory infection, Coughing, Sore Throat, Headache, Runny Nose, High Temperature (or) High Fever}.
The **Decisional attribute** { Corona Virus }.

Equivalence Class:

$\{P_1, P_4\}\{P_2\}\{P_3\}\{P_5\}\{P_6\}\{P_7\}$

Lower Approximation (R_L):

$\{P_1, P_2, P_4, P_5\}$

Upper Approximation (R_U):

$\{P_1, P_2, P_4, P_5\}$

Boundary region (RN_R):

$\{\phi\}$

Outside region (RN_O):

$\{P_3, P_6, P_7\}$

Rough topology:

$\boldsymbol{\tau = \{U, \emptyset, R_L, R_U, RN_R, RN_O\}}$

$\tau = \{U, \emptyset, \{P_1, P_2, P_4, P_5\}, \{P_1, P_2, P_4, P_5\}, \{\phi\}, \{P_3, P_6, P_7\}\}$

Basis:

$\boldsymbol{B = \{U, \emptyset, R_L, RN_R\}}$

$= \{U, \emptyset, \{P_1, P_2, P_4, P_5\}, \{\phi\}\}$

INDISCERNIBILITY MATRIX:

Let, $X1 = \{P_1, P_2, P_4, P_5\}$

$X2 = \{\phi\}$

TABLE: 2

	X_1
X_1	A+B+F

The indisernibility function for the table is A+B+F. Hence the

CORE = { A+B+F}.

Therefore, severe are the attributes that decides the Corona Virus.

V. CONCLUSION

Rough set has been used for knowledge representation; data mining; dealing with imperfect data; reducing knowledge representation and for analysing attribute dependencies, In some parts of the virus, still we can see the occurrence of natural disease oftenly. In this paper, the concept has been applied to find out the deciding factors for Corona Virus.

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