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ROUGH TOPOLOGY TO SAMPLE POPULATION

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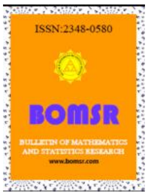

ABSTRACT

This paper deals with rough topology. Here problem and its solution on rough topology is discussed. The concept of rough topology has been applied here to find the most common death rate year in some states of India and found that the details are correct for the sample population.

Key words: Approximation space, Boundary region, Rough topology.

1. INTRODUCTION

Rough set theory is introduced by Z.Pawlak .It is a mathematical tool for representing, reasoning and decision making in the case of certain information. Rough set theory has a close connection with many other theories. Rough set theory have been proposed for a wide variety of application. In particular the rough set approach seem to be important for artificial intelligence and cognitive science, especially in machine learning, knowledge discovery, data mining, approximate reasoning and pattern recognition. The lower and upper approximation of a set are analogous to the interior and closure operation in a topology generated by data .In this paper, which year all the states have high death rate is found by applying rough topology.

Rough set methods can be applied as a component of hybrid solution in machine learning and data mining . They have been found to be particularly useful for rule induction and feature selection.Rough set based data analysis method have been successfully applied inBio informatics, Economics, Finance, Medicine, Multimedia, Web and text mining, Signal and image processing, Software engineering(example power system and control engineering, Robotic engineering). Recently the three regions of acceptance, rejection and deferment this leads to three way decision making approach with the model which can potentially lead to interesting figure application.

2. PRELIMINARIES

DEFINITION 2.1TOPOLOGIZED APPROXIMATION SPACE

Let K = (X , R) be an approximation space with general relation R and τ_k is the topology associated to K . Then the triple k =(X , R, τ_k) is called a topologized approximation space

DEFINITIONS 2.2 UPPER APPROXIMATION:

Let U be a universal set (non empty finite set) and R be an equivalence relation on U. Let X be a subset of U then the upper approximation of X with respect to R on U is denoted as $R^*(X)$ and defined as $R^*(X)$= {R(x):R(x)$\neq \phi$}. i, e R*(X)=cl(x)(here cl (x) is closure of X)

Example 2.3

Let U= {a, b, c, d, e, f}(universal set).U/R={{a, b}, {c, d},{e}}. X= {a, c, d}. Upper approximation of X with respect to U that is $R^*(X)$= {a, b, c, d}

DEFINITION 2.4 LOWER APPROXIMATION:

Let U be a universal set (non empty finite set) and R be an equivalence relation on U. Let X be a subset of U then the lower approximation of X with respect to R on U is denoted as $R_*(X)$ and defined as $R_*(X)$ = {R(x) : R(x)$\subseteq$X}. Also $R_*(X)$= int (X).

EXAMPLE2.4:

Let U= {a, b, c, d, e, f}(universal set) and U/R={{a, b}, {c, d},{e}}. X= {a, c, d}. Lower approximation of R with respect to X on U is $R_*(X)$= {c, d}

BOUNDARRY REGION 2.5:

The boundary region of X is denoted by $B_R(X)$ and is defined by $B_R(X)= R^*(X) – R_*(X)$

EXAMPLE 2.6

Let U={a, b, c, d, e, f}(universal set). U/R={{a, b}, {c, d},{e}}. X= {a, c, d}. Upper approximation of X with respect to U that is $R^*(X)$={a, b, c, d}.Lower approximation of R with respect to X on U is $R_*(X)$ = {c, d}

$B_R(X)$= {a, b, c, d}-{c, d }= {a, b}

$B_R(X)$ = {a, b}

DEFINITON 2.7 ROUGH SET

If the lower approximation of a set is not equal to upper approximation of that set then the set is called rough set. That is $R_*(X)\neq R^*(X)$. ($B_R(X)\neq \phi$

EXAMPLE 2.8

Let U ={1, 2, 3, 4, 5, },U/R = {{1, 2},{3, 4}, {5}}, X= {1, 3, 4}.$R^*(X)$ = {1, 2, 3, 4}. $R_*(X)$ = {3, 4}

$R_*(X)\neq R^*(X)\Longrightarrow$ ($B_R(X)\neq \phi$. So that X is rough set.

DEFINTION 2.9 ROUGH TOPOLOGY

Let U be the universe and R be a equivalence relation on U. Let X be the subset of U(X$\subset$ U) if τ_R is said to be rough topology on U then it satisfies the following condition

(i) U and empty set belongs to τ_R

(ii) τ_R closed under arbitrary union

(iii) τ_R is closed under finite intersection

here τ_R={U, , $R_*(X)$, $R^*(X)$, $B_R(X)$} and(U, τ_R, X) is called rough topological space.

DEFINITION 2.10 BASIS OF ROUGH TOPOLOGY:

If τ_R is a rough topology on U with respect to X , then the set□={U, $R_*(X)$, $B_R(X)$} is called as the basis of the Rough topology

EXAMPLE 2.11

Let U={1, 2, 3, 4, 5}. U/R={{1,2}, {3, 4}, {5}}.X= {1,3, 4}

Then $R_*(X)$ = {1, 2, 3, 4}and $R^*(X)$= {3,4 }

$B_R(X)= R^*(X)-R_*(X)$ = {1, 2, 3, 4}-{3,4} $B_R(X)$ = {1,2}

The rough topology={U, , {1, 2, 3, ,4},{3, 4},{1,2}}

3. ALGORITHM FOR DECIDING COMMON FACTOR

Step:1 Write the finite universe set .choose the class. That is choose the subsets. Write the attributes as the condition.

Step: 2 To find Lower approximation, Upper approximation, Boundary region

Step: 3 Generate the rough topology (τ_R)

Step: 4 Generate basis of rough topology ($B_R(X)$)

Step: 5 Remove the first condition from the given table. Then find the new lower, upper approximation and boundary condition for remaining attributes .

Step: 6 Generate the new rough topology and basis for removing attributes .

Step:7 Repeat the steps 4, 5, 6 for all attributes.

Step :8 Find the core and decide the common factor.

4. ROUGH TOPOLOGY IN DEATH RATES

The four years data of the death rate for ten states in India is given below

STATE NAME	2016	2015	2014	2013	Percentage%
Sikkim(A_1)	Low	Low	medium	medium	Low
Tamil Nadu(A_2)	Low	High	high	Very High	High
Tripura(A_3)	High	Very high	low	Low	Low
Uttrakhand (A_4)	High	Very high	high	Very high	High
West Bengal(A_5)	Medium	Medium	high	High	Low
Goa(A_6)	High	High	high	High	Low
Kerala(A_7)	Very high	High	high	High	High
Gujarat(A_8)	high	High	high	High	High
Punjab(A_9)	Low	Low	high	High	High
Jammu Kashmir(A_{10})	Low	Low	medium	medium	Low

To find most death of the year:

Here column indicates the years and row indicates the name of the state.

Now to write the universal set U= $\{A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}\}$

Divide the two classes

X=$\{A_1, A_3, A_5, A_6, A_{10}\}$ (CACE 1)

X= $\{A_2, A_4, A_7, A_8, A_9\}$ (CASE 2)

U/I(R)= $\{\{A_1, A_{10}\},\{A_2\}, \{A_3\},\{A_4\},\{A_5\},\{A_6, A_8, A_9\},\{A_7\}\}$

$R_*(X)= \{A_1, A_3, A_5, A_{10}\}$ and $R^*(X)= \{A_1, A_3, A_5, A_6, A_8, A_9, A_{10}\}$

$B_R(X)= \{A_6, A_8, A_9\}$

$\tau_{R}=\{U,\emptyset, \{A_1, A_3, A_5, A_{10}\},\{A_1, A_3, A_5, A_6, A_8, A_9, A_{10}\},\{A_6, A_8, A_9\}\}$

$\beta_R= \{U, \{\{A_1, A_3, A_5, A_{10}\}, \{A_6, A_8, A_9\}\}$

NOW WE REMOVE THE YEAR 2016, We get

$U/(R\text{-}2016)= \{\{A_1, A_{10}\},\{A_2\}, \{A_3\},\{A_4\},\{A_5\},\{A_6, A_8, A_9\},\{A_7\}\}$

$(R\text{-}2016)_*(X)= \{A_1, A_3, A_5, A_{10}\}$ and $(R\text{-}2016)^*(X)= \{A_1, A_5, A_6, A_7, A_8, A_9, A_{10}\}$

$B_{(R\text{-}2016)}(X) = \{A_6, A_7, A_8, A_9, A_{10}\}$

$\tau_{R\text{-}2016} = \{U, \emptyset, \{A_1, A_3, A_5, A_5\},\{A_1, A_5, A_6, A_7, A_8, A_9, A_{10}\}, \{A_6, A_7, A_8, A_9, A_{10}\}\}$

$\beta_{R\text{-}2016}(X)= \{U, \{A_1, A_3, A_5, A_{10}\}, \{A_6, A_7, A_8, A_9, A_{10}\}\}$

$\tau_R(X) \neq \tau_{R\text{-}2016}(X), \beta_R(X) \neq \beta_{R\text{-}2016}(X)$

NOW TO REMOVE THE YEAR 2015

$U/(R\text{-}2015) = \{\{A_1, A_{10}\},\{A_2\}, \{A_3\},\{A_4\},\{A_5\},\{A_6, A_8, A_9\},\{A_7\}\}$

$U/(IR) = U/(R\text{-}2015)$

NEXT TO REMOVE THE YEAR 2014

$U/(R\text{-}2014)= \{\{A_1, A_{10}\},\{A_2\}, \{A_3\},\{A_4\},\{A_5\},\{A_6, A_8, A_9\},\{A_7\}\}$

$U/IR = U/(R\text{-}2014)$

NEXT WE REMOVE 2013, We get

$U/I(R\text{-}2013) = \{\{A_1, A_{10}\},\{A_2, A_6, A_8, A_9\}, \{A_3\},\{A_4\},\{A_5\}, \{A_7\}\}$

$(R\text{-}2013)_*(X) = \{A_1, A_3, A_5, A_{10}\}$ and $(R\text{-}2103^*(X) = \{A_1, A_2, A_5, A_6, A_8, A_9\}$

$B_{(R\text{-}2013)}(X) = \{A_6, A_8, A_9\}$

$\tau_{(R\text{-}2013)}(X) =\{U, \emptyset, \{A_1, A_3, A_5, A_{10}\}, \{A_1, A_2, A_5, A_6, A_8, A_9\}, \{A_6, A_8, A_9\}\}$

$\tau_{R\text{-}2013} \neq \tau_R, \beta_{R\text{-}2013} \neq$ □R. The core is {2016, 2013}

CASE 2:For this case $X = \{A_2, A_4, A_7, A_8, A_9\}$

$U/I(R)= \{\{A_1, A_{10}\},\{A_2\}, \{A_3\},\{A_4\},\{A_5\},\{A_6, A_8, A_9\},\{A_7\}\}$

$(R\text{-}2016)_*(X)= \{A_2, A_4, A_7\}$ and $(R\text{-}2016)^*(X)= \{A_2, A_4, A_7, A_6, A_8, A_9\}$

$B_{(R\text{-}2016}(X)= \{A_6, A_8, A_9\}$. $\tau_R(X) \neq \tau_{R\text{-}2016}(X)$. $\beta_R(X) \neq \beta_{R\text{-}2016}(X)$

TO REMOVE 2015, We get

$U/(R\text{-}2015) = \{\{A_1, A_{10}\},\{A_2\}, \{A_3\},\{A_4\},\{A_5\},\{A_6, A_8, A_9\},\{A_7\}\}$

$U/(IR) = U/(R\text{-}2015)$

NEXT TO REMOVE THE YEAR 2014

$U/(R\text{-}2014)= \{\{A_1, A_{10}\},\{A_2\}, \{A_3\},\{A_4\},\{A_5\},\{A_6, A_8, A_9\},\{A_7\}\}$

$U/IR = U/(R\text{-}2014)$

NEXT WE REMOVE 2013, We get

$U/I(R\text{-}2013) = \{\{A_1, A_{10}\},\{A_2, A_6, A_8, A_9\}, \{A_3\},\{A_4\},\{A_5\}, \{A_7\}\}$

$(R\text{-}2013)_*(X) =\{A_4, A_7\}$ and $(R\text{-}2013)^*(X) = \{A_2, A_4, A_6, A_8, A_9, A_7\}$

$B_{(R\text{-}2013)}(X) = \{A_2,A_6, A_8, A_9\}$

$\tau_{(R\text{-}2013)}(X) =\{U, \emptyset, \{A_4, A_7\}, \{A_2, A_4, A_6, A_8, A_9, A_7\}, \{A_6, A_8, A_9\}\}$

$\tau_{R\text{-}2013} \neq \tau_R$. $\beta_{R\text{-}2013} \neq \beta_R$. Core is {2016,2013}

Result: Most death occurred in the years 2013 and 2016

5. CONCLUSION

In this paper rough topology theory is applied to a problem and verified with its solution. The concept of rough topology has been applied to find the year which had most death rate in all the states of India from the given table of sample population. Rough topology can be applied to different data collected in different manners. It is interesting to do more innovative research on this theory.

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