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Application of Initial Right Nano Topological Space in Decision Making

R. Maheswari[1], R. Malathi[2], S. Nesha[3]

[1]Assistant Professor, Department of Mathematics, Shrimati Indira Gandhi College, Affiliated to Bharathidasan University,Trichy-620 002, Tamil Nadu.
Email id: mahimathematics@gmail.com
[2]PG Scholar, Department of Mathematics, Shrimati Indira Gandhi College, Affiliated to Bharathidasan University, Trichy-620 002, Tamil Nadu.
Email id: malathiraja2003@gmail.com
[3]PG Scholar, Department of Mathematics, Shrimati Indira Gandhi College, Affiliated to Bharathidasan University, Trichy-620 002, Tamil Nadu.
Email id: neshasekar26@gmail.com

ABSTRACT:

The main aim of this paper is to investigate how the condition of Initial Right Nano topology is used to find the impact factors of Cardiovascular Disease.

Keywords: Upper Approximation, Lower Approximation, Boundary Region, Nano Topological space Cardiovacular Disease.

1.Introduction:

Cardiovascular disease is a general term for condition affecting the Heart or Blood vessels. It usually associate with a buildup of fatty deposits inside the arteries and an increased risk of blood clots.

L.Thivagar and C. Richard introduce the concept of Nano topological spaces with respect to a subset X of a Universe $\mathbb{U}$. The topology introduce here is named Nono topology because of its size, since it has atmost five elememts. In this paper we indentify the impact factors of Cardiovasuclar Disease in Patient via Nano topology.

2.Initial Right neighbourhood:

Definition 2.1

Initial Right Neighbourhood:

Let $\gamma \in \mathbb{U}$. Then the initial right neighbourhood of γ $\Re_{ir}(\gamma) = \{\delta \in \mathbb{U} \mid \Re_{ir}(\gamma) \subseteq \Re_{ir}(\delta)\}$, where $\Re_{ir}(\gamma) = \{\delta \in \mathbb{U} \mid \delta \Re \gamma\}$

Definition 2.2

Initial Right Lower approximation:

The Initial right lower approximation of X with respect to $\Re$ is the set of all objects which can for certain classified as $X \subseteq \mathbb{U}$ with respect to $\Re$ and it is denoted by $\underline{\mathcal{L}}_{ir}(x)$

$$(i.e.)\ \underline{\mathcal{L}}_{ir}(x) = \bigcup_{x \in \mathbb{U}} \{\Re_{ir}(x) : \Re_{ir}(x) \subseteq x\}$$

Definition 2.3

Initial Right Upper approximation :

The Initial right upper approximation of X with respect to $\Re$ is the set of all objects which can be possible classified as $X \subseteq \mathbb{U}$ with respect to $\Re$ and it is denoted by $\overline{\mathfrak{U}}'_{ir}(X)$

$$(\text{i.e.})\overline{\mathfrak{U}}_{ir}(x) = \cup_{x \in \mathbb{U}} \{\Re_{ir}(x) : \Re_{ir}(x) \cap X \neq \emptyset\}$$

Definition 2.4

Boundary region :

The boundary region of X with respect to $\Re$ is the set of all objects which can classified neither as X nor as with respect to $\Re$ and it is denoted by $\mathfrak{B}nd_{ir}(X)$.

(i.e.) $\mathfrak{B}nd_{ir}(X) = \overline{\mathfrak{U}}_{ir}(X) - \underline{\mathcal{L}}_{ir}(X)$

Definition 2.5

Nano Topology :

Let $\mathbb{U}$ be a non-empty, finite universe of objects be an equivalence relation on $\mathbb{U}$. Let X$\subseteq \mathbb{U}$. Let $\tau_{ir}(X) = \{\mathbb{U}, \emptyset, \underline{\mathcal{L}}_{ir}(X), \overline{\mathfrak{U}}_{ir}(X), \mathfrak{B}nd_{ir}(X)\}$. Then $\tau_{ir}(X)$ is called as the Nano topology with respect to $\mathbb{U}$.Elements of the nano topology are known as the Nano open sets in $\mathbb{U}$ and $(\mathbb{U}, \tau_{ir}(X))$ is called the nano topology space.

Definition 2.6

Basis:

Let $\mathbb{U}$ be a finite set and X $\subseteq \mathbb{U}$ then the basis of nano topology $\tau(X)$ is given by,

(i.e.) $\delta_{ir}(X) = \{\mathbb{U}, \underline{\mathcal{L}}_{ir}(X), \mathfrak{B}nd_{ir}(X)\}$

Application of Initial Right Nano Topology:

Here $\mathbb{U} = \cup_{i=1}^{15} S_1$ are the students with their Cardiovascular Disease

$\mathbb{U} = \{S_1, S_2, S_3, S_4, S_5, S_6, S_7, S_8, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$ and

A= {Irregular heartbeat (C_1),Chest pain(C_2), Heart Failure(C_3),Hypertenstion(C_4), Swollen feet or Ankle(C_5), Fatigue(C_6),Shortness of breath(C_7),Fainting(C_8),High blood pressure(C_9)}

A is classified as Q= $\{C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8, C_9\}$ and

X = $\{S_2, S_4, S_7, S_9, S_{10}, S_{11}, S_{15}\}$

Y=$\{S_1, S_3, S_5, S_6, S_8, S_{12}, S_{13}, S_{14}\}$

The following information table give the details of 15 Patients and the reasons for Cardiovacular Disease.

S.NO	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	**Affected Patients**
S_1	3	1	1	2	2	2	2	2	1	No
S_2	3	2	1	2	2	2	1	1	2	Yes
S_3	3	2	2	1	3	3	2	2	3	No
S_4	2	2	1	2	2	1	3	3	1	Yes
S_5	3	1	1	3	3	3	1	1	2	No
S_6	2	2	2	2	2	2	2	1	2	No
S_7	2	2	3	2	1	2	2	1	1	Yes
S_8	2	2	1	3	2	3	2	2	3	No
S_9	2	2	2	2	1	1	2	2	2	Yes
S_{10}	2	2	2	1	2	2	2	2	2	Yes
S_{11}	2	1	3	1	3	3	2	2	3	Yes
S_{12}	3	1	1	1	1	2	1	1	1	No
S_{13}	3	1	2	1	2	2	1	1	1	No
S_{14}	3	2	2	1	2	2	2	1	2	No
S_{15}	3	2	1	1	2	2	1	2	2	Yes

The family of equivalence classes Corresponding to Q is given by

$\mathbb{U}/\Re(X) = \{(S_1,S_1),(S_{12},S_1),(S_2,S_2),(S_{12},S_2),(S_3,S_3),(S_{10},S_3),(S_{12},S_3),(S_{13},S_3),$

$(S_{14},S_3),(S_{15},S_3),(S_4,S_4),(S_5,S_5),(S_{12},S_5),(S_6,S_6),(S_7,S_7),(S_8,S_8),(S_9,S_9),$

$(S_{10},S_{10}),(S_{11},S_{11}),(S_{12},S_{12}),(S_{12},S_{13}),(S_{12},S_{14}),(S_{12},S_{15}),(S_{13},S_{13}),(S_{13},S_{14}),$

$(S_{14},S_{14}),(S_{15},S_{15})\}$

Right Neighbourhood:

$\Re_r(S_1) = \{S_1\}, \Re_r(S_2) = \{S_2\}, \Re_r(S_3) = \{S_3\}, \Re_r(S_4) = \{S_4\}, \Re_r(S_5) = \{S_5\},$ $\Re_r(S_6) = \{S_6\}, \Re_r(S_7) = \{S_7\}, \Re_r(S_8) = \{S_8\}, \Re_r(S_9) = \{S_9\}, \Re_r(S_{10}) = \{S_3, S_{10}\},$ $\Re_r(S_{11}) = \{S_{11}\}, \Re_r(S_{12}) = \{S_1,S_2,S_3,S_5,S_{12},S_{13},S_{14},S_{15}\}, \Re_r(S_{13}) = \{S_3, S_{13}, S_{14}\},$

$\Re_r(S_{14}) = \{S_3, S_{14}\}, \Re_r(S_{15}) = \{S_3, S_{15}\}$

Initial Right Neighbourhood:

$\Re_{ir}(S_1) = \{S_1,S_{12}\}, \Re_{ir}(S_2) = \{S_2,S_{12}\}, \Re_{ir}(S_3) = \{S_3,S_{10},S_{12},S_{13},S_{14},S_{15}\},$ $\Re_{ir}(S_4) = \{S_4\}, \Re_{ir}(S_5) = \{S_5,S_{12}\}, \Re_{ir}(S_6) = \{S_6\}, \Re_{ir}(S_7) = \{S_7\}, \Re_{ir}(S_8) = \{S_8\}$ $\Re_{ir}(S_9) = \{S_9\}, \Re_{ir}(S_{10}) = \{S_{10}\}, \Re_{ir}(S_{11}) = \{S_{11}\}, \Re_{ir}(S_{12}) = \{S_{12}\},$ $\Re_{ir}(S_{13}) = \{S_{13},S_{12}\}, \Re_{ir}(S_{14}) = \{S_{12},S_{13},S_{14}\}, \Re_{ir}(15) = \{S_{12},S_{15}\}$

CASE I : Consider the level of the patients with their Cardiovacular Disease

Here the set of Affected patients is X = $\{S_2,S_4,S_7,S_9,S_{10},S_{11},S_{15}\}$

Then ,

$\underline{\mathcal{L}}_{ir}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir}(X) = \{S_2,S_3,S_4,S_7,S_9,S_{10},S_{11},S_{12},S_{13},S_{14},S_{15}\}$

$\mathfrak{Bnd}_{ir}(X) = \overline{\mathfrak{U}}_{ir}(X) - \underline{\mathcal{L}}_{ir}(X)$

$\mathfrak{Bnd}_{ir}(X) = \{S_2,S_3,S_4,S_7,S_9,S_{10},S_{11},S_{12},S_{13},S_{14},S_{15}\}$

Therefore the Nano topology is given by ,

$\tau_{ir}(X) = \{\mathbb{U}, \emptyset, \{S_2,S_3,S_4,S_7,S_9,S_{10},S_{11},S_{12},S_{13},S_{14},S_{15}\}\}$

STEP 1:

When the attribute "Irregular heartbeat (C_1)" is removed from Q.

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_1)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_1)}(X) = \{S_2,S_3,S_4,S_7,S_8,S_9,S_{10},S_{12},S_{13},S_{14},S_{15}\}$

$\mathfrak{Bnd}_{ir(Q-C_1)}(X) = \{S_2,S_3,S_4,S_7,S_8,S_9,S_{10},S_{12},S_{13},S_{14},S_{15}\}$

Therefore the Nano topology is given by ,

$\tau_{ir(Q-C_1)}(X) = \{\mathbb{U}, \emptyset, \{S_2,S_3,S_4,S_7,S_8,S_9,S_{10},S_{12},S_{13},S_{14},S_{15}\}\}$

Hence

$\tau_{ir(Q-C_1)}(X) \neq \tau_{ir}(X)$

STEP 2:

When the attribute "Chest pain (C_2)" is removed from Q

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_2)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_2)}(X) = \{S_2,S_3,S_4,S_5,S_7,S_9,S_{10},S_{11},S_{12},S_{13},S_{14},S_{15}\}$

$\mathfrak{Bnd}_{ir(Q-C_2)}(X) = \{S_2,S_3,S_4,S_5,S_7,S_9,S_{10},S_{11},S_{12},S_{13},S_{14},S_{15}\}$

Therefore the Nano topology is given by ,

$\tau_{ir(Q-C_2)}(X) = \{\mathbb{U}, \emptyset, \{S_2,S_3,S_4,S_5,S_7,S_9,S_{10},S_{11},S_{12},S_{13},S_{14},S_{15}\}\}$

Hence

$\tau_{ir(Q-C_2)}(X) \neq \tau_{ir}(X)$

STEP 3:

When the attribute " Heart Failure(C_3)" is removed from Q

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_3)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_3)}(X) = \{S_2, S_3, S_4, S_6, S_7, S_8, S_9, S_{10}, S_{12}, S_{13}, S_{14}, S_{15}\}$

$\mathfrak{Bnd}_{ir(Q-C_3)}(X) = \{S_2, S_3, S_4, S_6, S_7, S_8, S_9, S_{10}, S_{12}, S_{13}, S_{14}, S_{15}\}$

Therefore the Nano topology is given by ,

$\tau_{ir(Q-C_3)}(X) = \{\mathbb{U}, \emptyset, \{S_2, S_3, S_4, S_6, S_7, S_8, S_9, S_{10}, S_{12}, S_{13}, S_{14}, S_{15}\}\}$

Hence

$\tau_{ir(Q-C_3)}(X) \neq \tau_{ir}(X)$

STEP 4:

When the attribute "Hypertenstion (C_4)" is removed from Q.

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_4)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_4)}(X) = \{S_2, S_3, S_4, S_5, S_6, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

$\mathfrak{Bnd}_{ir(Q-C_4)}(X) = \{S_2, S_3, S_4, S_5, S_6, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

Therefore the Nano topology is given by ,

$\tau_{ir(Q-C_4)}(X) = \{\mathbb{U}, \emptyset, \{S_2, S_3, S_4, S_5, S_6, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}\}$

Hence

$\tau_{ir(Q-C_4)}(X) \neq \tau_{ir}(X)$

STEP 5:

When the attribute "Swollen feet (C_5)" is removed from Q.

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_5)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_5)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

$\mathfrak{Bnd}_{ir(Q-C_5)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

Therefore the Nano topology is given by ,

$\tau_{ir(Q-C_5)}(X) = \{\mathbb{U}, \emptyset, \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}\}$

Hence

$\tau_{ir(Q-C_5)}(X) = \tau_{ir}(X)$

STEP 6:

When the attribute "Fatigue (C_6)" is removed from Q

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_6)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_6)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

$\mathfrak{Bnd}_{ir(Q-C_6)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

Therefore the Nano topology is given by ,

$\tau_{ir(Q-C_6)}(X) = \{\mathbb{U}, \emptyset, \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}\}$

Hence

$\tau_{ir(Q-C_6)}(X) = \tau_{ir}(X)$

STEP 7:

When the attribute "Shortness of breath(C_7)" is removed from Q

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_7)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_7)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

$\mathfrak{Bnd}_{ir(Q-C_7)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

Therefore the Nano topology is given by ,

$$\tau_{ir(Q-C_7)}(X) = \{\mathbb{U}, \emptyset, \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}\}$$

Hence

$$\tau_{ir(Q-C_7)}(X) = \tau_{ir}(X)$$

STEP 8:

When the attribute "Fainting(C_8)" is removed from Q.

Then ,

$\underline{\mathcal{L}}_{ir(Q-C_8)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_8)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

$$\mathfrak{Bnd}_{ir(Q-C_8)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$$

Therefore the Nano topology is given by ,

$$\tau_{ir(Q-C_8)}(X) = \{\mathbb{U}, \emptyset, \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}\}$$

Hence

$$\tau_{ir(Q-C_8)}(X) = \tau_{ir}(X)$$

STEP 9:

When the attribute "High blood pressure (C_9)" is removed from Q.

Then,

$\underline{\mathcal{L}}_{ir(Q-C_9)}(X) = \emptyset$, $\overline{\mathfrak{U}}_{ir(Q-C_9)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$

$$\mathfrak{Bnd}_{ir(Q-C_9)}(X) = \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}$$

Therefore the Nano topology is given by ,

$$\tau_{ir(Q-C_9)}(X) = \{\mathbb{U}, \emptyset, \{S_2, S_3, S_4, S_7, S_9, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{15}\}\}$$

Hence

$$\tau_{ir(Q-C_9)}(X) = \tau_{ir}(X)$$

CASE II : Consider the unaffected Patient is Y = $\{S_1, S_3, S_5, S_6, S_8, S_{12}, S_{13}, S_{14}\}$

The following facts have been obtained

1. $\tau_{ir(Q-C_1)}(Y) \neq \tau_{ir}(Y)$
2. $\tau_{ir(Q-C_2)}(Y) \neq \tau_{ir}(Y)$
3. $\tau_{ir(Q-C_3)}(Y) \neq \tau_{ir}(Y)$
4. $\tau_{ir(Q-C_4)}(Y) \neq \tau_{ir}(Y)$
5. $\tau_{ir(Q-C_5)}(Y) \neq \tau_{ir}(Y)$
6. $\tau_{ir(Q-C_6)}(Y) \neq \tau_{ir}(Y)$
7. $\tau_{ir(Q-C_7)}(Y) \neq \tau_{ir}(Y)$
8. $\tau_{ir(Q-C_8)}(Y) \neq \tau_{ir}(Y)$
9. $\tau_{ir(Q-C_9)}(Y) \neq \tau_{ir}(Y)$

CONCLUSION:

We have concluded that Irregular heartbeat ,Chest pain, Heart Failure and Hypertension are the major factors of Cardiovascular Disease. Similarly, the corresponding Initial Right Nano topology are being used in decision making of real world problems in any field.

References:

1.Brindha.S,Sathishmohan.P and Rajendran.V,Attribute reduction in polycystic ovary syndrome via Nano topology using basis,Advances and Applications in Mathematical Sciences,18(2019),1487-1497.

2.Jayalakshmi.A,and C.Janaki,A new class of sets in Nano topological spaces with an application in Medical Diagnosis International journal of Applied Engineering Research,12(2017),5894-5899

3.LellisThivagar.M,Caramel Richard,on Nano forms of weakly open sets,International Journal of Mathematics and statistics,D.A.MaryInvention,1(2013),31-37.

4.D.A.Mary,I.Arockiarani,Oncharacterizations of Nano reg-classed set in Nano topological spaces,Int.J.Mod.En.Res.5(1(2015)68-76

5.Z.Pawlak,Rough sets,Int.J.Comput.Inf.Sci.11(5)(1982)341-356

6.A.Revathy,G.Ilango,Onnano β–open sets,Int.J.Eng.Contemp,Math.Sci.1(2)(2015)1-6.

7.Maheswari.R,Kathiroli.K,Diagonosing Hyperthyrodism in women using the concepts of Nano Topology,International Jounrnal of Research Publication and Reviews,Vol 4,no 10,pp 3083-3092 octobar2023.

8. Maheswari.R,Lavanya.P,Elimination of Attributes in peptic Ulcer in Human Being Via Nano Topology,International Journal of Research Publication and Reviews,Vol 4,no 10,pp 3072-3082 octobar 2023.