



Elimination of Attributes in Coccidiosis with Cattle Disease Through Nano Topology.

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Abstract:

The main objective of this paper is to apply elimination of attributes in information systems through Nano topological spaces. Also we identify the risk factors that cause Coccidiosis with cattle by using Nano topology.

Keywords: Nano topological space, basis, attributes, lower approximation, upper approximation, boundary region, core.

1. Introduction:

Coccidiosis occurs mainly in calves that are 3 weeks to 6 months of age and is usually accompanied by diarrhea varying in severity from watery manure to one containing blood. Animals affected with Coccidiosis often strain due to irritation of the lower bowel and rectum. The severity of the disease depends on a number of factors including the number of oocysts eaten, the species of Coccidia present, the age of the animal, or if the animal has developed immunity due to previous infection. Blood may appear in the manure after the second or third day of diarrhea. The symptoms of the diseases are Weakness, Low Production, Pale Comb, Rough Coat, Emaciation, Dehydration. A new topology called a Nano topology was introduced by Lellis Thivagar[3] and Cramel Richard. The topology introduced here is named Nano topology because of its size, since it has at most 5 elements. In this paper we identify the impact factor of Coccidiosis with cattle via Nano topology.

2. Preliminaries.

Definition: 2.1[3]

Let U be a non-empty finite set of subject called the “universe” and \mathfrak{R} be an equivalence relation on U named as the indisceribility relation elements belonging to the same equivalence class are said to be indiscerible with one another. The pair (U, \mathfrak{R}) is said to be approximate space. Let $X \subseteq U$.

I. Lower approximation:

The lower approximation of X with respect to \mathfrak{R} is the set of all objects which can for certain classified as X with respect to \mathfrak{R} and it is denoted by $\underline{LOW}_{\mathfrak{R}}(X)$.

$$(i.e.) \underline{LOW}_{\mathfrak{R}}(X) = \bigcup_{x \in U} \{\mathfrak{R}(x) : \mathfrak{R}(x) \subseteq X\}$$

where $\mathfrak{R}(x)$ denotes the equivalence class determined by x .

II. Upper approximation: -

The upper approximation of X with respect to \mathfrak{R} is the set of all objects which can be possibly classified as x with respect to \mathfrak{R} and it is denoted by

$$\overline{UPP}_{\mathfrak{R}}(X).$$

$$(i.e.) \overline{UPP}_{\mathfrak{R}}(X) = \bigcup_{x \in U} \{\mathfrak{R}(x) : \mathfrak{R}(x) \cap X \neq \emptyset\}$$

III. Boundary region:-

The boundary region of X with respect to \mathfrak{R} is the set of all objects which can classified neither as x nor as not x with respect to \mathfrak{R} and it is denoted by $B_{\mathfrak{R}}(X)$.

$$(i.e.) B_{\mathfrak{R}}(X) = \overline{UPP}_{\mathfrak{R}}(X) - \underline{LPP}_{\mathfrak{R}}(X)$$

IV. Nano topology:

Let U be a non-empty, finite universe of objects and \mathfrak{R} be an equivalence relation on U. Let $X \subseteq U$.

$$\text{Let } \tau_{\mathfrak{R}}(X) = \{U, \varphi, \underline{LOW}_{\mathfrak{R}}(X), \overline{UPP}_{\mathfrak{R}}(X), B_{\mathfrak{R}}(X)\}.$$

Then $\tau_{\mathfrak{R}}(X)$ is a topology on U, called as the Nano topology with respect to X.

Elements of the Nano topology are known as the Nano open sets in U and $(U, \tau_{\mathfrak{R}}(X))$ is called the Nan topological space.

Definition:2.2

Let U be a finite set and $X \subseteq U$ then the basis of Nano topology $\tau(X)$ is given by, $\beta_{\mathfrak{R}}(X) = \{U, \underline{LOW}_{\mathfrak{R}}(X), B_{\mathfrak{R}}(X)\}$.

3. Applications of Nano topology.

3.1 Algorithm:

Step:1 For a limited universe U, a limited set of attributes A which is partitioned in to two class S and D and an equivalence relation \mathfrak{R} on U corresponding to S.

Step: 2 Find the lower boundary, upper boundary and boundary region with respect to \mathfrak{R} .

Step: 3 Generate the Nano topology $\tau_S(X)$ and its basis $\beta_S(X)$.

Step: 4 Eliminate an attributes Y from S and determine lower boundary, upper boundary and boundary region for S-Y.

Step: 5 Generate the Nano topology $\tau_{S-Y}(X)$ and its basis $\beta_{S-Y}(X)$.

Step: 6 Repeat steps 4 and 5 for each attribute.

Step: 7 The CORE attributes are those for which $\beta_S(X) = \beta_{S-Y}(X)$.

Step:8 Eliminate an attribute not CORE. Repeat steps 4 and 7 and determine the CORE in all the cases.

Step: 9 The attributes in CORE are the risk factors that cause the disease.

INFORMATION TABLE

Cattle	weakness	Low production	Pale comb	Rough coat	Emaciation	Dehydration	Decision
C ₁	✓	✓	✗	✓	✓	✗	✓
C ₂	✗	✓	✓	✓	✗	✗	✓
C ₃	✓	✓	✗	✓	✓	✗	✗
C ₄	✗	✓	✗	✓	✗	✓	✓
C ₅	✗	✗	✗	✗	✗	✓	✗
C ₆	✓	✓	✓	✓	✓	✓	✓
C ₇	✗	✓	✓	✓	✗	✓	✗
C ₈	✓	✓	✗	✓	✗	✓	✗
C ₉	✓	✗	✗	✗	✗	✓	✗
C ₁₀	✓	✓	✓	✓	✓	✓	✓

Here $U = \bigcup_{i=1}^{10} C_i$ is the set of cattle is $U = \{C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10}\}$ and $A = \{\text{Weakness, Low production, Pale Comb, Rough Coat, Emaciation, Dehydration}\}$.

A is classified into two classes $S = \{W, LP, PC, RC, E, D\}$ and $D = \{\text{Coccidiosis}\}$. The family of equivalence classes U/S corresponding to S is given by

$$U/\mathfrak{R}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}$$

CASEI: CATTLE AFFECTED WITH COCCIDIOSIS.

Here the set of Cattle with Coccidiosis is $X = \{C_1, C_2, C_4, C_6, C_{10}\}$.

Then,

$$\underline{LOW}_{\mathfrak{R}}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{\mathfrak{R}}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{\mathfrak{R}}(X) = \{C_1, C_3\}.$$

Therefore, the Nano topology is given by,

$$\tau_S(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}$$

$$\beta_S(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}$$

STEP I:

When the attribute "WEAKNESS" is removed from S .

$$U/\mathfrak{R}_{(S-W)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_8\}, \{C_5, C_9\}, \{C_6, C_{10}\}, \{C_7\}\}$$

Then,

$$\underline{LOW}_{(S-W)}(X) = \{C_2, C_6, C_{10}\}$$

$$\overline{UPP}_{(S-W)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_8, C_{10}\}.$$

$$B_{(S-W)}(X) = \{C_1, C_3, C_4, C_8\}.$$

Then the Nano topology is given by,

$$\tau_{(S-W)}(X) = \{\varphi, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_8, C_{10}\}, \{C_1, C_3, C_4, C_8\}\}.$$

$$\beta_{(S-W)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4, C_8\}\}$$

$$\text{Hence, } \tau_{(S-W)}(X) \neq \tau_S(X) \text{ and } \beta_{(S-W)}(X) \neq \beta_S(X).$$

When the attribute "LOW PRODUCTION" is removed from S .

$$U/\mathfrak{R}_{(S-LP)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(S-LP)}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(S-LP)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(S-LP)}(X) = \{C_1, C_3\}.$$

Then the Nano topology is given by,

$$\tau_{(S-LP)}(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\beta_{(S-LP)}(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\text{Hence, } \tau_{(S-LP)}(X) = \tau_S(X) \text{ and } \beta_{(S-LP)}(X) = \beta_S(X).$$

When the attribute "PALE COMB" is removed from S .

$$U/\mathfrak{R}_{(S-PC)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_7\}, \{C_5\}, \{C_6, C_{10}\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(S-PC)}(X) = \{C_2, C_6, C_{10}\}.$$

$$\overline{UPP}_{(S-PC)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(S-PC)}(X) = \{C_1, C_3, C_4\}.$$

Then the Nano topology is given by,

$$\tau_{(S-PC)}(X) = \{\varphi, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3, C_4\}\}.$$

$$\beta_{(S-PC)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4\}\}.$$

Hence, $\tau_{(S-PC)}(X) \neq \tau_S(X)$ and $\beta_{(S-PC)}(X) \neq \beta_S(X)$.

When the attribute "ROUGH COAT" is removed from S.

$$U/\mathfrak{R}_{(S-RC)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$LOW_{(S-RC)}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(S-RC)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(S-RC)}(X) = \{C_1, C_3\}.$$

Then the Nano topology is given by,

$$\tau_{(S-RC)}(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\beta_{(S-RC)}(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

Hence, $\tau_{(S-RC)}(X) = \tau_S(X)$ and $\beta_{(S-RC)}(X) = \beta_S(X)$.

When the attribute "EMACIATION" is removed from S.

$$U/\mathfrak{R}_{(S-E)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$LOW_{(S-E)}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(S-E)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(S-E)}(X) = \{C_1, C_3\}.$$

Then the Nano topology is given by,

$$\tau_{(S-E)}(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\beta_{(S-E)}(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

Hence, $\tau_{(S-E)}(X) = \tau_S(X)$ and $\beta_{(S-E)}(X) = \beta_S(X)$.

When the attribute "DEHYDRATION" is removed from S.

$$U/\mathfrak{R}_{(S-D)}(X) = \{\{C_1, C_3\}, \{C_2, C_7\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$LOW_{(S-D)}(X) = \{C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(S-D)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}.$$

$$B_{(S-D)}(X) = \{C_1, C_2, C_3, C_7\}.$$

Then the Nano topology is given by,

$$\tau_{(S-D)}(X) = \{\varphi, U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}, \{C_1, C_2, C_3, C_7\}\}.$$

$$\beta_{(S-D)}(X) = \{U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_7\}\}.$$

Hence, $\tau_{(S-D)}(X) \neq \tau_S(X)$ and $\beta_{(S-D)}(X) \neq \beta_S(X)$.

Core A = {Weakness, Pale Comb, Dehydration}.

STEP2:

Consider T=S-LP = {W, PC, RC, E, D}.

When the attribute "WEAKNESS" is removed from T.

$$U/\mathfrak{R}_{(T-W)}(X) = \{\{C_1, C_3\}\{C_2\}, \{C_4, C_8\}, \{C_5, C_9\}, \{C_6, C_{10}\}, \{C_7\}\}$$

Then,

$$\underline{LOW}_{(T-W)}(X) = \{C_2, C_6, C_{10}\}.$$

$$\overline{UPP}_{(T-W)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_8, C_{10}\}.$$

$$B_{(T-W)}(X) = \{C_1, C_3, C_4, C_8\}.$$

Then the Nano topology is given by,

$$\tau_{(T-W)}(X) = \{\varphi, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_8, C_{10}\}, \{C_1, C_3, C_4, C_8\}\}.$$

$$\beta_{(T-W)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4, C_8\}\}.$$

Hence, $\tau_{(T-W)}(X) \neq \tau_S(X)$ and $\beta_{(T-W)}(X) \neq \beta_S(X)$.

When the attribute "PALE COMB" is removed from T.

$$U/\mathfrak{R}_{(T-PC)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_7\}, \{C_5\}, \{C_6, C_{10}\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(T-PC)}(X) = \{C_2, C_6, C_{10}\}.$$

$$\overline{UPP}_{(T-PC)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}.$$

$$B_{(T-PC)}(X) = \{C_1, C_3, C_4, C_7\}.$$

Then the Nano topology is given by,

$$\tau_{(T-PC)}(X) = \{\varphi, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}, \{C_1, C_3, C_4, C_7\}\}.$$

$$\beta_{(T-PC)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4, C_7\}\}.$$

Hence, $\tau_{(T-PC)}(X) \neq \tau_S(X)$ and $\beta_{(T-PC)}(X) \neq \beta_S(X)$.

When the attribute "ROUGH COAT" is removed from T.

$$U/\mathfrak{R}_{(T-RC)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8, C_9\}\}.$$

Then,

$$\underline{LOW}_{(T-RC)}(X) = \{C_2, C_6, C_{10}\}.$$

$$\overline{UPP}_{(T-RC)}(X) = \{C_1, C_2, C_3, C_4, C_5, C_6, C_{10}\}.$$

$$B_{(T-RC)}(X) = \{C_1, C_3, C_4, C_5\}.$$

Then the Nano topology is given by,

$$\tau_{(T-RC)}(X) = \{\varphi, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_5, C_6, C_{10}\}, \{C_1, C_3, C_4, C_5\}\}.$$

$$\beta_{(T-RC)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4, C_5\}\}.$$

Hence, $\tau_{(T-RC)}(X) \neq \tau_S(X)$ and $\beta_{(T-RC)}(X) \neq \beta_S(X)$.

When the attribute "EMACIATION" is removed from T.

$$U/\mathfrak{R}_{(T-E)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(T-E)}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(T-E)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(T-E)}(X) = \{C_1, C_3\}.$$

Then the Nano topology is given by,

$$\tau_{(T-E)}(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\beta_{(T-E)}(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

Hence, $\tau_{(T-E)}(X) = \tau_S(X)$ and $\beta_{(T-E)}(X) = \beta_S(X)$.

When the attribute "DEHYDRATION" is removed from T.

$$U/\mathfrak{R}_{(T-D)}(X) = \{\{C_1, C_3\}, \{C_2, C_7\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(T-D)}(X) = \{C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(T-D)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}.$$

$$B_{(T-D)}(X) = \{C_1, C_2, C_3, C_7\}.$$

Then the Nano topology is given by,

$$\tau_{(T-D)}(X) = \{\varnothing, U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}, \{C_1, C_2, C_3, C_7\}\}.$$

$$\beta_{(T-D)}(X) = \{U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_7\}\}.$$

Hence, $\tau_{(T-D)}(X) \neq \tau_S(X)$ and $\beta_{(T-D)}(X) \neq \beta_S(X)$.

Core B = {Weakness, Pale Comb, Rough Coat, Dehydration}

STEP3:

Consider V = S-RC = {W, LP, PC, E, D}

When the attribute "WEAKNESS" is removed from V.

$$U/\mathfrak{R}_{(V-W)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_8\}, \{C_5, C_9\}, \{C_6, C_{10}\}, \{C_7\}\}.$$

Then,

$$\underline{LOW}_{(V-W)}(X) = \{C_2, C_6, C_{10}\}.$$

$$\overline{UPP}_{(V-W)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_8, C_{10}\}.$$

$$B_{(V-W)}(X) = \{C_1, C_3, C_4, C_8\}.$$

Then the Nano topology is given by,

$$\tau_{(V-W)}(X) = \{\varnothing, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_8, C_{10}\}, \{C_1, C_3, C_4, C_8\}\}.$$

$$\beta_{(V-W)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4, C_8\}\}.$$

Hence, $\tau_{(V-W)}(X) \neq \tau_S(X)$ and $\beta_{(V-W)}(X) \neq \beta_S(X)$.

When the attribute "LOW PRODUCTION" is removed from V.

$$U/\mathfrak{R}_{(V-LP)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8, C_9\}\}.$$

Then,

$$\underline{LOW}_{(V-LP)}(X) = \{C_2, C_6, C_{10}\}.$$

$$\overline{UPP}_{(V-LP)}(X) = \{C_1, C_2, C_3, C_4, C_5, C_6, C_{10}\}.$$

$$B_{(V-LP)}(X) = \{C_1, C_3, C_4, C_5\}.$$

Then the Nano topology is given by,

$$\tau_{(V-LP)}(X) = \{\varnothing, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_5, C_6, C_{10}\}, \{C_1, C_3, C_4, C_5\}\}.$$

$$\beta_{(V-LP)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4, C_5\}\}.$$

Hence, $\tau_{(V-LP)}(X) \neq \tau_S(X)$ and $\beta_{(V-LP)}(X) \neq \beta_S(X)$.

When the attribute "PALE COMB" is removed from V.

$$U/\mathfrak{R}_{(V-PC)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_7\}, \{C_5\}, \{C_6, C_{10}\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(V-PC)}(X) = \{C_2, C_6, C_{10}\}.$$

$$\overline{UPP}_{(V-PC)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}.$$

$$B_{(V-PC)}(X) = \{C_1, C_3, C_4, C_7\}.$$

Then the Nano topology is given by,

$$\tau_{(V-PC)}(X) = \{\varphi, U, \{C_2, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_{10}\}, \{C_1, C_3, C_4, C_7\}\}.$$

$$\beta_{(V-PC)}(X) = \{U, \{C_2, C_6, C_{10}\}, \{C_1, C_3, C_4, C_7\}\}.$$

Hence, $\tau_{(V-PC)}(X) \neq \tau_S(X)$ and $\beta_{(V-PC)}(X) \neq \beta_S(X)$.

When the attribute "EMACIATION" is removed from V.

$$U/\mathfrak{R}_{(V-E)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(V-E)}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(V-E)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(V-E)}(X) = \{C_1, C_3\}.$$

Then the Nano topology is given by,

$$\tau_{(V-E)}(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\beta_{(V-E)}(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

Hence, $\tau_{(V-E)}(X) = \tau_S(X)$ and $\beta_{(V-E)}(X) = \beta_S(X)$.

When the attribute "DEHYDRATION" is removed from V.

$$U/\mathfrak{R}_{(V-D)}(X) = \{\{C_1, C_3, C_8\}, \{C_2, C_7\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(V-D)}(X) = \{C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(V-D)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}.$$

$$B_{(V-D)}(X) = \{C_1, C_2, C_3, C_7, C_8\}.$$

Then the Nano topology is given by,

$$\tau_{(V-D)}(X) = \{\varphi, U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}, \{C_1, C_2, C_3, C_7, C_8\}\}.$$

$$\beta_{(V-D)}(X) = \{U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_7, C_8\}\}.$$

Hence, $\tau_{(V-D)}(X) \neq \tau_S(X)$ and $\beta_{(V-D)}(X) \neq \beta_S(X)$.

Core C = {Weakness, Low Production, Pale Comb, Dehydration}.

STEP4:

Consider Z = S-E = {W, LP, PC, RC, D}

When the attribute "WEAKNESS" is removed from Z.

$$U/\mathfrak{R}_{(Z-W)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_8\}, \{C_5, C_9\}, \{C_6, C_7, C_{10}\}\}.$$

Then,

$$\underline{LOW}_{(Z-W)}(X) = \{C_2\}.$$

$$\overline{UPP}_{(Z-W)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}.$$

$$B_{(Z-W)}(X) = \{C_1, C_3, C_4, C_6, C_7, C_8, C_{10}\}.$$

Then the Nano topology is given by,

$$\tau_{(Z-W)}(X) = \{\varphi, U, \{C_2\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}, \{C_1, C_3, C_4, C_6, C_7, C_8, C_{10}\}\}.$$

$$\beta_{(Z-W)}(X) = \{U, \{C_2\}, \{C_1, C_3, C_4, C_6, C_7, C_8, C_{10}\}\}.$$

Hence, $\tau_{(Z-W)}(X) \neq \tau_S(X)$ and $\beta_{(Z-W)}(X) \neq \beta_S(X)$.

When the attribute "LOW PRODUCTION" is removed from Z.

$$U/\mathfrak{R}_{(Z-LP)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(Z-LP)}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(Z-LP)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(Z-LP)}(X) = \{C_1, C_3\}.$$

Then the Nano topology is given by,

$$\tau_{(Z-LP)}(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\beta_{(Z-LP)}(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

Hence, $\tau_{(Z-LP)}(X) = \tau_S(X)$ and $\beta_{(Z-LP)}(X) = \beta_S(X)$.

When the attribute "PALE COMB" is removed from Z.

$$U/\mathfrak{R}_{(Z-PC)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4, C_7\}, \{C_5\}, \{C_6, C_8, C_{10}\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(Z-PC)}(X) = \{C_2\}.$$

$$\overline{UPP}_{(Z-PC)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}.$$

$$B_{(Z-PC)}(X) = \{C_1, C_3, C_4, C_6, C_7, C_8, C_{10}\}.$$

Then the Nano topology is given by,

$$\tau_{(Z-PC)}(X) = \{\varphi, U, \{C_2\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}, \{C_1, C_3, C_4, C_6, C_7, C_8, C_{10}\}\}.$$

$$\beta_{(Z-PC)}(X) = \{U, \{C_2\}, \{C_1, C_3, C_4, C_6, C_7, C_8, C_{10}\}\}.$$

Hence, $\tau_{(Z-PC)}(X) \neq \tau_S(X)$ and

When the attribute "ROUH COAT" is removed from Z.

$$U/\mathfrak{R}_{(Z-RC)}(X) = \{\{C_1, C_3\}, \{C_2\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_7\}, \{C_8\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(Z-RC)}(X) = \{C_2, C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(Z-RC)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_{10}\}.$$

$$B_{(Z-RC)}(X) = \{C_1, C_3\}.$$

Then the Nano topology is given,

$$\tau_{(Z-RC)}(X) = \{\varphi, U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

$$\beta_{(Z-RC)}(X) = \{U, \{C_2, C_4, C_6, C_{10}\}, \{C_1, C_3\}\}.$$

Hence, $\tau_{(Z-RC)}(X) = \tau_S(X)$ and $\beta_{(Z-RC)}(X) = \beta_S(X)$.

When the attribute "DEHYDRATION" is removed from Z.

$$U/\mathfrak{R}_{(Z-D)}(X) = \{\{C_1, C_3, C_8\}, \{C_2, C_7\}, \{C_4\}, \{C_5\}, \{C_6, C_{10}\}, \{C_9\}\}.$$

Then,

$$\underline{LOW}_{(Z-D)}(X) = \{C_4, C_6, C_{10}\}.$$

$$\overline{UPP}_{(Z-D)}(X) = \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}.$$

$$B_{(Z-D)}(X) = \{C_1, C_2, C_3, C_7, C_8\}.$$

Then the Nano topology is given by,

$$\tau_{(Z-D)}(X) = \{\varphi, U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_4, C_6, C_7, C_8, C_{10}\}, \{C_1, C_2, C_3, C_7, C_8\}\}.$$

$$\beta_{(Z-D)}(X) = \{U, \{C_4, C_6, C_{10}\}, \{C_1, C_2, C_3, C_7, C_8\}\}.$$

Hence, $\tau_{(Z-D)}(X) \neq \tau_S(X)$ and $\beta_{(Z-D)}(X) \neq \beta_S(X)$.

Core D = {Weakness, Pale Comb, Dehydration}

By taking the intersection of Core A, Core B, Core C and Core D. We conclude that the major core will be

{Weakness, Pale Comb, Dehydration}.

CASEII: CATTLE NOT AFFECTED WITH COCCIDIOSIS.

Assume $Y = \{C_3, C_5, C_7, C_8, C_9\}$ be the set of cattle not affected with Coccidiosis. By using the same procedure as in Case-I, we get

Core = {Weakness, Pale Comb, Dehydration}.

4. Conclusion:

We conclude that, WEAKNESS, PALE COMB, DEHYDRATION, are the most impact factors for "CATTLE WITH COCCIDIOSIS". Also this method can be applied in various field namely, Medical field, Academic related field, Marketing fields, Business sectors and so on.

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