January-February 2020
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Nano αg*s-Continuous Function in Nano Topological Spaces

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Abstract:
The purpose of this paper is to introduce the notion of Nano αg*s-Continuous Function in Nano Topological Spaces and obtain some of its characteristics. And identified risk factors for the cause of HIV through the concept of Nano Topology.

Keywords:*Nαg*s-Continuous Function, Nαg*s-irresolute.*

I. INTRODUCTION

In 1970 the new class of set is g-closed sets, a super class of closed sets was introduced . The Nano topological space with respect to a subset S of a universe was introduced which is defined in terms of lower and upper approximation of S. The purpose of this paper is to introduce the notion of sets called Nano αg*s-Continuous Function in Nano Topological spaces and their characterization are analyzed. Also we identified the risk factors for the cause of HIV through the concept of Nano Topology.

II.PRELIMINARIES

Definition 2.1. [2] If pair (S,R) is an approximation space I,J ⊆S, then

- $L_R(I)\subseteq I\subseteq S_R(I)$
- $L_R(\varphi)=S_R(\varphi)=\varphi$
- $L_R(S)=S_R(S)=S$
- $S_R(I\cap J)=S_R(I)\cap S_R(J)$
- $S_R(I^c)=[L_R(I)]^c$ and $L_R(I^c)=[S_R(I)]^c$
- $S_R(S_R(I))=L_R(S_R(I))= S_R(I)$
- $L_R(L_R(I))=U_R(L_R(I))=L_R(I)$

Definition 2.2. [2] If (S, τ_R(I)) be a nano topological space w.r.t I. Where I⊆G and if A⊆G, then

- The nano interior is defined as the union of all nano open subsets

January-February 2020
ISSN: 0193-4120 Page No. 15008 - 15013

contained in A and is denoted by Nint(A), Nint(A) is the largest nano open subset of A.

- The nano closure is defined as the intersection of all nano closed sets containing A and is denoted by Ncl(A).

Definition 2.3.[4] A nano topological space $(S,\tau_R(I))$ is said to be nano extremally disconnected, if the nano-closure of each nano-open set is nano-open.

Definition 2.4. Let $(S, \tau_R (I))$ be a nano topological space and A ⊆G. Then A is said to be

Nr-closed [2] if A =Ncl(Nint(A).

Nα-closed[2] if Nint(Ncl(Nint(A))) ⊆A.

Np-closed[2] if Nint(Ncl(A)) ⊆A.

Definition 2.5.[4]

- A subset A of nano topological space $(S,\tau_R(I))$ is called Nano-α-generalized star semi-closed (briefly Nαg*s-closed) set if Nscl(A)⊆G and G is Nαg*s-open in $(S,\tau_R(I))$.
- A subset A of a nano topological space $(S,\tau_R(I))$ is called Nano-α-generalized star semi-open (briefly Nαg*s-open)A^C is nano αg*s-closed.

III. Nαg*s- Continuous Function

Definition: 3.1 Let $(P,\tau_R(I))$ and $(Q,\tau_R(J))$ are two nano topological spaces. Then a mapping $H:(P,\tau_R(I))\rightarrow(Q,\tau_R(J))$ is Nαg*s continuous if $H^{-1}(H)$ is Nαg*s-closed in P if for every nano-closed set H of Q.

Theorem 3.2

(i).Every Nano continuous function are Nαg*s continuous

(ii).Every Nano α-continuous function are Nαg*s continuous .

Proof:

(i).Let $H:(P,\tau_R(I))\rightarrow(Q,\tau_R(J))$ are nano continuous and H is nano closed in Q. Then H^{-1} (H) are nano closed in P. Since any nano closed set is Nαg*s closed $H^1(H)$ be nαg*s closed in P. The inverse image of every nano closed set be Nαg*s closed. Therefore H be Nαg*s continuous.

(ii).proof is obvious.

Example 3.3

Let P={1,2,3} with P/R={{1},{2},{3}}. Let I={1,3}⊆P. Then $\tau_R(I)$={S ,∅ ,{1},{2,3}}Nαg*s closed. {P,∅,{1},{2},{3},{1,2},{1,3},{2,3}}.Let Q={1,2,3} with Q/τ ={{2},{1,3}}Let

TEST Engineering & Management

January-February 2020
ISSN: 0193-4120 Page No. 15008 - 15013

J={1,2}⊆Q.Then τ_R(j)={{2},{1,3}}.Define H:(P,τ_R(I))→(Q,τ_R(J)) as h(1)=3, h(2)=2, h(3)=1. Then h^{-1}{{1,3}}={1,3} Which is Nαg*s closed but which is not nano closed set. Therefore f is not nano continuous. Hence Nαg*s continuous map need not be nano-continuous.

Definition:3.4 Let (P,τ_R(I)) and (Q,τ_R(J)) are two nano topological spaces then a mapping H:(P,τ_R(I))→(Q,τ_R(J)) is Nαg*s-irresolute if h^{-1}(H) is Nαg*s-closed set in P if for every Nαg*s closed set is H of Q.

Theorem 3.5

Let H:(P,τ_R(I))→(Q,τ_R(J)) &T:(Q,τ_R(J))→(W,τ_R(K)) are any two functions. Then

(i). t○h is Nαg*s continuous if t is Nano-continuous and h is Nαg*s continuous.

(ii). t○h is Nαg*s irresolute if t is Nαg*s-irresolute and h is irresolute.

(iii). t○h is Nαg*s-continuous if t is Nαg*s continuous and h is Nαg*s irresolute.

Proof:

(i). Let H is nano closed in W. Then t^{-1}(H) are nano closed in Q. since t is Nano-continuous. By hypothesis h^{-1} (t^{-1}(H)) is Nαg*s closed in P. Hence t○h is Nαg*s continuous.

(ii). Let H is nano closed in W. Then t^{-1}(H) are nano closed in Q, since Nαg*s is Nano-irresolute. By hypothesis h^{-1}(t^{-1}(H)) is Nαg*s closed in P. Hence t○h is Nαg*s irresolute.

(iii). Let H is nano closed in W. Then t^{-1}(H) are nano closed in Q, since Nαg*s be Nαg*s continuous. By hypothesis h^{-1}(t^{-1}(H)) is Nαg*s closed in P. Hence t○h is Nαg*s irresolute.

Theorem 3.6

If (P,τ_R(I)) and (Q,τ_R(J)) be nano topological spaces with respect to I⊆P and J⊆Q respectively, then any function H:P→Q the following condition satisfies they are equivalent.

(i) H:(P,τ_R(I))→(Q,τ_R(J)) is Nαg*s continuous

(ii) h(Nscl(C)) ⊆ Ncl(C)) for every subset is C of P.

(iii) Nscl (h^{-1}(D)) ⊆ h^{-1}(Ncl(D)) for every subset is D of Q.

Proof:

(i)⟹(ii) Let h be Nαg*s continuous and C ⊆P. Then h(C)⊆Q. since h is Nαg*s

TEST Engineering & Management
January-February 2020
ISSN: 0193-4120 Page No. 15008 - 15013

continuous and Ncl(h(C)) is nano-closed in Q. h^{-1}(Ncl(f(C))) is Nαg*s closed in P. Since h(C)⊆Ncl(h(C)), h^{-1}(h(C))⊆ h^{-1}(Ncl(h(C))) then Nscl(C)⊆Nscl(h^{-1}(scl(h(C)))]=h^{-1}(scl(h(C))). Thus Nscl(C)=h^{-1}(scl(h(C))).Therefore h(Nscl(C))⊆Ncl(h(C)) for every subset is C of Q.

(ii)⇒(iii) Let h(Nscl(C))⊆Ncl(h(C)) and C=h^{-1}(D)⊆P for every subset is D⊆Q. Since h(Nscl(C))⊆Ncl(h(C)) we have, h(Nscl(h^{-1}(D)))⊆Ncl(h(h^{-1}(D))⊆Ncl(D) that is, h(Nscl(h^{-1}(D)))⊆Ncl(D) which implies that Nscl(h^{-1}(D))⊆ h^{-1}(Ncl(D)) for every subset is D⊆Q.

(iii)⇒(i)Let Nscl(h^{-1}(D))⊆ h^{-1}(Ncl(D)) for every subset is D of Q. If D be nano closed in Q, then Ncl(D)=D. By assumption Nscl(h^{-1}(D))⊆ h^{-1}(Ncl(D)) =h^{-1}(B).Thus, Nscl(h^{-1}(D))⊆ h^{-1}(D).

But h^{-1}(D)⊆Nscl((h^{-1}(D)).Therefore, Nscl(h^{-1}(D))=h^{-1}(D). That is, h^{-1}(D) is Nαg*s closed in P for every nano closed set is D in Q. Therefore h are Nαg*s continuous on P.

4.APPLICATIONOFNANOTOPOLOGY

Example4.1

Here we apply the Nano topology to find the key factors of 'HIV' using topological reduction of attributes in incomplete information system.

The following table gives information about patients those who are having Head Ache, Skin Rash, Night Sweats, Pain in the Joints and Family history.

Patients	Head Ache	Skin Rash	Diarrhea	Swollen lymph nodes	Family History	Result
H1	✓	✓	✓	Nil	Nil	Yes
H2	✓	Nil	Nil	✓	✓	Yes
H3	Nil	✓	✓	Nil	✓	Yes
H4	✓	✓	✓	Nil	Nil	No
H5	Nil	✓	✓	Nil	Nil	No
H6	Nil	✓	✓	Nil	✓	No
H7	✓	Nil	✓	Nil	✓	Yes
H8	✓	Nil	✓	✓	Nil	No

TEST Engineering & Management

January-February 2020
ISSN: 0193-4120 Page No. 15008 - 15013

Here P = {H1, H2 ,H3 ,H4 ,H5, H6 ,H7 , H8 }, the set of patients and A = { Head Ache, Skin Rash, Diarrhea, Swollen lymph nodes, and Family history, HIV} which is divided into two classes, C= {HA,SR,DA,SN,FH} and D = { HIV}. The family equivalence of classes, S/C corresponding to C is given byP/R(C)={{H1,H4},{H2},{H3,H6},{H5},{H7}{H8}}.

Case 1 :(Patients with HIV) Let I = {H1,H2,H3,H7}, the set of patient with HIV. Then L_C(I)= {H2, H7}, P_C(I)= {H1, H2, H3, H4, H6, H7} and B_R(I) = {H1, H3, H4, H6}. Therefore, τ_C(I) = {P, φ, {H2, H7}, {H1, H2, H3, H4, H6, H7}, {B1, B3, B4, B6}}. The basis of τ_C(I) is given by β_C(I) ={P,{H2,H7},{H1,H3,H4,H6}}

Step 1: When the attribute 'Head Ache' is removed from C, P/R(C-HA) = {{H1, H4 ,H5}, {H2}, {H3,H6}, {H7], {H8}} and hence the lower and upper approximations of X corresponding to C-{HA} are given by $L_{C-\{HA\}}${I} = {{H2, H7}, $P_{C-\{HA\}}$(I)= {H1, H2, H3, H4,H5, H6, H7} and the corresponding boundary region is $B_{C-\{\mathrm{HA}\}}$(I)={H1, H3, H4, H6}.Therefore the corresponding nano topology and its basis are given $\tau_{C-\{HA\}}$(I)= { P,φ, {H2, H7} , {H1, H2, H3, H4,H5, H6, H7}, {H1, H3, H4, H6}} and$\beta_{C-\{HA\}}$(I)= {P, {H2, H7} , {H1, H3, H4, H6}}≠β_C(I)

Step 2: When the attribute 'Skin Rash' is removed from C, P/R(C-SR) = {{H1, H4}, {H2}, {H3,H6}, {H5}, {H7], {H8}} and hence $\tau_{C-\{SR\}}$(I)= { P,φ, {H2, H7} , {H1, H2, H3, H4, H6, H7}, {H1, H3, H4, H6}} and $\beta_{C-\{SR\}}$(I)= {P, {H2, H7} , {H1, H3, H4, H6}} = β_C(I).

Step 3: When the attribute 'Diarrhea' is removed from C, P/R(C-DA) = {{H1, H4}, {H2}, {H3,H6}, {H5}, {H7], {H8}} and hence $\tau_{C-\{DA\}}$(I)= { P, φ, {H2, H7} , {H1, H2, H3, H4, H6, H7}, {H1, H3, H4, H6}} and $\beta_{C-\{SR]}$(I)= {P,{H2, H7} , {H1,H3,H4,H6}}=β_C(I).

Step 4: When the attribute 'Swollen lymph nodes' is removed from C, P/R(C-SN) = {{H1, H4}, {H2}, {H3,H6}, {H5}, {H7], {H8}} and hence $\tau_{C-\{SN\}}$(I) = { P,φ, {H2, H7} , {H1, H2, H3, H4, H6, H7}, {H1, H3, H4, H6}} and $\beta_{C-\{SN\}}$(I)= {P, {H2, H7} ,{H1,H3,H4,H6}}=β_C(I).

Step 5: When the attribute 'Remove family History' is removed from C, P/R(C-FH) = {{H1, H4}, {H2}, {H3,H5, H6}, {H7}, {H8}} and hence $\tau_{C-\{FH\}}$(I)= { $\mathcal{U}$,φ, {H2, H7} , {H1, H2, H3, H4, H5, H6, H7}, {H1, H3, H4, H5, H6}} and$\beta_{C-\{FH\}}$(I)= {P, {H2, H7} , {H1, H3, H4, H5, H6}} ≠ β_C(I). Therefore,CORE = {HeadAche,Familyhistory}.

Case2 (Patients not with HIV) Let I = {H4, H5, H6 ,H8}, the set of patients without HIV. Therefore, τ_C(I) = {P, φ, {H5, H8}, {H1, H3, H4, H5, H6, H8}, {H1, H3, H4, H6}}. The basis of τ_C(I) isgivenbyβ_C(I)={P,{H5,H8},{H1,H3,H4,H6}}.

Step 1: When the attribute 'Head Ache' is removed from C, P/R(C-HA) = {{H1,H4,H5}, {H2}, {H3,H6}, {H7], {H8}}. Therefore,$\tau_{C-\{HA\}}$(I) = { P, φ, {H8} , {H1, H3, H4,H5, H6, H8}, {H1, H3, H4,

January-February 2020
ISSN: 0193-4120 Page No. 15008 - 15013

H5 ,H6}} and$\beta_{C-\{HA\}}$(I) = {P, {H8} , {H1, H3, H4,H5,H6}}≠β_C(I).

Step 2: When the attribute ‘Skin Rash’ is removed from C, P/*R*(C-SR) = {{H1, H4}, {H2}, {H3,H6}, {H5}, {H7], {H8}} and hence $\tau_{C-\{SR\}}$(I)= { P,φ, {H5, H8} , {H1, H3, H4, H5, H6, H8}, {H1, H3, H4, H6}} and $\beta_{C-\{SR\}}$(I) = {P, {H5, H8} , {H1, H3, H4,H6}}=β_C(I).

Step 3: When the attribute ‘Diarrhea’ is removed from C, P/*R*(C-DA) = {{H1, H4}, {H2}, {H3,H6}, {H5}, {H7], {H8}} and hence $\tau_{C-\{DA\}}$(I) = { S, φ, {H5, H8} , {H1, H3, H4, H5, H6, H8}, {H1, H3, H4, H6}} and $\beta_{C-\{DA\}}$(I) = {P, {H5, H8} , {H1, H3, H4, H6}} = β_C(I).

Step 4: When the attribute ‘Swollen lymph nodes’ is removed from C, P/*R*(C-SN) = {{H1, H4}, {H2}, {H3,H6}, {H5}, {H7], {H8}} and hence $\tau_{C-\{SN\}}$(I) = { P, φ, {H5, H8} , {H1, H3, H4, H5, H6, H8}, {H1,H3,H4,H6}}.$\beta_{C-\{SN\}}$(I)={P,{H5,H8},{H1,H3,H4,H6}}=β_C(I).

Step 5: When the attribute ‘Remove family History’ is removed from C, P/*R*(C-FH) = {{H1, H4}, {H2}, {H3,H5,H6}, {H7}, {H8}} and hence $\tau_{C-\{FH\}}$(I) = { P ,φ, {H8} , {H1, H3, H4, H5, H6, H7,H8}, {H1, H3, H4, H5, H6,H7}} and $\beta_{C-\{FH\}}$(I) = {P, {H8} , {H1, H3,H4,H5,H6,H7}}≠β_C(I).Therefore, CORE={HeadAche, Familyhistory}.

OBSERVATION

From the CORE, we observed that ‘Head Ache’ and ‘Family History’ are the key factors for HIV. Proper medical care and change in the behavioral pattern can prevent the risk.

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