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The Undergraduate Students Success through-Via Nanotopology

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***Abstract: The indent of this paper is to apply nanotopology with set-valued ordered information system to choose the best combinations of study materials to be provided in the library to face the competitive examinations. The method applied here rests on the basis of nanotopology*.**

I. INTRODUCTION

As acquisition of knowledge depends only on reading, library plays the role of ladder in shaping one's life. Library being the "Heart core" source of learning community provides a place for students and faculty to conduct their research and develop their knowledge. Most of the undergraduate students enroll themselves in college education to get placed both in public and private sectors. Using library is an inevitable factor for a successful career. Undergraduate students cannot acquire wide knowledge, just through text books or class room lectures. There arises a need to refer to other book resources too. For this library is of great help to the students in the fulfillment of their goals, ambitions and inclinations, as it provides ample opportunities for acquiring knowledge and directing them to the road of a successful career.Nanotopology with set-valued ordered information system [1,2,4,6] is a powerful technique to choose the best combinations of study materials to be provided in the library to face the competitive examinations. Y.H. Qian, C.Y. Dang, J.Y. Liang and D.W. Tang had applied set-valued ordered information system [5] in many real valued problems. Nanotopology[3] was introduced by lellisthivagar. In this paper the above technique is used to filter the best combination among various sections of the library.

II. PRELIMINARIES

A. *Definition 2.1*

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, 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 $X \subseteq U$.

The lower approximation of X with respect to R is the set of all objects, which can be for certain classified as X with respect to R and it is denoted by $L_R(X)$. That is $L_R(X) = \cup_{x\in U}\{R(x): R(x) \subseteq X\}$, where $R(x)$ denotes the equivalence class determined by x.

The upper approximation of X with respect to R is the set of all objects, which can be possibly classified as X with respect to R and it is denoted by $U_R(X)$. That is $U_R(X) = \cup_{x\in U}\{R(x): R(x) \cap X \neq \emptyset\}$ where $R(x)$ denotes the equivalence class determined by x.

The boundary region of X with respect to R is set of all objects, which can be classified neither as X nor as not X with respect to R and it is denoted by $B_R(X)$.That is $B_R(X) = U_R(X) - L_R(X)$.

B. *Definition 2.2*

Let U be the universe, R be an equivalence relation on U and $\tau_R(X) = \{U, \emptyset, L_R(X), U_R(X), B_R(X)\}$ where $X \subseteq U$. Then $\tau_R(X)$ satisfies the following axioms:

1) U and $\emptyset \in \tau_R(X)$.
2) The union of the elements of any sub collection of $\tau_R(X)$ is in $\tau_R(X)$.
3) The intersection of the elements of any finite sub collection of $\tau_R(X)$ is in $\tau_R(X)$.

That is, $\tau_R(X)$ forms a topology on U called as the nanotopology on U with respect to X We call $(U, \tau_R(X))$ as the nanotopological space.

C. *Definition 2.3*

A set-valued information system is a quadruple $S = (U, A, V, f)$ where U is a non- empty finite set of objects, A is a finite set of attributes, $V = \cup V_a$ where V_a is a domain of the attribute 'a', $f: U \times A \rightarrow P(V)$ is a function such that for every $x \in U$ and $a \in$

$A, f(x,a) \subseteq V_a$. Also we assume that $f(x,a) \geq 1$. The attribute set A is divided into two subsets - a set C condition attributes and a decision attribute d where $C \cap \{d\} = \emptyset$.

D. Definition 2.4

If the domain of a condition attribute is ordered according to a decreasing or increasing preference, then the attribute is a criterion. If in a set-valued information system, every condition attribute is a criterion, then it is said to be a set-valued ordered information system.

E. Definition 2.5

If $\tau_R(X)$ is the nanotopology on U with respect to X, then the set $B = \{U, L_R(X), B_R(X)\}$ is the basis for $\tau_R(X)$.

1) Algorithm

a) *Step-1* Finding an equivalence classes of universal object(U) corresponding to conditional attributes(C) and subset X of U, Lower approximation $(L_C(X))$, Upper approximation $(U_C(X))$, Boundary region $(B_C(X))$, Nanotopology $(\tau_C(X))$, and Basis for nanotopology $(\beta_C(X))$ by case(i).

b) *Step-2* Remove an attribute 'a' from C to find Lower approximation $\left(L_{C-\{a\}}(X)\right)$, Upper approximation $\left(U_{C-\{a\}}(X)\right)$, Boundary region $\left(B_{C-\{a\}}(X)\right)$. Generate the nanotopology $\left(\tau_{C-\{a\}}(X)\right)$ on U and its basis $\left(\beta_{C-\{a\}}(X)\right)$.

c) *Step-3* Repeat the above step for all attributes in C.

d) *Step-4* Those attributes in C for which $\beta_C(X) \neq \beta_{C-\{a\}}(X)$ from the core.

e) *Step-5* Finding an equivalence classes of universal object(U) corresponding to conditional attributes(C) and subset X of U, Lower approximation $(L_C(X))$, Upper approximation $(U_C(X))$, Boundary region $(B_C(X))$, Nanotopology $(\tau_C(X))$, and Basis for nanotopology $(\beta_C(X))$ by case(ii).

f) *Step-6* Repeat the steps 2 to 4.

g) *Step-7* Core value for step 4 and 6.

III. MAIN RESULTS

$U = \{UG_1, UG_2, UG_3, UG_4, UG_5, UG_6, UG_7, UG_8\}$, A ={C(competitive examination books), G(General knowledge books), N(Newspapers), T(Thesis section), D(Digital library section)}.

$C = \{C, G, T, D, N\}$. Here U is the universe of objects, A is the set of attributes namely conditional attributes(C) and Decision attribute(D).

Consider the following table in which information about the referred habits of eight students are given.

Undergraduate Students	C	G	T	D	N	Decision(D)
UG_1	Y	N	N	N	N	Unsuccessful
UG_2	Y	Y	N	N	Y	Successful
UG_3	Y	Y	N	N	N	Successful
UG_4	N	N	N	N	Y	Unsuccessful
UG_5	N	Y	Y	Y	N	Unsuccessful
UG_6	Y	Y	N	N	N	Unsuccessful
UG_7	Y	Y	Y	Y	N	Successful
UG_8	Y	Y	N	N	Y	Successful

$X = \{UG_2, UG_3, UG_7, UG_8\}$ be the set of successful undergraduate students.

Let R be an equivalence relation on U with respect to set of all conditional attributes is given by

$U_C = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$, the lower and upper approximation of X are given by

$L_C(X) = \{UG_2, UG_8, UG_7\}, U_C(X) = \{UG_2, UG_8, UG_3, UG_6, UG_7\}$and the boundary region of X is

$B_C(X) = \{UG_3, UG_6\}$ and corresponding to nanotopology, basis for nanotopology are given by

$\tau_C(X) = \{U, \emptyset, \{UG_2, UG_8, UG_7\}, \{UG_2, UG_8, UG_3, UG_6, UG_7\}, \{UG_3, UG_6\}\}$,

$\beta_C(X) = \{U, \{UG_2, UG_8, UG_7\}, \{UG_3, UG_6\}\}$.

Remove an attribute Competitive examination books (C) from conditional attributes, the result is given by $U_{C-\{C\}} = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5, UG_7\}\}$,

$L_{C-\{C\}}(X) = \{UG_2, UG_8\}, U_{C-\{C\}}(X) = \{UG_2, UG_8, UG_3, UG_5, UG_6, UG_7\}$,

$B_{C-\{C\}}(X) = \{UG_3, UG_6, UG_5, UG_7\}$,

$\tau_{C-\{C\}}(X) = \{U, \emptyset, \{UG_2, UG_8\}, \{UG_2, UG_8, UG_3, UG_5, UG_6, UG_7\}, \{UG_3, UG_6, UG_5, UG_7\}\}$,

$\beta_{C-\{C\}}(X) = \{U, \{UG_2, UG_8\}, \{UG_5, UG_7, UG_3, UG_6\}\}$.Therefore $\beta_C(X) \neq \beta_{C-\{C\}}(X)$.

Remove an attribute General knowledge books (G) from conditional attributes, the result is given by $U_{C-\{G\}} = \{\{UG_1, UG_3, UG_6\}, \{UG_2, UG_8\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{G\}}(X) = \{UG_2, UG_8, UG_7\}, U_{C-\{G\}}(X) = \{UG_1, UG_8, UG_3, UG_2, UG_6, UG_7\}$,

$B_{C-\{G\}}(X) = \{UG_3, UG_6, UG_1\}$,

$\tau_{C-\{G\}}(X) = \{U, \emptyset, \{UG_2, UG_8, UG_7\}, \{UG_1, UG_8, UG_3, UG_2, UG_6, UG_7\}, \{UG_1, UG_3, UG_6\}\}$,

$\beta_{C-\{G\}}(X) = \{U, \{UG_2, UG_8, UG_7\}, \{UG_1, UG_3, UG_6\}\}$.Therefore $\beta_C(X) \neq \beta_{C-\{G\}}(X)$.

Remove an attribute Thesis section $(T)$from conditional attributes, the result is given by

$U_{C-\{T\}} = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{T\}}(X) = \{UG_2, UG_8, UG_7\}, U_{C-\{T\}}(X) = \{UG_2, UG_8, UG_3, UG_6, UG_7\}, B_{C-\{T\}}(X) = \{UG_3, UG_6\}$,

$\tau_{C-\{T\}}(X) = \{U, \emptyset, \{UG_2, UG_8, UG_7\}, \{UG_2, UG_8, UG_3, UG_6, UG_7\}, \{UG_3, UG_6\}\}$,

$\beta_{C-\{T\}}(X) = \{U, \{UG_2, UG_8, UG_7\}, \{UG_3, UG_6\}\}$. Therefore $\beta_C(X) = \beta_{C-\{T\}}(X)$.

Remove an attribute Digital library section $(D)$from conditional attributes, the result is given by

$U_{C-\{D\}} = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{D\}}(X) = \{UG_2, UG_8, UG_7\}, U_{C-\{D\}}(X) = \{UG_2, UG_8, UG_3, UG_6, UG_7\}, B_{C-\{D\}}(X) = \{UG_3, UG_6\}, \tau_{C-\{D\}}(X) = \{U, \emptyset, \{UG_2, UG_8, UG_7\}, \{UG_2, UG_8, UG_3, UG_6, UG_7\}, \{UG_3, UG_6\}\}$,

$\beta_{C-\{D\}}(X) = \{U, \{UG_2, UG_8, UG_7\}, \{UG_3, UG_6\}\}$. Therefore $\beta_C(X) = \beta_{C-\{D\}}(X)$.

Remove an attribute Newspapers$(N)$from conditional attributes, the result is given by

$U_{C-\{N\}} = \{\{UG_1\}, \{UG_2, UG_3, UG_6, UG_8\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{N\}}(X) = \{UG_7\}, U_{C-\{N\}}(X) = \{UG_8, UG_3, UG_2, UG_6, UG_7\}$,

$B_{C-\{N\}}(X) = \{UG_3, UG_6, UG_2, UG_8\}$, $\tau_{C-\{N\}}(X) = \{U, \emptyset, \{UG_7\}, \{UG_8, UG_3, UG_2, UG_6, UG_7\}, \{UG_8, UG_3, UG_2, UG_6\}\}$,

$\beta_{C-\{N\}}(X) = \{U, \{UG_7\}, \{UG_3, UG_8, UG_2, UG_6\}\}$. Therefore $\beta_C(X) \neq \beta_{C-\{N\}}(X)$.

Hence core$(A) = \{C, G, N\}$.

$X = \{UG_1, UG_4, UG_5, UG_6\}$ be the set of unsuccessful undergraduate students and corresponding to an equivalence relation on U is given by,

$U_C = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$. The result is,

$L_C(X) = \{UG_1, UG_4, UG_5\}, U_C(X) = \{UG_1, UG_4, UG_3, UG_6, UG_5\}, B_C(X) = \{UG_3, UG_6\}$

$\tau_C(X) = \{U, \emptyset, \{UG_1, UG_4, UG_5\}, \{UG_1, UG_4, UG_3, UG_6, UG_5\}, \{UG_3, UG_6\}\}$,

$\beta_C(X) = \{U, \{UG_1, UG_4, UG_5\}, \{UG_3, UG_6\}\}$.

Remove an attribute Competitive examination books (C) from conditional attributes, the result is given by $U_{C-\{C\}} = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5, UG_7\}\}$,

$L_{C-\{C\}}(X) = \{UG_1, UG_4\}, U_{C-\{C\}}(X) = \{UG_1, UG_4, UG_3, UG_5, UG_6, UG_7\}$,

$B_{C-\{C\}}(X) = \{UG_3, UG_6, UG_5, UG_7\}$,

$\tau_{C-\{C\}}(X) = \{U, \emptyset, \{UG_1, UG_4\}, \{UG_1, UG_4, UG_3, UG_5, UG_6, UG_7\}, \{UG_3, UG_6, UG_5, UG_7\}\}$,

$\beta_{C-\{C\}}(X) = \{U, \{UG_1, UG_4\}, \{UG_5, UG_7, UG_3, UG_6\}\}$. Therefore $\beta_C(X) \neq \beta_{C-\{C\}}(X)$.

Remove an attribute General knowledge books (G) from conditional attributes, the result is given by $U_{C-\{G\}} = \{\{UG_1, UG_3, UG_6\}, \{UG_2, UG_8\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{G\}}(X) = \{UG_4, UG_5\}, U_{C-\{G\}}(X) = \{UG_1, UG_3, UG_4, UG_6, UG_5\}$,

$B_{C-\{G\}}(X) = \{UG_3, UG_6, UG_1\}$,

$\tau_{C-\{G\}}(X) = \{U, \emptyset, \{UG_4, UG_5\}, \{UG_1, UG_3, UG_4, UG_6, UG_5\}, \{UG_1, UG_3, UG_6\}\}$,

$\beta_{C-\{G\}}(X) = \{U, \{UG_4, UG_5\}, \{UG_1, UG_3, UG_6\}\}$. Therefore $\beta_C(X) \neq \beta_{C-\{G\}}(X)$.

Remove an attribute Thesis section(T) from conditional attributes, the result is given by $U_{C-\{T\}} = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{T\}}(X) = \{UG_1, UG_4, UG_5\}, U_{C-\{T\}}(X) = \{UG_1, UG_3, UG_6, UG_4, UG_5\}, B_{C-\{T\}}(X) = \{UG_3, UG_6\}, \tau_{C-\{T\}}(X) = \{U, \emptyset, \{UG_1, UG_4, UG_5\}, \{UG_1, UG_3, UG_6, UG_4, UG_5\}, \{UG_3, UG_6\}\}$

$\beta_{C-\{T\}}(X) = \{U, \{UG_1, UG_4, UG_5\}, \{UG_3, UG_6\}\}$. Therefore $\beta_C(X) = \beta_{C-\{T\}}(X)$.

Remove an attribute Digital library section(D) from conditional attributes, the result is given by

$U_{C-\{D\}} = \{\{UG_1\}, \{UG_2, UG_8\}, \{UG_3, UG_6\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{D\}}(X) = \{UG_1, UG_4, UG_5\}, U_{C-\{D\}}(X) = \{UG_1, UG_4, UG_3, UG_6, UG_5\}, B_{C-\{D\}}(X) = \{UG_3, UG_6\}, \tau_{C-\{D\}}(X) = \{U, \emptyset, \{UG_1, UG_4, UG_5\}, \{UG_1, UG_4, UG_3, UG_6, UG_5\}, \{UG_3, UG_6\}\}$

$\beta_{C-\{D\}}(X) = \{U, \{UG_1, UG_4, UG_5\}, \{UG_3, UG_6\}\}$. Therefore $\beta_C(X) = \beta_{C-\{D\}}(X)$.

Remove an attribute Newspapers(N) from conditional attributes, the result is given by

$U_{C-\{N\}} = \{\{UG_1\}, \{UG_2, UG_3, UG_6, UG_8\}, \{UG_4\}, \{UG_5\}, \{UG_7\}\}$,

$L_{C-\{N\}}(X) = \{UG_1, UG_4, UG_5\}, U_{C-\{N\}}(X) = \{UG_1, UG_8, UG_3, UG_2, UG_6, UG_4, UG_5\}$,

$B_{C-\{N\}}(X) = \{UG_3, UG_6, UG_2, UG_8\}$,

$\tau_{C-\{N\}}(X) = \{U, \emptyset, \{UG_1, UG_4, UG_5\}, \{UG_1, UG_8, UG_3, UG_2, UG_6, UG_4, UG_5\}, \{UG_8, UG_3, UG_2, UG_6\}\}$,

$\beta_{C-\{N\}}(X) = \{U, \{UG_1, UG_4, UG_5\}, \{UG_2, UG_8, UG_3, UG_6\}\}$.

Therefore $\beta_C(X) \neq \beta_{C-\{N\}}(X)$. Hence core$(A) = \{C, G, N\}$.

IV. OBSERVATION

From the Core(A), for the above two cases we conclude that (Competitive examination books, General knowledge books, Newspapers) are the best combinations for the undergraduate students to enhance their successful career.

V. CONCLUSION

In this paper, we used the applications of nanotopology with powerful technique. We conclude that, it will be used for attribute reduction such as “Competitive examination books, General knowledge books and Newspapers” are the best combinations of study materials in the library to face the competitive examinations.

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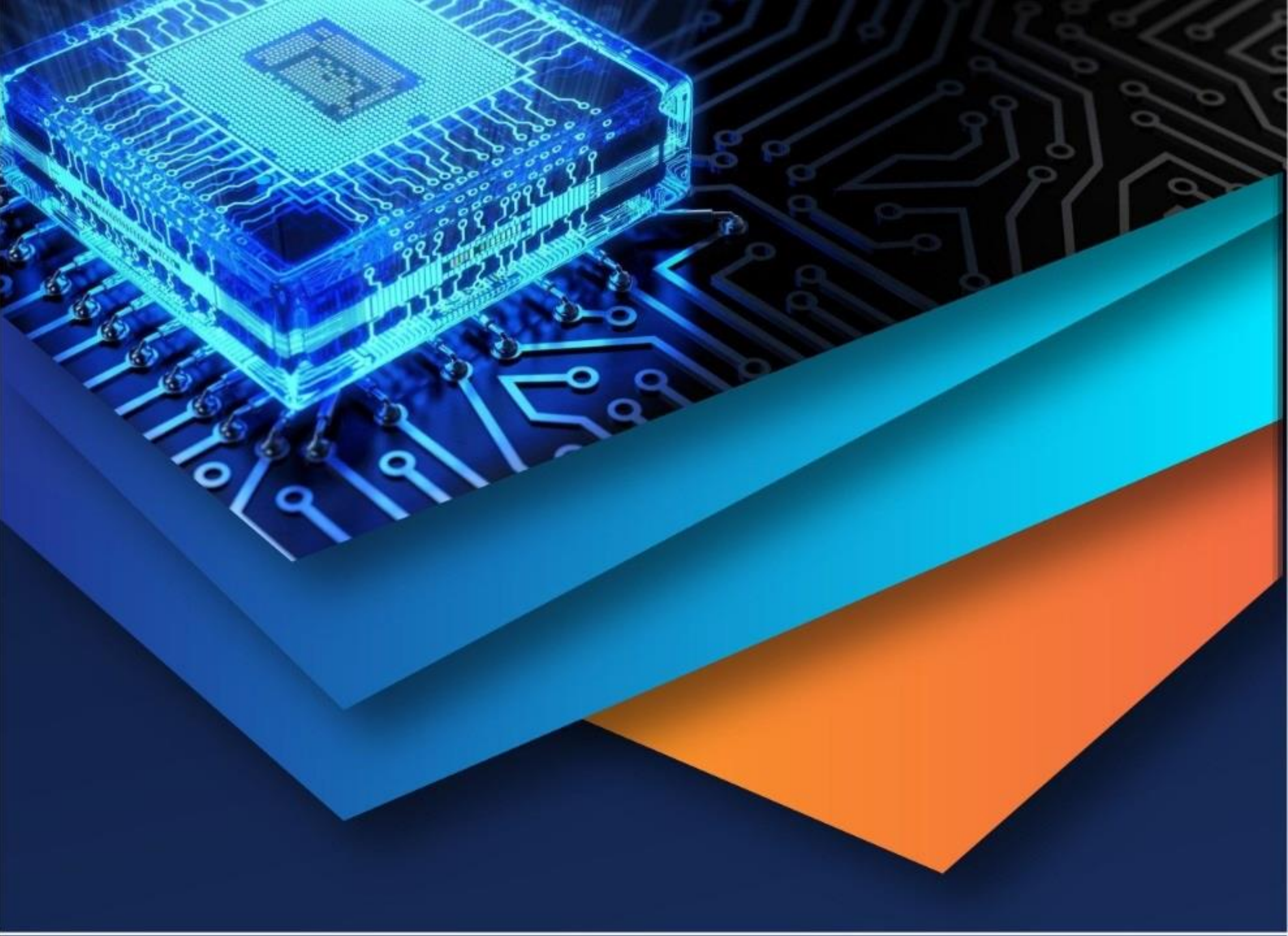

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