# Application of Multi Vague Set in Career Guidance

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## ABSTRACT

Career guidance often involves analyzing uncertain, imprecise, and subjective information such as student preferences, aptitudes, skills and academic performance. Traditional fuzzy or intuitionistic fuzzy models handle some of this uncertainty, but fall short when Multi dimensional vagueness exists. This paper introduces a novel distance-based framework using Multi vague sets, which can represent multiple levels of truth, falsity and hesitation for each attribute. We apply this model to career counseling by comparing a students Multi vague profile with those of various career options. The proposed system computes distance measures between student profiles and ideal job requirement profiles to recommend the most suitable career paths. Experimental results validate the approach, demonstrating its effectiveness in handling uncertainty and improving the decision-making process in career guidance.

**Keywords: -** Vague set, Multi vague set, Distance measure, Career guidance.

**Mathematical Subject Classification (2000):** 08A72, 20N25, 03E72.

## INTRODUCTION

Career guidance is a critical decision-making process that requires evaluating an individuals skills, preferences and traits often expressed in uncertain or imprecise terms. To address this, L.A. Zadeh (1965) [25] introduced fuzzy set theory, which models uncertainty using degrees of membership. Later, Gau and Buehrer (1993) [14] proposed vague sets, refining this by incorporating both membership and non-membership functions explicitly, along with a hesitation margin, allowing for more expressive modeling of uncertainty.

In this study, professions such as software developer, data analyst, teacher and civil servant are modelled using Multi vague representations across four key attributes technical skills, communication, leadership, and social awareness each subdivided into relevant sub skills. The proposed model offers an effective framework to handle incomplete, vague data and provides accurate recommendations even in complex, uncertain environments.

To further enhance the expressiveness of fuzzy models, Gau and Buehrer introduced vague sets, which define membership, non-membership and hesitation functions independently. Building on these concepts, Multi vague sets, as introduced by N. Ramakrishna [18], provide a Multi-dimensional representation of uncertainty, allowing each attribute to be described by multiple degrees of truth, falsity and indeterminacy. This is particularly useful in real-life decision-making scenarios like career guidance, where each attribute such as technical skill or communication ability can have several nuanced subskills.

In such contexts, matching a candidates profile with suitable career options requires effective distance measures to quantify similarity. Szmidt and Kacprzyk [21] developed prominent distance measures for intuitionistic fuzzy set, highlighting their importance in applications like decision support and classification. Leveraging these ideas, this work applies a Multi vague set-based distance approach to the career guidance problem.

## PRELIMINARIES

**Definition 2.1** A Vague set A in the universe of discourse G is a pair $(t_A, f_A)$ where $t_A: G \to [0, 1]$, $f_A: G \to [0, 1]$, are the mappings such that $t_A(x) + f_A(x) \leq 1$, for all $x \in G$. The functions $t_A(x)$ and $f_A(x)$ are true and false membership functions respectively.

**Definition 2.2** Let G be a non-empty set. A vague set $A = (t_A, f_A)$ where $t_A(x) = (t_{1A}(x), t_{2A}(x), ..., t_{kA}(x))$ and $f_A(x) = (f_{1A}(x), f_{2A}(x), ..., f_{kA}(x))$ and $t_{iA}: G \to [0, 1]$, $f_{iA}: G \to [0, 1]$, are mappings such that $t_{iA}(x) + f_{iA}(x) \leq 1$, for all $x \in G$, for $i = 1,2,3, . . . , k$., is called Multi vague set of G with dimension **k**. Here $t_{1A}(x) \geq t_{2A}(x) \geq ......t_{kA}(x)$, for all $x \in G$.

Note: We arranged the true membership sequence is decreasing order, then the corresponding false membership sequence need not be in decreasing or increasing order.

According to fuzzy set theory, if the membership degree of an element is $t_A(x)$, if non- membership degree of an element x is $f_A(x)$. Furthermore, we have $\pi_A(x) = 1 - t_A(x) - f_A(x)$ called the vague set index or hesitation on margin of x in A. $\pi_A(x)$ is the degree of indeterminacy of $x \in G$ to the vague set A and i.e., $\pi_A(x) \in [0, 1]$ for every $x \in G$, $\pi_A(x)$ expresses the lack of knowledge of whether x belongs to the vague set A or not.

**Definition 2.3** Let G be non-empty group and A, B, C are vague sets in G. The distance between vague sets A and B is a mapping $d: G \times G \to [0, 1]$ if d (A, B) satisfies the following axioms.

$A_1$) $0 \leq d(A, B) \leq 1$
$A_2$) $d(A, B) = 0$ iff $A = B$
$A_3$) $d(A, B) = d(B, A)$
$A_4$) $d(A, C) + d(C, B) \geq d(A, B)$
$A_5$) if $A \subseteq B \subseteq C$, then $d(A, C) \geq d(A, B)$ and $d(A, C) \geq d(B, C)$

Distance measure is a term that describes the difference between vague sets and can be considered as a dual concept of similarity measures between vague sets proposed by Szmidt. E and Kacprzyk. J.

**Definition 2.4** Let $A = \{\langle x, t_A(x), f_A(x), \pi_A(x)\rangle \mid x \in G\}$ & $B = \{\langle x, t_B(x), f_B(x), \pi_B(x)\rangle \mid x \in G\}$ be two vague sets in $G = \{x_1, x_2, ..., x_n\}$. Based on the geometric interpretation of vague set, Szmidt, E and Kacprzyk, J, propose the following four distance measures between A and B.

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Let $A = \{\langle x_1, t_A(x_1), f_A(x_1), \pi_A(x_1)\rangle,$
$\langle x_2, t_A(x_2), f_A(x_2), \pi_A(x_2)\rangle,$
$\langle \ldots, \ldots, \ldots\ldots,\rangle,$
$\langle \ldots, \ldots, \ldots\ldots,\rangle,$
$\langle x_n, t_A(x_n), f_A(x_n), \pi_A(x_n)\rangle\}$
$B = \{\langle x_1, t_B(x_1), f_B(x_1), \pi_B(x_1)\rangle,$
$\langle x_2, t_B(x_2), f_B(x_2), \pi_B(x_2)\rangle,$
$\langle \ldots, \ldots, \ldots\ldots,\rangle,$
$\langle \ldots, \ldots, \ldots\ldots,\rangle,$
$\langle x_n, t_B(x_n), f_B(x_n), \pi_B(x_n)\rangle\}$, then

1) The Hamming distance.

$$d_H(A,B) = \frac{1}{2}\sum_{i=1}^{n}(|t_A(x_i) - t_B(x_i)| + |f_A(x_i) - f_B(x_i)| + |\pi_A(x_i) - \pi_B(x_i)|)$$

2) The Euclidean distance.

$$d_E(A,B) = \sqrt{\frac{1}{2}\sum_{i=1}^{n}(|t_A(x_i) - t_B(x_i)|^2 + |f_A(x_i) - f_B(x_i)|^2 + |\pi_A(x_i) - \pi_B(x_i)|^2)}$$

3) The Normalized Euclidean distance.

$$d_E(A,B) = \sqrt{\frac{1}{2n}\sum_{i=1}^{n}(|t_A(x_i) - t_B(x_i)|^2 + |f_A(x_i) - f_B(x_i)|^2 + |\pi_A(x_i) - \pi_B(x_i)|^2)}$$

4) The Normalized Hamming distance.

$$d_H(A,B) = \frac{1}{2n}\sum_{i=1}^{n}(|t_A(x_i) - t_B(x_i)| + |f_A(x_i) - f_B(x_i)| + |\pi_A(x_i) - \pi_B(x_i)|)$$

Now, we extend these distances to Multi vague sets.

i.e., $A = \{< x_1, (t_{1A}(x_1), \ldots\ldots, t_{kA}(x_1)), (f_{1A}(x_1), \ldots\ldots, f_{kA}(x_1)), (\pi_{1A}(x_1), \ldots\ldots, \pi_{kA}(x_1))>$

$< \ldots, (t_{1A}(\ldots), \ldots\ldots, t_{kA}(\ldots)), (f_{1A}(\ldots), \ldots\ldots, f_{kA}(\ldots)), (\pi_{1A}(\ldots), \ldots\ldots, \pi_{kA}(\ldots))>$

$< x_1, (t_{1A}(x_j), \ldots\ldots, t_{kA}(x_j)), (f_{1A}(x_j), \ldots\ldots, f_{kA}(x_j)), (\pi_{1A}(x_j), \ldots\ldots, \pi_{kA}(x_j))>$

$< \ldots, (t_{1A}(\ldots), \ldots\ldots, t_{kA}(\ldots)), (f_{1A}(\ldots), \ldots\ldots, f_{kA}(\ldots)), (\pi_{1A}(\ldots), \ldots\ldots, \pi_{kA}(\ldots))>$

$< x_1, (t_{1A}(x_n), \ldots\ldots, t_{kA}(x_n)), (f_{1A}(x_n), \ldots\ldots, f_{kA}(x_n)), (\pi_{1A}(x_n), \ldots\ldots, \pi_{kA}(x_n))>\}$

$B = \{< x_1, (t_{1B}(x_1), \ldots\ldots, t_{kB}(x_1)), (f_{1B}(x_1), \ldots\ldots, f_{kB}(x_1)), (\pi_{1B}(x_1), \ldots\ldots, \pi_{kB}(x_1))>$

$< .., (t_{1B}(..), \ldots\ldots, t_{kB}(..)), (f_{1B}(..), \ldots\ldots, f_{kB}(..)), (\pi_{1B}(..), \ldots\ldots, \pi_{kB}(..))>$

$< x_1, (t_{1B}(x_j), \ldots\ldots, t_{kB}(x_j)), (f_{1B}(x_j), \ldots\ldots, f_{kB}(x_j)), (\pi_{1B}(x_j), \ldots\ldots, \pi_{kB}(x_j))>$

$< .., (t_{1B}(..), \ldots\ldots, t_{kB}(..)), (f_{1B}(..), \ldots\ldots, f_{kB}(..)), (\pi_{1B}(..), \ldots\ldots, \pi_{kB}(..))>$

$< x_1, (t_{1B}(x_n), \ldots\ldots, t_{kB}(x_n)), (f_{1B}(x_n), \ldots\ldots, f_{kB}(x_n)), (\pi_{1B}(x_n), \ldots\ldots, \pi_{kB}(x_n))>\}$

Here A and B are Multi vague sets with dimension **k**, and having n elements.
and $t_{1A} \geq t_{2A} \geq \cdots \geq t_{kA},\ t_{iA}: G \to [0,1],\ f_{iA}: G \to [0,1]\ and\ \pi_{iA}: G \to [0,1]$ are membership, non- membership and hesitant functions respectively. Also
$t_{iA} + f_{iA} + \pi_{iA} = 1, \forall i = 1,2,..,k.$ And j=1, 2, …, n.

1) The Manhattan distance.

$$d_{Man}(A,B) = \frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{k}\left(\left|t_{iA}(x_j) - t_{iB}(x_j)\right| + \left|f_{iA}(x_j) - f_{iB}(x_j)\right| + \left|\pi_{iA}(x_j) - \pi_{iB}(x_j)\right|\right)$$

2) The Normalized Manhattan distance.

$$d_{n-Man}(A,B) = \frac{1}{nk}\sum_{j=1}^{n}\sum_{i=1}^{k}\left(\left|t_{iA}(x_j) - t_{iB}(x_j)\right| + \left|f_{iA}(x_j) - f_{iB}(x_j)\right| + \left|\pi_{iA}(x_j) - \pi_{iB}(x_j)\right|\right)$$

3) The Euclidean distance.

$$d_E(A,B) = \sqrt{\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{k}\left(|t_A(x_i) - t_B(x_i)|^2 + |f_A(x_i) - f_B(x_i)|^2 + |\pi_A(x_i) - \pi_B(x_i)|^2\right)}$$

4) The Normalized Euclidean distance.

$$d_{n-E}(A,B) = \sqrt{\frac{1}{nk}\sum_{j=1}^{n}\sum_{i=1}^{k}\left(\left|t_{iA}(x_j) - t_{iB}(x_j)\right|^2 + \left|f_{iA}(x_j) - f_{iB}(x_j)\right|^2 + \left|\pi_{iA}(x_j) - \pi_{iB}(x_j)\right|^2\right)}$$

Note: Hamming distance counts the number of positions at which two vectors (or strings) of equal length differ. It's typically used for categorical, binary or discrete data, while Manhattan measures the sum of absolute differences between coordinates in a Multi-dimensional space. It's a numeric measure for continuous or real-valued vectors. So, we replacing Hamming distance with Manhattan distance.

**Example 3.1** Let G be a nonempty group. A and B are Multi vague sets of G with dimension 4, with 3 elements. Let x, y and z ∈ G

A = {⟨x, (0.9, 0.8, 0.7, 0.6), (0, 0.1, 0.1, 0.3) ⟩,
⟨y, (0.8, 0.7, 0.7, 0.5), (0, 0, 0.2, 0.3) ⟩,
⟨z, (0.7, 0.6, 0.6, 0.4), (0.2, 0.3, 0.3, 0.4 ⟩}

B = {⟨x, (0.7, 0.6, 0.5, 0.5), (0.1, 0.1, 0.2, 0.2) ⟩,
⟨y, (0.6, 0.5, 0.4, 0.4), (0.2, 0.3, 0.3, 0.2) ⟩,
⟨z, (0.6, 0.5, 0.3, 0.1), (0.2, 0.3, 0.6, 0.3) ⟩}

1) The Manhattan distance.

$$\mathrm{d}_{Man}(\mathrm{A}, \mathrm{B}) = 1.86$$

2) The Normalized Manhattan distance.

$$\mathrm{d}_{n-Man}(\mathrm{A}, \mathrm{B}) = 0.465$$

3) The Euclidean distance.

$$\mathrm{d}_{\mathrm{E}}(\mathrm{A}, \mathrm{B}) = 1.16$$

4) The Normalized Euclidean distance.

$$\mathrm{d}_{\mathrm{n-E}}(\mathrm{A}, \mathrm{B}) = 0.31$$

Note: We observed that

1) $0 \leq d_H(A, B) \leq n$
2) $0 \leq d_{n-H}(A, B) \leq 1$
3) $0 \leq d_H(A, B) \leq \sqrt{n}$
4) $0 \leq d_{n-E}(A, B) \leq 1$

 

**Model of Multi vague sets in Career Guidance**

This multidimensional modeling is especially valuable in career guidance, where attributes like "communication skills" may involve subcomponents such as verbal ability, written expression, and public speaking each with varying levels of proficiency and evaluation sources. By integrating these multiple assessments into a single framework, Multi Vague Sets offer a more realistic and fine-grained understanding of an individual's competencies.

In this study, we apply Multi Vague Sets to career attributes to develop a more nuanced and effective decision support system. By incorporating diverse evaluations at a micro-level, the calculated distances between candidate profiles and ideal career paths become more accurate, facilitating better alignment between individual potential and career recommendations.

Now, we introduce the Multi vague set concept in each attribute, by introducing these values, the distance will be more accurate and precise, more over considering all parameters in minute level.

Let P = { $S_1$, $S_2$, $S_3$, $S_4$ } be a set of Students, C = {Software Developer, Data Analyst, Teacher, Civil Services} be a set of careers and {technical skills, communication skills, leadership skills, social awareness} be a set of skills.

$A_l = \left\{ < t_{A_l}(x_j), f_{A_l}(x_j), \pi_{A_j}(x_j) > \middle|\ x_j \in X \right\}$ becomes

$A_l = \left\{ < t_{A_{il}}(x_j)\}_{i=1}^{k}, f_{A_{il}}(x_j)\}_{i=1}^{k}, \pi_{A_{ij}}(x_j)\}_{i=1}^{k} > \middle|\ x_j \in X \right\}_{j=1}^{n}$ and l = 1,2..., m.

Here $t_{iA_l}: X \to [0,1]$, $f_{iA_l}: X \to [0,1]$ and $\pi_{iA_l}: X \to [0,1]$ membership, non- membership and hesitant margin respectively. So, we modify the above example with Multi dimension

k = 5, l= 1, 2,3,4,5 and 6, also j = 1,2,3 and 4.

$$\text{i.e., } A_l = \{[< t_{1A_l}(x_j), t_{2A_l}(x_j), t_{3A_l}(x_j), t_{4A_l}(x_j), t_{5A_l}(x_j) >,$$

$$< f_{1A_l}(x_j), f_{2A_l}(x_j), f_{3A_l}(x_j), f_{4A_l}(x_j), f_{5A_l}(x_j) >,$$

$$< \pi_{1A_l}(x_j), \pi_{2A_l}(x_j), \pi_{3A_l}(x_j), \pi_{4A_l}(x_j), \pi_{5A_l}(x_j) >] |\ x_j \in X \}_{j=1}^{4}$$

$$\text{or } A_l = \{[< t_{1A_l}(x_1), t_{2A_l}(x_1), t_{3A_l}(x_1), t_{4A_l}(x_1), t_{5A_l}(x_1) >,$$

$$< f_{1A_l}(x_1), f_{2A_l}(x_1), f_{3A_l}(x_1), f_{4A_l}(x_1), f_{5A_l}(x_1) >,$$

$$< \pi_{1A_l}(x_1), \pi_{2A_l}(x_1), \pi_{3A_l}(x_1), \pi_{4A_l}(x_1), \pi_{5A_l}(x_1) >$$

$$[< t_{1A_l}(x_2), t_{2A_l}(x_2), t_{3A_l}(x_2), t_{4A_l}(x_2), t_{5A_l}(x_2) >,$$

$$< f_{1A_l}(x_2), f_{2A_l}(x_2), f_{3A_l}(x_2), f_{4A_l}(x_2), f_{5A_l}(x_2) >,$$

$$< \pi_{1A_l}(x_2), \pi_{2A_l}(x_2), \pi_{3A_l}(x_2), \pi_{4A_l}(x_2), \pi_{5A_l}(x_2) >]$$

$$[< t_{1A_l}(x_3), t_{2A_l}(x_3), t_{3A_l}(x_3), t_{4A_l}(x_3), t_{5A_l}(x_3) >,$$

$$< f_{1A_l}(x_3), f_{2A_l}(x_3), f_{3A_l}(x_3), f_{4A_l}(x_3), f_{5A_l}(x_3) >,$$

$$< \pi_{1A_l}(x_3), \pi_{2A_l}(x_3), \pi_{3A_l}(x_3), \pi_{4A_l}(x_3), \pi_{5A_l}(x_3) >]$$

$$[< t_{1A_l}(x_4), t_{2A_l}(x_4), t_{3A_l}(x_4), t_{4A_l}(x_4), t_{5A_l}(x_4) >,$$

$$< f_{1A_l}(x_4), f_{2A_l}(x_4), f_{3A_l}(x_4), f_{4A_l}(x_4), f_{5A_l}(x_4) >,$$

$$< \pi_{1A_l}(x_4), \pi_{2A_l}(x_4), \pi_{3A_l}(x_4), \pi_{4A_l}(x_4), \pi_{5A_l}(x_4) >]$$

$$[< t_{1A_l}(x_5), t_{2A_l}(x_5), t_{3A_l}(x_5), t_{4A_l}(x_5), t_{5A_l}(x_5) >,$$

$$< f_{1A_l}(x_5), f_{2A_l}(x_5), f_{3A_l}(x_5), f_{4A_l}(x_5), f_{5A_l}(x_5) >,$$

$$< \pi_{1A_l}(x_5), \pi_{2A_l}(x_5), \pi_{3A_l}(x_5), \pi_{4A_l}(x_5), \pi_{5A_l}(x_5) >]\}$$

we subdivide each attribute, i.e., technical skill, communication skills, leadership skills, Social Awareness. we subdivide each attribute as follows

1) Technical Skill (TS)
$TS_1$ Programming
$TS_2$: Data Analysis
$TS_3$: Software Design
$TS_4$: Problem Solving
$TS_5$ Debugging

2) Communication Skills (CS)
$CS_1$ Verbal Skills
CS2 Writing Skills
$CS_3$ Presentation
$CS_4$ Active Listening
$CS_5$Negotiation

3) Leadership Skills (LS)
$LS_1$ Decision Making
$LS_2$ Team Management
$LS_3$ Conflict Handling
$LS_4$ Motivating Others
$LS_5$ Responsibility

4) Social Awareness (SA)
$SA_1$ Empathy
$SA_2$ Cultural Sensitivity
$SA_3$ Community Service
$SA_4$ Ethical Judgment
$SA_5$ Social Responsibility

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$t_{1A_1}(x_1)$, $f_{1A_1}(x_1)$, $\pi_{1A_1}(x_1)$ are the membership, non- membership and hesitant margin of programming sub skill in technical skill ($TS_1$).
$t_{2A_1}(x_1)$, $f_{2A_1}(x_1)$, $\pi_{2A_1}(x_1)$ are the membership, non- membership and hesitant margin of data analysis subskill in technical skill ($TS_2$).
$t_{3A_1}(x_1)$, $f_{3A_1}(x_1)$, $\pi_{3A_1}(x_1)$ are the membership, non- membership and hesitant margin of software design subskill in technical skill ($TS_3$).
$t_{4A_1}(x_1)$, $f_{4A_1}(x_1)$, $\pi_{4A_1}(x_1)$ are the membership, non- membership and hesitant margin of problem-solving subskill in technical skill ($TS_4$).
$t_{5A_1}(x_1)$, $f_{5A_1}(x_1)$, $\pi_{5A_1}(x_1)$ are the membership, non- membership and hesitant margin of debugging subskill in technical skill ($TS_5$).

$t_{1A_1}(x_3)$, $f_{1A_1}(x_3)$, $\pi_{1A_1}(x_3)$ are the membership, non- membership and hesitant margin of verbal subskill in communication skill ($CS_1$).
$t_{2A_1}(x_3)$, $f_{2A_1}(x_3)$, $\pi_{2A_1}(x_3)$ are the membership, non- membership and hesitant margin of writing subskill in communication skill ($CS_2$).
$t_{3A_1}(x_3)$, $f_{3A_1}(x_3)$, $\pi_{3A_1}(x_3)$ are the membership, non- membership and hesitant margin of presentation sub skill in communication skill ($CS_3$).
$t_{4A_1}(x_3)$, $f_{4A_1}(x_3)$, $\pi_{4A_1}(x_3)$ are the membership, non- membership and hesitant margin of active listening subskill in communication skill ($CS_4$).
$t_{5A_1}(x_3)$, $f_{5A_1}(x_3)$, $\pi_{5A_1}(x_3)$ are the membership, non- membership and hesitant margin of negotiation subskill in communication skill ($CS_5$).

$t_{1A_1}(x_2)$, $f_{1A_1}(x_2)$, $\pi_{1A_1}(x_2)$ are the membership, non- membership and hesitant margin of decision-making sub skill in leadership skill ($LS_1$).
$t_{2A_1}(x_2)$, $f_{2A_1}(x_2)$, $\pi_{2A_1}(x_2)$ are the membership, non- membership and hesitant margin of team management sub skill in leadership skill ($LS_2$).
$t_{3A_1}(x_2)$, $f_{3A_1}(x_2)$, $\pi_{3A_1}(x_2)$ are the membership, non- membership and hesitant margin of conflict handling sub skill in leadership skill ($LS_3$).
$t_{4A_1}(x_2)$, $f_{4A_1}(x_2)$, $\pi_{4A_1}(x_2)$ are the membership, non- membership and hesitant margin of motivating others sub skill in leadership skill ($LS_4$).
$t_{5A_1}(x_2)$, $f_{5A_1}(x_2)$, $\pi_{5A_1}(x_2)$ are the membership, non- membership and hesitant margin of responsibility sub skill in leadership skill ($LS_5$).

$t_{1A_1}(x_3)$, $f_{1A_1}(x_3)$, $\pi_{1A_1}(x_3)$ are the membership, non- membership and hesitant margin of empathy subskill in social awareness ($SA_1$).
$t_{2A_1}(x_3)$, $f_{2A_1}(x_3)$, $\pi_{2A_1}(x_3)$ are the membership, non- membership and hesitant margin of cultural sensitivity subskill in social awareness ($SA_2$).
$t_{3A_1}(x_3)$, $f_{3A_1}(x_3)$, $\pi_{3A_1}(x_3)$ are the membership, non- membership and hesitant margin of community service subskill in social awareness ($SA_3$).
$t_{4A_1}(x_3)$, $f_{4A_1}(x_3)$, $\pi_{4A_1}(x_3)$ are the membership, non- membership and hesitant margin of ethical judgement subskill in social awareness ($SA_4$).
$t_{5A_1}(x_3)$, $f_{5A_1}(x_3)$, $\pi_{5A_1}(x_3)$ are the membership, non- membership and hesitant margin of social responsibility subskill in social awareness ($SA_5$).

Table 1 below is an assumed database of careers and their skills are in in vague nature. Skills are represented with SD = software developer, DA = data analyst, T = teacher and CS = Civil Services.

Table 1:Career vs Skills

| | Technical Skill | Communication Skill | Leadership Skill | Social Awareness |
|---|---|---|---|---|
| T | (0.6,0.7,0.8,0.5,0.7)<br>(0.2,0.1,0,0.3,0.2)<br>(0.2,0.2,0.2,0.2,0.1) | (0.7,0.8,0.8,0.8,0.9)<br>(0.1,0.1,0,0.1,0)<br>(0.2,0.1,0.2,0.1,0) | (0.6,0.7,0.7,0.8,0.8)<br>(0.2,0.1,0.1,0.1,0.1)<br>(0.2,0.2,0.2,0.1,0.1) | (0.3,0.4,0.4,0.5,0.5)<br>(0.4,0.3,0.3,0.3,0.2)<br>(0.3,0.3,0.3,0.2,0.3) |
| C | (0.6,0.7,0.8,0.5,0.9)<br>(0.3,0.2,0.1,0.3,0.1)<br>(0.1,0.1,0.1,0.2,0) | (0.8,0.8,0.9,0.9,1)<br>(0,0,0,0,0)<br>(0.2,0.2,0.1,0.1,0) | (0.3,0.4,0.4,0.5,0.5)<br>(0.3,0.3,0.2,0.2,0.2)<br>(0.4,0.3,0.4,0.3,0.3) | (0.7,0.8,0.8,0.9,0.9)<br>(0.1,0.1,0,0,0)<br>(0.2,0.1,0.2,0.1,0.1) |
| TP | (0.4,0.8,0.7,0.6,0.5)<br>(0.5,0.1,0.2,0.3,0.4)<br>(0.1,0.1,0.1,0.1,0.1) | (0.4,0.4,0.5,0.6,0.7)<br>(0.3,0.3,0.3,0.2,0.1)<br>(0.3,0.3,0.2,0.2,0.2) | (0.4,0.5,0.5,0.6,0.6)<br>(0.3,0.2,0.2,0.2,0.1)<br>(0.3,0.3,0.3,0.2,0.3) | (0.8,0.9,0.9,0.9,1)<br>(0,0,0,0,0)<br>(0.2,0.1,0.1,0.1,0) |
| HA | (0.6,0.8,0.7,0.6,0.6)<br>(0.3,0.1,0.2,0.2,0.2)<br>(0.1,0.1,0.1,0.2,0.2) | (0.3,0.3,0.4,0.5,0.5)<br>(0.5,0.5,0.4,0.3,0.3)<br>(0.2,0.2,0.2,0.2,0.2) | (0.5,0.6,0.6,0.6,0.7)<br>(0.2,0.2,0.2,0.2,0.1)<br>(0.3,0.2,0.2,0.2,0.2) | (0.3,0.4,0.4,0.5,0.5)<br>(0.5,0.5,0.4,0.3,0.3)<br>(0.2,0.2,0.2,0.2,0.2) |
| BP | (0.7,0.6,0.5,0.8,0.7)<br>(0.2,0.3,0.4,0.1,0.2)<br>(0.1,0.1,0.1,0.1,0.2) | (0.6,0.7,0.7,0.7,0.8)<br>(0.2,0.2,0.2,0.2,0.1)<br>(0.2,0.1,0.1,0.1,0.1) | (0.6,0.7,0.7,0.8,0.8)<br>(0.3,0.2,0.2,0.1,0.2)<br>(0.1,0.1,0.1,0.1,0) | (0.5,0.6,0.6,0.7,0.7)<br>(0.3,0.2,0.3,0.2,0.1)<br>(0.2,0.2,0.1,0.1,0.2) |

In Table 1, each symptom is described by three numbers, i.e., membership function $t_A = \{t_{1A}, t_{2A}, t_{3A}, t_{4A}, t_{5A}\}$, non membership function $f_A = \{f_{1A}, f_{2A}, f_{3A}, f_{4A}, f_{5A}\}$ and hesitant margin $\pi_A = \{\pi_{1A}, \pi_{2A}, \pi_{3A}, \pi_{4A}, \pi_{5A}\}$

For counseling we assumed values are taken from the students and analyzed. From the analysis, we get Table 2 below. Students are represented with $\{S_1, S_2, S_3, S_4\}$ and skills are Technical Skill, Communication Skill, Leadership Skill and Social Awareness Skill.

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Table 2:Students vs Skills

| | Technical Skill | Communication Skill | Leadership Skill | Social Awareness |
|---|---|---|---|---|
| T | (0.7,0.6,0.7,0.8,0.8)<br>(0.1,0.2,0.1,0.1,0)<br>(0.2,0.2,0.2,0.1,0.2) | (0.3,0.4,0.5,0.5,0.6)<br>(0.5,0.4,0.3,0.3,0.2)<br>(0.2,0.2,0.2,0.2,0.2) | (0.1,0.2,0.2,0.3,0.4)<br>(0.7,0.6,0.6,0.5,0.4)<br>(0.2,0.2,0.2,0.2,0.2) | (0.5,0.5,0.5,0.6,0.7)<br>(0.4,0.4,0.3,0.3,0.2)<br>(0.1,0.1,0.2,0.1,0.1) |
| C | (0.4,0.4,0.5,0.5,0.6)<br>(0.4,0.4,0.3,0.3,0.2)<br>(0.1,0.2,0.1,0.1,0.1) | (0.7,0.7,0.8,0.8,0.8)<br>(0.2,0.1,0.1,0.1,0.1)<br>(0.1,0.2,0.1,0.1,0.1) | (0.2,0.3,0.3,0.4,0.5)<br>(0.3,0.2,0.2,0.1,0.1)<br>(0.5,0.5,0.5,0.5,0.4) | (0.3,0.4,0.5,0.5,0.6)<br>(0.4,0.4,0.3,0.3,0.2)<br>(0.3,0.2,0.2,0.2,0.2) |
| TP | (0.2,0.2,0.3,0.3,0.4)<br>(0.7,0.7,0.6,0.6,0)<br>(0.1,0.1,0.1,0.1,0.6) | (0.6,0.6,0.7,0.7,0.8)<br>(0.3,0.3,0.2,0.2,0.1)<br>(0.1,0.1,0.1,0.1,0.1) | (0.8,0.8,0.9,0.9,0.1)<br>(0,0,0,0,0)<br>(0.2,0.2,0.1,0.1,0) | (0.1,0.2,0.2,0.3,0.3)<br>(0.7,0.6,0.3,0.5,0.5)<br>(0.2,0.2,0.2,0.2,0.2) |
| HA | (0.6,0.6,0.7,0.7,0.8)<br>(0.3,0.3,0.2,0.2,0.1)<br>(0.1,0.1,0.1,0.1,0.1) | (0.5,0.5,0.6,0.6,0.7)<br>(0.5,0.5,0.4,0.3,0.3)<br>(0,0,0,0.1,0) | (0.2,0.3,0.3,0.4,0.5)<br>(0.7,0.6,0.6,0.5,0.4)<br>(0.1,0.1,0.1,0.1,0.1) | (0.6,0.6,0.7,0.7,0.7)<br>(0.3,0.3,0.2,0.2,0.2)<br>(0.1,0.1,0.1,0.1,0.1) |
| BP | (0.2,0.3,0.4,0.4,0.5)<br>(0.5,0.5,0.4,0.3,0.3)<br>(0.3,0.2,0.2,0.3,0.2) | (0.8,0.8,0.9,0.9,0.9)<br>(0.1,0.1,0,0,0)<br>(0.1,0.1,0.1,0.1,0.1) | (0.4,0.4,0.5,0.5,0.5)<br>(0.6,0.5,0.4,0.4,0.4)<br>(0,0.1,0.1,0.1,0.1) | (0.5,0.5,0.5,0.6,0.7)<br>(0.5,0.5,0.4,0.3,0.3)<br>(0,0,0.1,0.1,0) |

The Normalized Euclidean distance formula.

$$d_{n-E}(A,B) = \sqrt{\frac{1}{nk}\left[\sum_{j=1}^{n}\left[\sum_{i=1}^{k}\left(|t_{iA}(x_j)-t_{iB}(x_j)|^2+|f_{iA}(x_j)-f_{iB}(x_j)|^2+|\pi_{iA}(x_j)-\pi_{iB}(x_j)|^2\right)\right]\right]}$$

Here j=4, k=5.

1) $d_{n-E}(SD,\ S_1) =$ square root of $\{\frac{1}{20}[(0.2^2+0.1^2+0.4^2+0^2+0.2^2)+$
$(0.1^2+0.1^2+0.1^2+0.1^2+0.1^2)+(0.1^2+0.1^2+0^2+0.2^2+0.1^2)+$
$(0^2+0.1^2+0.3^2+0.2^2+0^2)+(0.2^2+0.1^2+0.3^2+0^2+0.2^2)+$
$(0.1^2+0.1^2+0.1^2+0.1^2+0.1^2)+(0.1^2+0.1^2+0^2+0.1^2+0.1^2)+$
$(0.1^2+0.1^2+0.3^2+0.2^2+0^2)+(0^2+0^2+0.1^2+0^2+0^2)+$
$(0^2+0^2+0^2+0^2+0^2)+(0^2+0^2+0^2+0.1^2+0^2)+$
$(0.1^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[(0.04+0.01+0.16+0+0.04)+(0.01+0.01+0.01+0.01+0.01)+$
$(0.01+0.01+0+0.04+0.01)$ +(0+0.01+0.09+0.04+0) + (0.04+0.01+0.09+0+0.04) +(0.01+0.01+0.01+0.01+0.01) + (0.01+0.01+0+0.01+0.01) + (0.01+0.01+0.09+0.04+0) + (0+0+0.01+0+0) + (0+0+0+0+0) +(0+0+0+0.01+0) + (0.01+0+0+0+0)]}

=square root of $\{\frac{1}{20}[0.25 + 0.05 + 0.07 + 0.14 + 0.18 + 0.05 + 0.04 + 0.15 + 0.01 + 0 + 0.01 + 0.01]\}$

$$= \sqrt{\frac{1}{20}}(\,0.96) = \sqrt{0.048} = 0.219089$$
$$\therefore\ d_{n-E}(SD, S_1) = 0.219089$$

2) $\mathrm{d_{n-E}}(\mathrm{SD},\ S_2)$ = square root of $\{\frac{1}{20}[(0.3^2 + 0.2^2 + 0.3^2 + 0.1^2 + 0.3^2) + (0.2^2 + 0^2 + 0.2^2 + 0.2^2 + 0.2^2) + (0^2 + 0.2^2 + 0.2^2 + 0.2^2 + 0.1^2) + (0.1^2 + 0.1^2 + 0.3^2 + 0.1^2 + 0.1^2) + (0.3^2 + 0.2^2 + 0.2^2 + 0.1^2 + 0.3^2) + (0.2^2 + 0^2 + 0.2^2 + 0.1^2 + 0.3^2) + (0^2 + 0.2^2 + 0.2^2 + 0.1^2 + 0.1^2) + (0.2^2 + 0.1^2 + 0.3^2 + 0.1^2 + 0.1^2) + (0^2 + 0^2 + 0.1^2 + 0^2 + 0^2) + (0^2 + 0^2 + 0^2 + 0.1^2 + 0.1^2) + (0^2 + 0^2 + 0^2 + 0.1^2 + 0^2) + (0.1^2 + 0^2 + 0^2 + 0^2 + 0^2)]\}$

=square root of $\{\frac{1}{20}[0.32 + 0.16 + 0.13 + 0.13 + 0.27 + 0.18 + 0.10 + 0.16 + 0.01 + 0.01 + 0.01 + 0.01]\}$

$$= \sqrt{\frac{1}{20}}(\,1.49) = \sqrt{0.0745} = 0.2729$$
$$\therefore\ d_{n-E}(SD, S_2) = 0.2729$$

3) $\mathrm{d_{n-E}}(\mathrm{SD},\ S_3)$ = square root of $\{\frac{1}{20}[(0.1^2 + 0.2^2 + 0.1^2 + 0.1^2 + 0^2) + (0.1^2 + 0.1^2 + 0^2 + 0.2^2 + 0.1^2) + (0.1^2 + 0.1^2 + 0.2^2 + 0^2 + 0.1^2) + (0.3^2 + 0.2^2 + 0.4^2 + 0.2^2 + 0.2^2) + (0.1^2 + 0.1^2 + 0^2 + 0.1^2 + 0^2) + (0.1^2 + 0.1^2 + 0^2 + 0.2^2 + 0.1^2) + (0.1^2 + 0.1^2 + 0.2^2 + 0.1^2 + 0.1^2) + (0.4^2 + 0.2^2 + 0.4^2 + 0.2^2 + 0.2^2) + (0^2 + 0.1^2 + 0.1^2 + 0^2 + 0^2) + (0^2 + 0^2 + 0^2 + 0^2 + 0^2) + (0^2 + 0^2 + 0^2 + 0.1^2 + 0^2) + (0.1^2 + 0^2 + 0^2 + 0^2 + 0^2)]\}$

=square root of $\{\frac{1}{20}[0.07 + 0.07 + 0.07 + 0.37 + 0.03 + 0.07 + 0.08 + 0.44 + 0.02 + 0 + 0.01 + 0.01]\}$

$$= \sqrt{\frac{1}{20}}(\,1.24) = \sqrt{0.062} = 0.2489$$
$$\therefore\ d_{n-E}(SD, S_3) = 0.2489$$

4) $\mathrm{d_{n-E}}(\mathrm{SD},\ S_4)$ = square root of $\{\frac{1}{20}[(0.4^2 + 0.3^2 + 0.5^2 + 0.2^2 + 0.3^2) + (0.3^2 + 0.1^2 + 0.3^2 + 0.2^2 + 0.2^2) + (0.1^2 + 0.1^2 + 0.1^2 + 0.2^2 + 0^2) + (0^2 + 0.1^2 + 0.2^2 + 0.1^2 + 0^2) + (0.4^2 + 0.3^2 + 0.4^2 + 0.2^2 + 0.3^2) + (0.2^2 + 0.1^2 + 0.3^2 + 0.2^2 + 0.2^2) + (0.1^2 + 0.1^2 + 0.2^2 + 0.2^2 + 0^2) +$

$$(0.1^2+0.1^2+0.2^2+0.1^2+0^2)+(0^2+0^2+0.1^2+0^2+0^2)+ (1^2+0^2+0^2+0^2+0^2)+(0^2+0^2+0.1^2+0^2+0^2)+ (0.1^2+0^2+0^2+0^2+0^2)]\}$$

=square root of $\{\frac{1}{20}[0.63+0.27+0.07+0.06+0.54+0.22+0.10+0.07+0.01+ 0.01+0.01+0.01]\}$

$$=\sqrt{\frac{1}{20}(2)}=\sqrt{0.1}=0.3162$$

$$\therefore\ d_{n-E}(SD,S_4)=0.3162$$

5) $\mathrm{d_{n-E}}(\mathrm{DA},\ S_1)=$ square root of $\{\frac{1}{20}[(0^2+0.3^2+0.1^2+0.1^2+0^2)+ (0.1^2+0.1^2+0^2+0.1^2+0^2)+(0^2+0.1^2+0^2+0.2^2+0^2)+ (0.2^2+0^2+0^2+0^2+0.1^2)+(0^2+0.2^2+0.1^2+0.1^2+0^2)+ (0.1^2+0.1^2+0^2+0.1^2+0^2)+(0^2+0.1^2+0^2+0.2^2+0^2)+ (0.1^2+0^2+0^2+0^2+0.4^2)+(0^2+0.1^2+0^2+0^2+0^2)+ (0^2+0^2+0^2+0^2+0^2)+(0^2+0^2+0^2+0^2+0^2)+ (0.1^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[0.11+0.03+0.05+0.05+0.06+0.03+0.05+0.17+0.01+0+ 0+0.01]\}$

$$=\sqrt{\frac{1}{20}}(0.57)=\sqrt{0.0285}=0.1688$$

$$\therefore\ d_{n-E}(DA,S_1)=0.1688$$

6) $\mathrm{d_{n-E}}(\mathrm{DA},\ S_2)=$ square root of $\{\frac{1}{20}[(0.1^2+0.4^2+0^2+0^2+0.1^2)+ (0.2^2+0^2+0.1^2+0.2^2+0.1^2)+(0.1^2+0.1^2+0^2+0.2^2+0.1^2)+ (0^2+0.1^2+0.3^2+0.2^2+0^2)+(0.1^2+0.2^2+0.2^2+0.2^2+0.2^2)+ (0.1^2+0^2+0^2+0.1^2+0^2)+(0.1^2+0.3^2+0^2+0^2+0.1^2)+ (0^2+0^2+0^2+0.1^2+0.3^2)+(0^2+0.1^2+0^2+0^2+0^2)+ (0^2+0^2+0^2+0.1^2+0.1^2)+(0^2+0^2+0^2+0^2+0^2)+ (0.1^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[0.18+0.10+0.17+0.02+0.11+0.10+0.17+0.10+0.01+0.2+ 0+0.01]\}$

$$=\sqrt{\frac{1}{20}}(0.99)=\sqrt{0.0495}=0.2224$$

$$\therefore\ d_{n-E}(DA,S_2)=0.2224$$

7) $\mathrm{d_{n-E}}(\mathrm{DA},\ S_3)=$ square root of $\{\frac{1}{20}[(0.1^2+0^2+0.2^2+0.2^2+0.2^2)+ (0.1^2+0.1^2+0.1^2+0.2^2+0.2^2)+(0^2+0.1^2+0.2^2+0^2+0^2)+ (0.1^2+0.1^2+0.1^2+0^2+0.1^2)+(0.1^2+0^2+0.2^2+0.2^2+0.2^2)+ (0.1^2+0.1^2+0.1^2+0.2^2+0.2^2)+(0^2+0.1^2+0.2^2+0^2+0^2)+$

 

$(0.2^2 + 0.1^2 + 0.1^2 + 0^2 + 0.2^2) + (0^2 + 0^2 + 0^2 + 0^2 + 0^2) +$
$(0^2 + 0^2 + 0^2 + 0^2 + 0^2) + (0^2 + 0^2 + 0^2 + 0^2 + 0^2) +$
$(0.1^2 + 0^2 + 0^2 + 0^2 + 0^2)]\}$

=square root of $\{\frac{1}{20}[0.13 + 0.11 + 0.05 + 0.04 + 0.13 + 0.11 + 0.05 + 0.10 + 0 + 0 + 0 + 0.01]\}$

$$= \sqrt{\frac{1}{20}( 1.72)} = \sqrt{0.086} = 0.2932$$

$$\therefore\ d_{n-E}(DA, S_3) = 0.2932$$

8) $\mathrm{d}_{\mathrm{n-E}}(\mathrm{DA},\ S_4) =$ square root of $\{\frac{1}{20}[(0.2^2 + 0.5^2 + 0.2^2 + 0.1^2 + 0.1^2) +$
$(0.3^2 + 0.1^2 + 0.2^2 + 0.2^2 + 0.1^2) + (0^2 + 0.1^2 + 0.1^2 + 0.2^2 + 0.1^2) +$
$(0.2^2 + 0^2 + 0.1^2 + 0.1^2 + 0.1^2) + (0.2^2 + 0.4^2 + 0.2^2 + 0.1^2 + 0.1^2) +$
$(0.2^2 + 0.1^2 + 0.2^2 + 0.2^2 + 0.1^2) + (0.3^2 + 0.1^2 + 0.2^2 + 0.3^2 + 0.1^2) +$
$(0.1^2 + 0^2 + 0.1^2 + 0.1^2 + 0.4^2) + (0^2 + 0.1^2 + 0^2 + 0^2 + 0^2) +$
$(0^2 + 0^2 + 0^2 + 0^2 + 0^2) + (0^2 + 0^2 + 0.1^2 + 0.1^2 + 0^2) +$
$(0.1^2 + 0^2 + 0^2 + 0^2 + 0^2)]\}$

=square root of $\{\frac{1}{20}[0.35 + 0.19 + 0.07 + 0.07 + 0.22 + 0.14 + 0.24 + 0.19 + 0.01 + 0 + 0.02 + 0.01]\}$

$$= \sqrt{\frac{1}{20}( 1.51)} = \sqrt{0.0755} = 0.2474$$

$$\therefore\ d_{n-E}(DA, S_4) = 0.2474$$

9) $\mathrm{d}_{\mathrm{n-E}}(\mathrm{T},\ S_1) =$ square root of $\{\frac{1}{20}[(0.3^2 + 0.1^2 + 0.1^2 + 0.2^2 + 0.1^2) +$
$(0.2^2 + 0.2^2 + 0.2^2 + 0.1^2 + 0.1^2) + (0^2 + 0.2^2 + 0.2^2 + 0^2 + 0.1^2) +$
$(0^2 + 0.1^2 + 0.3^2 + 0.2^2 + 0^2) + (0.3^2 + 0.1^2 + 0.1^2 + 0.2^2 + 0.1^2) +$
$(0.2^2 + 0.2^2 + 0.1^2 + 0.1^2 + 0.1^2) + (0^2 + 0.2^2 + 0.1^2 + 0^2 + 0.1^2) +$
$(0^2 + 0.1^2 + 0.3^2 + 0.2^2 + 0^2) + (0^2 + 0^2 + 0^2 + 0^2 + 0^2) +$
$(0^2 + 0^2 + 0.1^2 + 0^2 + 0^2) + (0^2 + 0^2 + 0.1^2 + 0^2 + 0^2) +$
$(0^2 + 0^2 + 0^2 + 0^2 + 0^2)]\}$

=square root of $\{\frac{1}{20}[0.16 + 0.14 + 0.09 + 0.14 + 0.16 + 0.11 + 0.06 + 0.14 + 0 + 0.01 + 0.01 + 0]\}$

$$= \sqrt{\frac{1}{20}(1.02)} = \sqrt{0.051} = 0.2258$$

$$\therefore\ d_{n-E}(T, S_1) = 0.2258$$

10) $\mathrm{d}_{\mathrm{n-E}}(\mathrm{T},\ S_2) =$ square root of $\{\frac{1}{20}[(0.2^2 + 0^2 + 0.2^2 + 0.1^2 + 0^2) +$
$(0.1^2 + 0.1^2 + 0.1^2 + 0^2 + 0^2) + (0.1^2 + 0.1^2 + 0^2 + 0^2 + 0.1^2) +$
$(0.1^2 + 0.1^2 + 0.3^2 + 0.1^2 + 0.1^2) + (0.2^2 + 0^2 + 0.2^2 + 0.1^2 + 0^2) +$
$(0.1^2 + 0.1^2 + 0^2 + 0.1^2 + 0.1^2) + (0.1^2 + 0.1^2 + 0.1^2 + 0^2 + 0.1^2) +$
$(0.1^2 + 0.1^2 + 0.3^2 + 0.1^2 + 0.1^2) + (0^2 + 0^2 + 0^2 + 0^2 + 0^2) +$

$(0^2+0^2+0.1^2+0.1^2+0.1^2)+(0^2+0^2+0.1^2+0^2+0^2)+$
$(0^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[0.09+0.03+0.03+0.13+0.09+0.04+0.04+0.13+0+0.03+$
$0.01+0]\}$

$$=\sqrt{\frac{1}{20}(0.62)}=\sqrt{0.1760}=0.1760$$

$\therefore\ d_{n-E}(T,S_2)=0.1760$

11) $\mathrm{d}_{n-E}(\mathrm{T},\ S_3)=$ square root of $\{\frac{1}{20}[(0.4^2+0.4^2+0.4^2+0.3^2+0.3^2)+$
$(0.4^2+0.2^2+0.3^2+0.4^2+0.3^2)+(0^2+0.2^2+0^2+0.2^2+0.1^2)+$
$(0.3^2+0.2^2+0.4^2+0.2^2+0.2^2)+(0.4^2+0.3^2+0.4^2+0.3^2+0.3^2)+$
$(0.4^2+0.2^2+0.2^2+0.4^2+0.3^2)+(0^2+0.2^2+0.1^2+0.2^2+0.1^2)+$
$(0.3^2+0.2^2+0.4^2+0.2^2+0.2^2)+(0^2+0.1^2+0^2+0^2+0^2)+$
$(0^2+0^2+0.1^2+0^2+0^2)+(0^2+0^2+0.1^2+0^2+0^2)+$
$(0^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[0.66+0.44+0.09+0.37+0.59+0.49+0.10+0.17+0.37+$
$0.01+0.01+0.01+0]\}$

$$=\sqrt{\frac{1}{20}(3.14)}=\sqrt{0.157}=0.3962$$

$\therefore\ d_{n-E}(T,S_3)=0.3962$

12) $\mathrm{d}_{n-E}(\mathrm{T},\ S_4)=$ square root of $\{\frac{1}{20}[(0^2+0^2+0^2+0^2+0^2)+$
$(0.1^2+0^2+0.1^2+0^2+0^2)+(0^2+0^2+0.2^2+0.1^2+0^2)+$
$(0^2+0^2+0^2+0^2+0^2)+(0.1^2+0.1^2+0^2+0^2+0^2)+$
$(0.1^2+0^2+0.1^2+0^2+0^2)+(0^2+0^2+0.1^2+0.1^2+0^2)+$
$(0^2+0.1^2+0.2^2+0.1^2+0^2)+(0^2+0^2+0^2+0^2+0^2)+$
$(0.1^2+0^2+0.1^2+0^2+0^2)+(0^2+0^2+0.2^2+0.1^2+0^2)+$
$(0^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[0+0.01+0.06+0+0.02+0.02+0.02+0.06+0+0.02+0.05+$
$0]\}$

$$=\sqrt{\frac{1}{20}(0.26)}=\sqrt{0.013}=0.1140$$

$\therefore\ d_{n-E}(T,S_4)=0.1140$

13) $\mathrm{d}_{n-E}(\mathrm{CS},\ S_1)=$ square root of $\{\frac{1}{20}[(0.4^2+0.1^2+0.3^2+0.2^2+0.3^2)+$
$(0.1^2+0.2^2+0^2+0^2+0.2^2)+(0.3^2+0.2^2+0.3^2+0.1^2+0.3^2)+$
$(0.2^2+0^2+0.1^2+0^2+0.1^2)+(0.4^2+0.1^2+0.3^2+0.2^2+0.3^2)+$
$(0.1^2+0.2^2+0^2+0.1^2+0.2^2)+(0.2^2+0.2^2+0.3^2+0.1^2+0.2^2)+$
$(0.2^2+0^2+0.1^2+0^2+0.1^2)+(0^2+0^2+0^2+0^2+0^2)+$

$(0^2+0^2+0^2+0.1^2+0^2)+(0.1^2+0^2+0^2+0^2+0.1^2)+(0^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[0.39+0.09+0.32+0.06+0.39+0.10+0.22+0.06+0+0.01+0.02+0]\}$

$$=\sqrt{\frac{1}{20}(1.66)}=\sqrt{0.083}=0.2880$$

$$\therefore\ d_{n-E}(CS,S_1)=0.2880$$

14) $\mathrm{d_{n-E}}(\mathrm{CS},\ S_2)$ = square root of $\{\frac{1}{20}[(0.3^2+0^2+0.4^2+0.1^2+0.2^2)+(0^2+0.1^2+0.1^2+0.1^2+0.1^2)+(0.2^2+0.1^2+0.1^2+0.1^2+0.1^2)+(0.3^2+0^2+0.1^2+0.1^2+0^2)+(0.3^2+0^2+0.4^2+0.1^2+0.2^2)+(0^2+0.1^2+0.1^2+0.1^2+0^2)+(0.1^2+0.1^2+0.1^2+0.1^2+0^2)+(0.3^2+0^2+0.1^2+0.1^2+0^2)+(0^2+0^2+0^2+0^2+0^2)+(0^2+0^2+0^2+0^2+0.1^2)+(0.1^2+0^2+0^2+0^2+0.1^2)+(0^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[0.30+0.04+0.07+0.11+0.30+0.03+0.04+0.11+0+0.01+0.02+0]\}$

$$=\sqrt{\frac{1}{20}(1.03)}=\sqrt{0.0515}=0.2269$$

$$\therefore\ d_{n-E}(CS,S_2)=0.2269$$

15) $\mathrm{d_{n-E}}(\mathrm{CS},\ S_3)$ = square root of $\{\frac{1}{20}[(0.5^2+0.4^2+0.6^2+0.3^2+0.5^2)+(0.3^2+0.2^2+0.1^2+0.3^2+0.4^2)+(0.3^2+0.2^2+0.1^2+0.3^2+0.3^2)+(0.5^2+0.1^2+0^2+0^2+0.1^2)+(0.5^2+0.3^2+0.6^2+0.3^2+0.5^2)+(0.3^2+0.2^2+0.1^2+0.2^2+0.4^2)+(0.2^2+0.2^2+0.1^2+0.3^2+0.2^2)+(0.5^2+0.1^2+0^2+0^2+0.1^2)+(0^2+0.1^2+0^2+0^2+0^2)+(0^2+0^2+0^2+0.1^2+0^2)+(0.1^2+0^2+0.1^2+0^2+0.1^2)+(0^2+0^2+0^2+0^2+0^2)]\}$

=square root of $\{\frac{1}{20}[1.11+0.39+0.32+0.27+1.04+0.34+0.22+0.27+0.01+0.01+0.02+0]\}$

$$=\sqrt{\frac{1}{20}(4)}=\sqrt{0.2}=0.4472$$

$$\therefore\ d_{n-E}(CS,S_3)=0.4472$$

16) $\mathrm{d_{n-E}}(\mathrm{CS},\ S_4)$ = square root of $\{\frac{1}{20}[(0.2^2+0.1^2+0.2^2+0^2+0.2^2)+(0.1^2+0^2+0.2^2+0.1^2+0.1^2)+(0.3^2+0^2+0.2^2+0.1^2+0.2^2)+(0.2^2+0^2+0.2^2+0.1^2+0.1^2)+(0.2^2+0.1^2+0.2^2+0^2+0.2^2)+(0^2+0^2+0.2^2+0.2^2+0.1^2)+(0.2^2+0^2+0.1^2+0^2+0.1^2)+(0.2^2+0^2+0.2^2+0.1^2+0.1^2)+(0^2+0^2+0^2+0^2+0^2)+(0.1^2+0^2+0^2+0.1^2+0^2)+(0.1^2+0^2+0.1^2+0.1^2+0.1^2)+$

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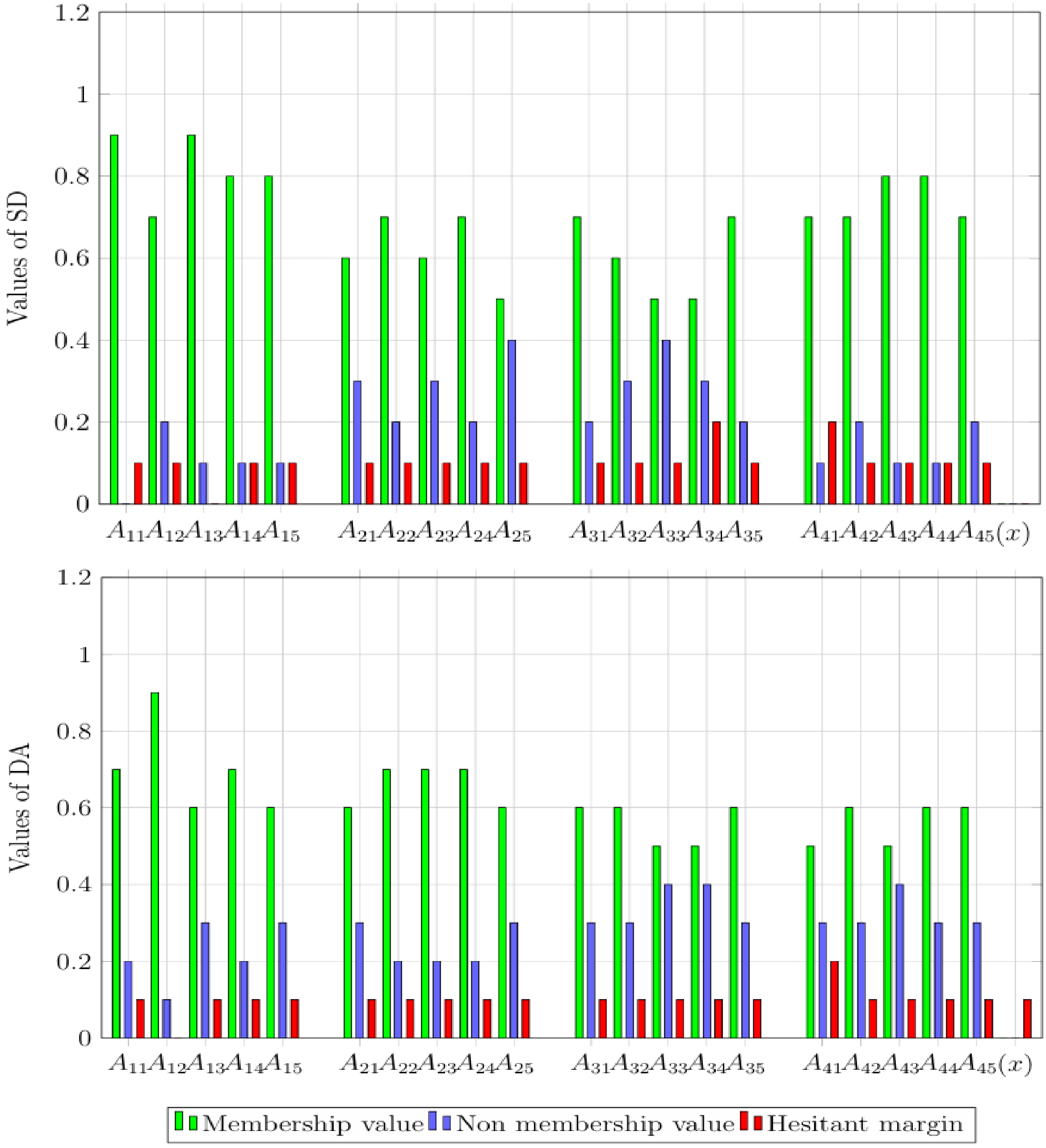
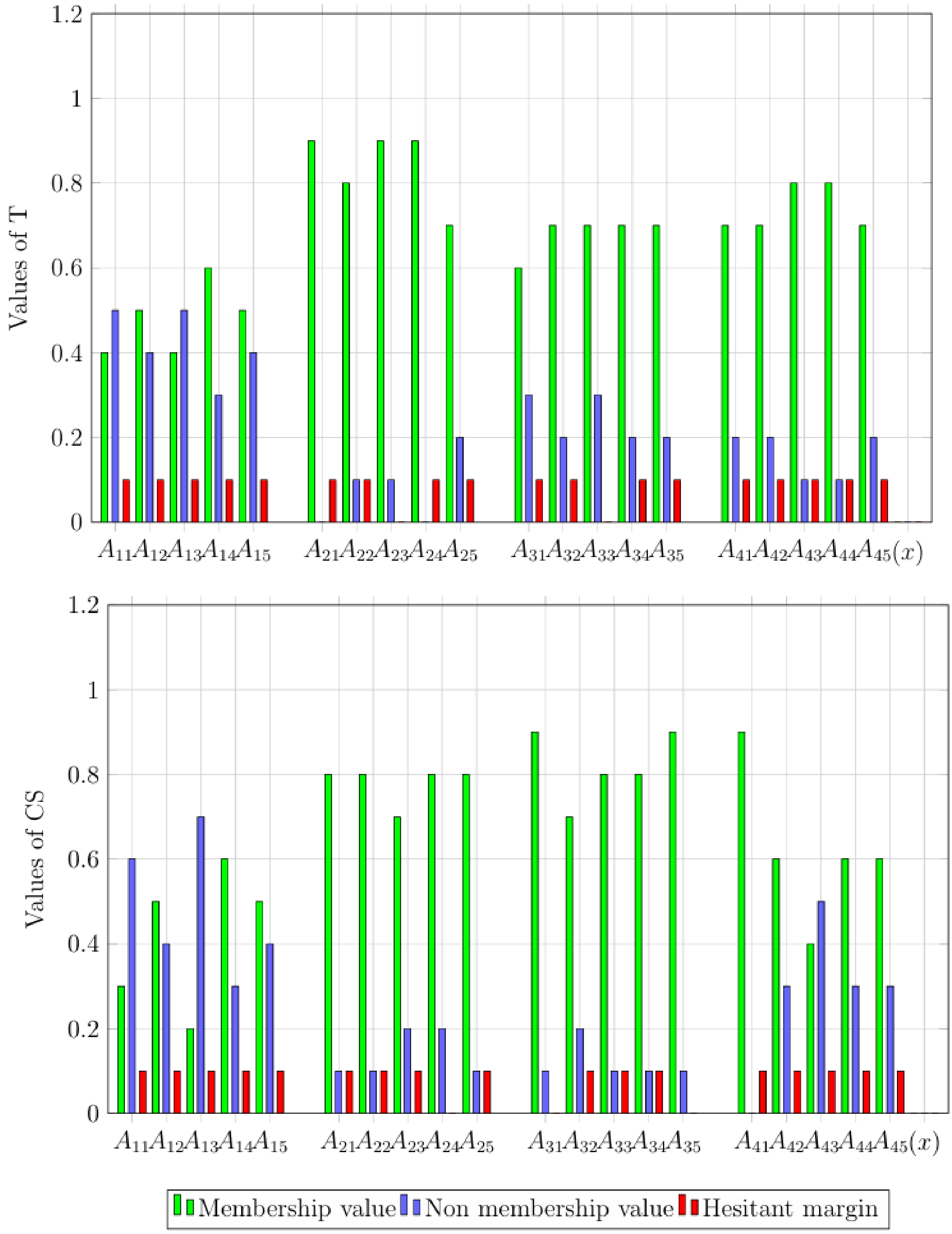
$$(0^2 + 0^2 + 0^2 + 0^2 + 0^2)]\}$$

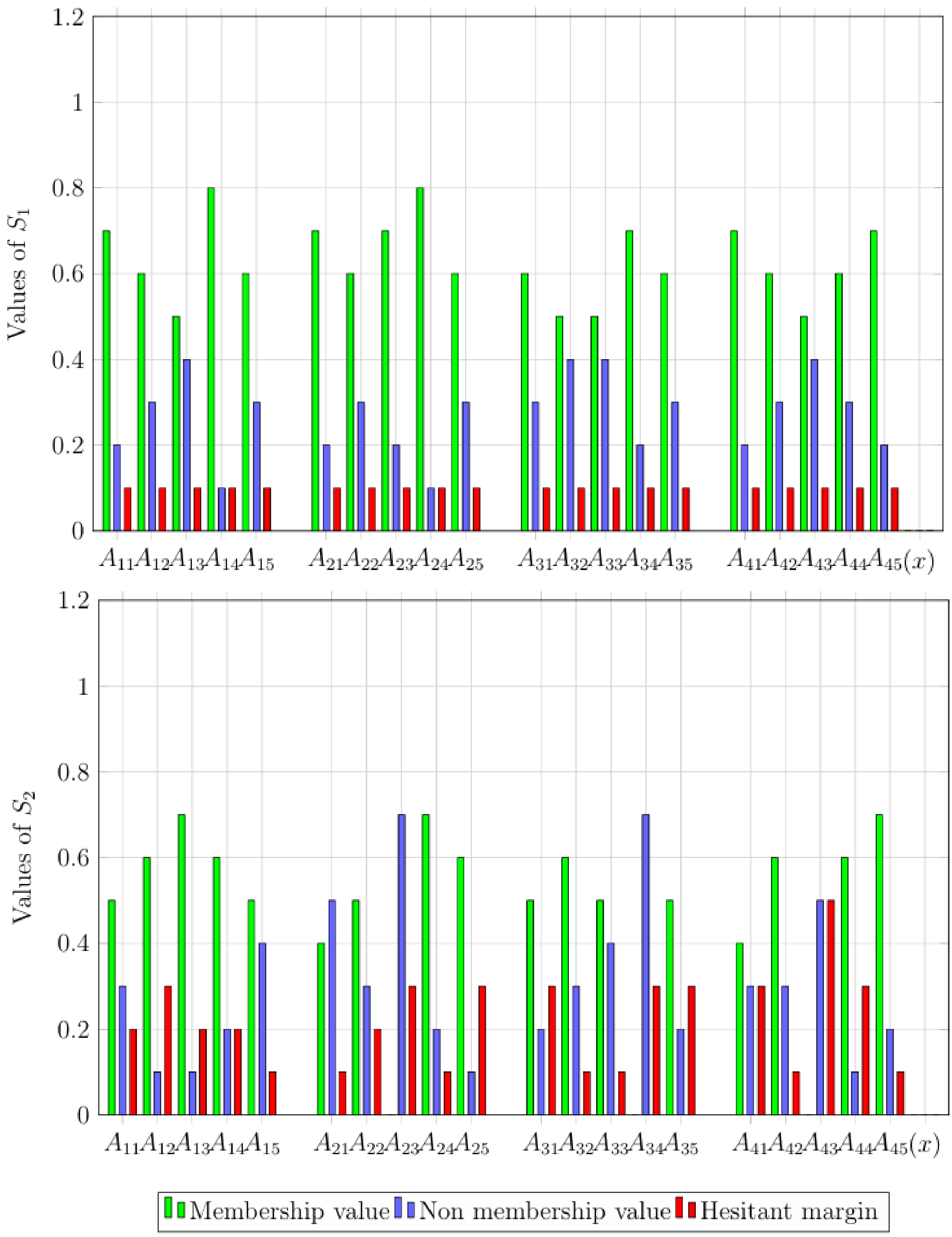
=square root of $\{\frac{1}{20}[0.13 + 0.07 + 0.18 + 0.13 + 0.13 + 0.09 + 0.06 + 0.10 + 0 + 0.02 + 0.04 + 0]\}$

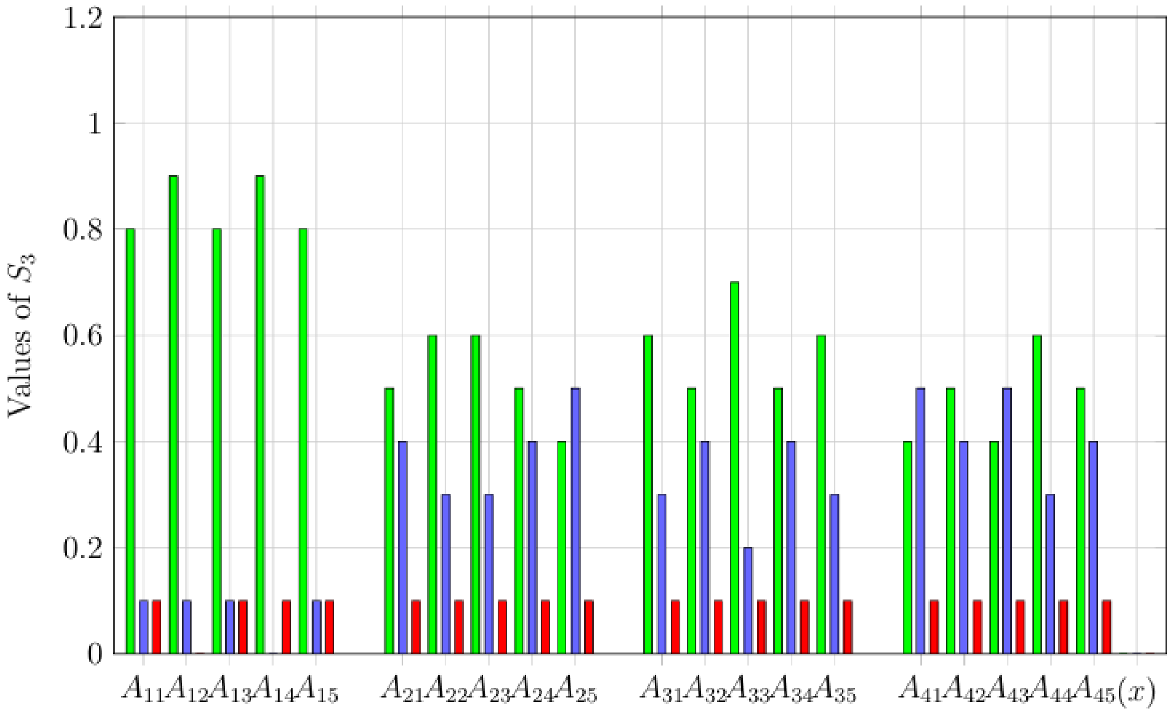
$$= \sqrt{\frac{1}{20}(0.95)} = \sqrt{0.0475} = 0.2179$$

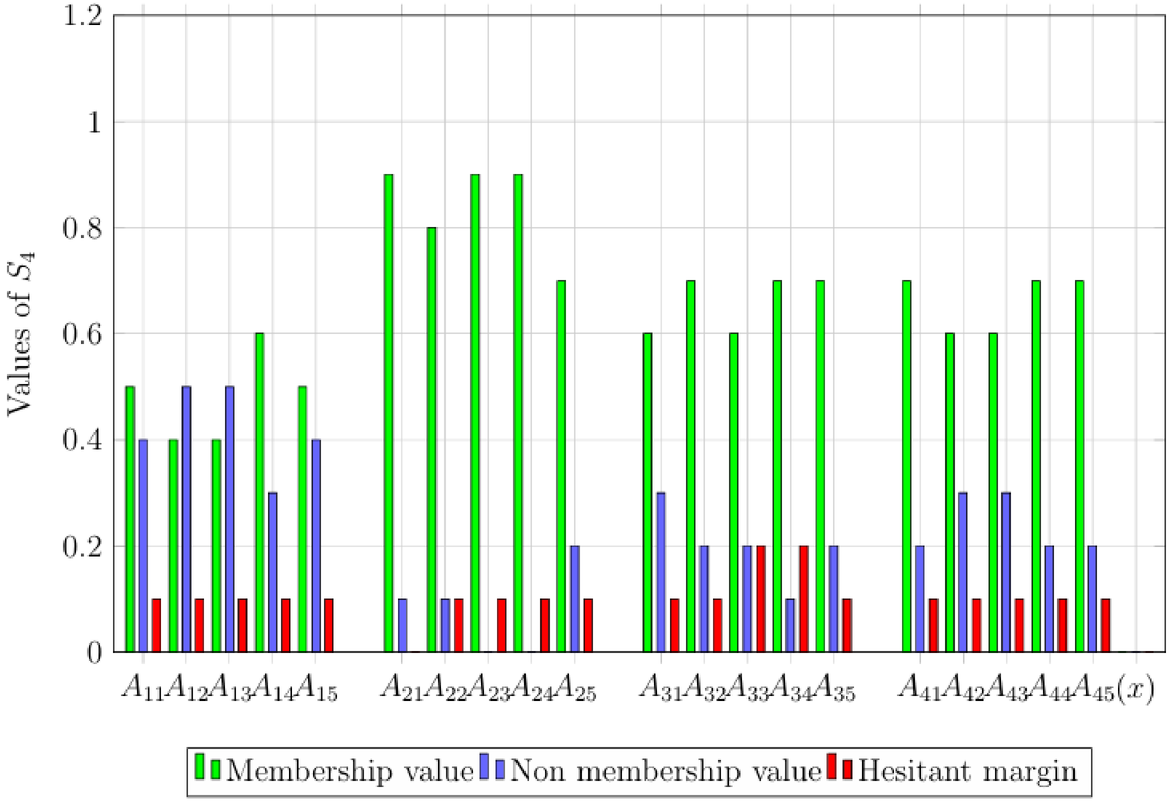
$$\therefore\ d_{n-E}(CS, S_4) = 0.2179$$




Values of T
Values of CS
$A_{11} A_{12} A_{13} A_{14} A_{15}$ $A_{21} A_{22} A_{23} A_{24} A_{25}$ $A_{31} A_{32} A_{33} A_{34} A_{35}$ $A_{41} A_{42} A_{43} A_{44} A_{45} (x)$
Membership value
Non membership value
Hesitant margin


Values of $S_1$
$A_{11}A_{12}A_{13}A_{14}A_{15}$ $A_{21}A_{22}A_{23}A_{24}A_{25}$ $A_{31}A_{32}A_{33}A_{34}A_{35}$ $A_{41}A_{42}A_{43}A_{44}A_{45}(x)$
Values of $S_2$
$A_{11}A_{12}A_{13}A_{14}A_{15}$ $A_{21}A_{22}A_{23}A_{24}A_{25}$ $A_{31}A_{32}A_{33}A_{34}A_{35}$ $A_{41}A_{42}A_{43}A_{44}A_{45}(x)$
Membership value
Non membership value
Hesitant margin

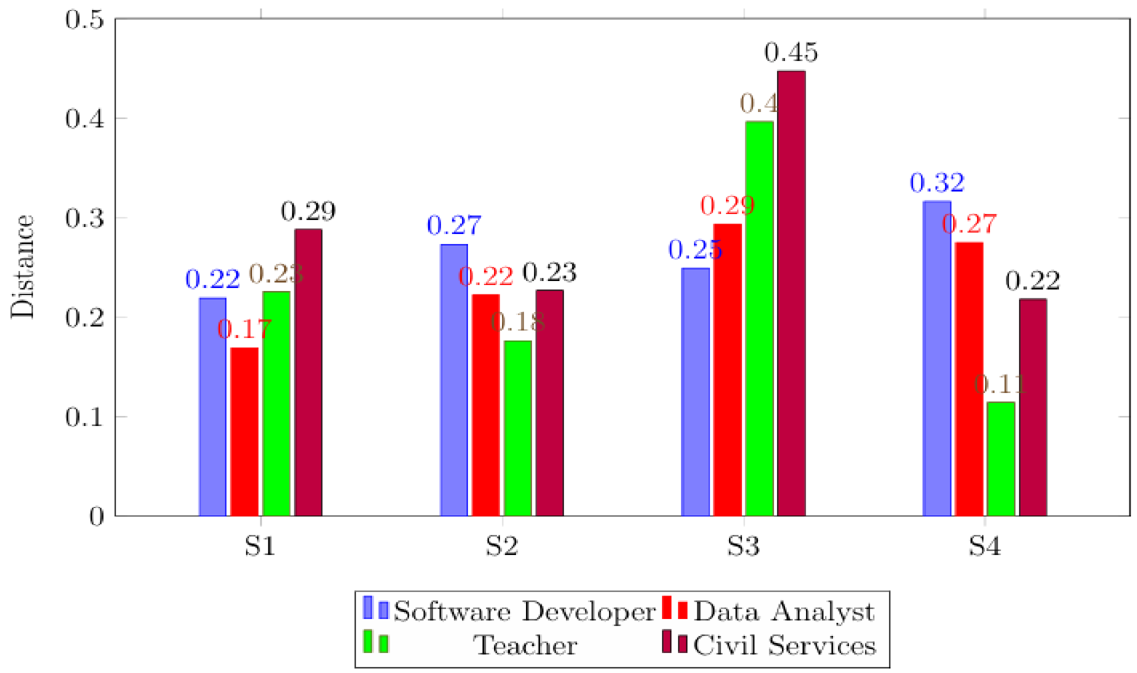

Values of $S_3$
1.2
1
0.8
0.6
0.4
0.2
0
$A_{11}A_{12}A_{13}A_{14}A_{15}$
$A_{21}A_{22}A_{23}A_{24}A_{25}$
$A_{31}A_{32}A_{33}A_{34}A_{35}$
$A_{41}A_{42}A_{43}A_{44}A_{45}(x)$


Values of $S_4$
1.2
1
0.8
0.6
0.4
0.2
0
$A_{11}A_{12}A_{13}A_{14}A_{15}$
$A_{21}A_{22}A_{23}A_{24}A_{25}$
$A_{31}A_{32}A_{33}A_{34}A_{35}$
$A_{41}A_{42}A_{43}A_{44}A_{45}(x)$
Membership value
Non membership value
Hesitant margin

To calculate the distance between each of the student in Table 2 and each of the career option in Table 1 with respect to each of the symptoms, Using the normalized Euclidean distance mentioned, we get the following tables as shown below.

Table 3: Distance between Students and Careers

| | Software Developer | Data Analyst | Teacher | Civil Services |
|---|---|---|---|---|
| $S_1$ | 0.2190 | 0.1688 | 0.2258 | 0.2880 |
| $S_2$ | 0.2729 | 0.2224 | 0.1760 | 0.2269 |
| $S_3$ | 0.2489 | 0.2932 | 0.3962 | 0.4472 |
| $S_4$ | 0.3162 | 0.2747 | 0.1140 | 0.2179 |




From Table 3 and graph, student $S_1$ can choose career as data analyst, student $S_2$ can choose career as teacher, student $S_3$ can choose career as software developer and student $S_4$ can choose career as teacher.

## CONCLUSION

Career guidance involves analyzing diverse and uncertain skill data from individuals and aligning it with the varying requirements of different professions. Traditional models often fall short in handling the inherent vagueness and Multi source evaluations involved in such decision-making processes. To address this, the present study introduces a framework based on Multi vague set theory, which extends the capabilities of classical fuzzy and vague sets by incorporating multiple degrees of membership and non-membership for each sub skill.

By representing student profiles and career roles (such as Software Developer, Data Analyst, Teacher, and Civil Services) through a structured set of attributes technical skills, communication skills, leadership skills and social awareness the model effectively measures the distance between student capabilities and job expectations. This enables a more refined matching process, even in the presence of conflicting or incomplete information.

The results illustrate that Multi vague sets provide a powerful mathematical foundation for complex decision-making scenarios in educational and vocational contexts. The proposed method not only enhances the accuracy of student career matching but also accommodates subjectivity, hesitation and diversity of assessment sources.

**Future Scope:** The model can be expanded to incorporate dynamic skill tracking, feedback mechanisms and integration with expert systems or AI-based recommendation engines, enabling more personalized and adaptive career guidance systems.

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