Multi-criteria decision making towards housemaids using single valued neutrosophic fuzzy numbers and comparing with triangular neutrosophic fuzzy number

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1. Introduction

Roughly about 1.8 million poor women in Tamil Nadu work as paid domestic workers. These are unorganized workers who are subjected to various forms of gendered exploitation, with their labour being expropriated without adequate compensation or any work security. The largest contingent of these women workers belong to the slums of Chennai (with inadequate sanitation facilities) and earn income to meet health crisis. The impact of Covid-19 on them is no less a threat than the virus itself. They are not sure of getting their job back. Even if some people continue engaging them, they face the problem of the transport, Tamil Nadu Domestic Workers Welfare Board (TNWWB): It is estimated that in Chennai alone there are 5.5 Lakh domestic workers. Of these only 64,825 women workers that form just 12 percent were registered with TNWEB. So the welfare schemes meant for the registered women workers cannot be availed by the remaining 88 percent of the domestic working women. Many families that employ them feel that they are the carriers of virus. Many resident associations have barred the entry of domestic workers and drivers into their families as they mostly live in slums which turned out to be contain-

The notion of Neutrosophic Numbers is quite popular and this paper showcases the varied viewpoints of it. Non-linear generalised triangular neutrosophic number plays a crucial role in theory of impreciseness and uncertainty. We have established the de-neutrosophication technique for triangular neutrosophic number. We have applied the theory in finding the major reason for the house maids being suppressed for various reasons.

Selection and peer-review under responsibility of the scientific committee of the Emerging Trends in Materials Science, Technology and Engineering.
2. Neutrosophic preliminaries

2.1. Definition on neutrosophic sets

Let $\delta$ be a course of points with common elements in $\delta$ denoted by n. Then a neutrosophic set $\omega_\delta$ in $\delta$ is designated by a truth membership function $T_\omega(n)$, an indeterminacy membership function $I_\omega(n)$ and a falsity membership function $F_\omega(n)$. The function $T_\omega(n) : \delta \rightarrow [0, 1]$; $I_\omega(n) : \delta \rightarrow [0, 1]$; $F_\omega(n) : \delta \rightarrow [0, 1]$.

It is noted that there is no restriction on the sum of $T_\omega(n), I_\omega(n), F_\omega(n)$ i.e. $0 \leq T_\omega(n) + I_\omega(n) + F_\omega(n) \leq 3$

2.2. Single valued neutrosophic set

Let $\delta$ be a universal course of points with a common elements of $\delta$ denoted by n. A single valued neutrosophic set $S$ is designated by a degree of acceptance $T_\omega(n)$, degree of indeterminacy $I_\omega(n)$, degree of falsity $F_\omega(n)$ with $T_\omega(n), I_\omega(n), F_\omega(n) \in [0, 1]$ for all n $\in \delta$

When $\delta$ is continuous a SVNS can be written as:

$$S = \int T_\omega(n), F_\omega(n), I_\omega(n) > n, \forall n \in \delta$$

When $\delta$ is discrete a SVNSs $S$ can be written as:

$$S = \sum T_\omega(n), F_\omega(n), I_\omega(n) > n, \forall n \in \delta$$

It is noted that for a SVNS $S$,

$$0 \leq \sup T_\omega(n) + \sup F_\omega(n) + \sup I_\omega(n) \leq 3, \forall n \in \delta$$

Step 1: Problem field selection

To find out the possible reason for House Maids The alternatives (Problems of House maids) are presented as follows:

$A_1$: Paying less salary
$A_2$: Ill-treatment
$A_3$: Sexual Abuse
$A_4$: Treating with suspicion

For this purpose, the following attributes of feelings of housemaids during their work are considered as criterions in decision making process. These are given as follows.

1. Unsatisfied ($N_1$)
2. Feeling Depressed ($N_2$)
3. Feeling insecure ($N_3$)
4. Oppressed and exploited ($N_4$)
5. Hypocritical ($N_5$)
6. Doing any kind of work for money ($N_6$)

Step 2: Single valued neutrosophic set score matrix

Single Valued Neutrosophic score function to each parameter using the below formula.

$$SVNFS(M_i) = \frac{1}{m} \sum_{i=1}^{m} \left( 2 + T_{ij} - I_{ij} - F_{ij} \right)$$

Step 3

By the triangular neutrosophic, the matrix changes to:

$$X = \begin{bmatrix}
A_1 & A_2 & A_3 & A_4 & A_5 & A_6 \\
0.12 & 0.13 & 0.05 & 0.09 & 0.17 & 0.08 \\
0.16 & 0.12 & 0.15 & 0.12 & 0.67 & 0.17 \\
0.12 & 0.15 & 0.14 & 0.14 & 0.65 & 0.17 \\
0.11 & 0.15 & 0.10 & 0.15 & 0.15 & 0.14 \\
\end{bmatrix}$$

By using the formulae for triangular neutrosophic fuzzy numbers,

$$X = \begin{bmatrix}
N_1 & N_2 & N_3 & N_4 & N_5 & N_6 \\
(0.8, 0.3, 0.2) & (0.6, 0.1, 0.2) & (0.9, 0.1, 0.2) & (0.6, 0.3, 0.2) & (0.8, 0.1, 0.2) & (0.6, 0.3, 0.2) \\
(0.8, 0.2, 0.3) & (0.5, 0.0, 0.3) & (0.9, 0.1, 0.2) & (0.6, 0.3, 0.2) & (0.8, 0.2, 0.2) & (0.6, 0.3, 0.2) \\
(0.6, 0.3, 0.3) & (0.6, 0.2, 0.4) & (0.8, 0.2, 0.1) & (0.5, 0.2, 0.3) & (0.7, 0.2, 0.3) & (0.4, 0.1, 0.2) \\
(0.6, 0.3, 0.2) & (0.4, 0.1, 0.2) & (0.9, 0.0, 0.1) & (0.7, 0.3, 0.1) & (0.8, 0.3, 0.3) & (0.4, 0.1, 0.1) \\
(0.8, 0.2, 0.3) & (0.6, 0.2, 0.3) & (0.7, 0.2, 0.4) & (0.8, 0.1, 0.2) & (0.9, 0.1, 0.2) & (0.6, 0.3, 0.2) \\
\end{bmatrix}$$

Finding the Mij using the below formula.

$$M_{ij} = \frac{1}{m} \sum_{i=1}^{m} \left( 2 + T_{ij} - I_{ij} - F_{ij} \right)$$

3. Conclusion

Comparing the single valued and triangular Neutrosophic fuzzy number in the case study of Housemaids, we reason that sexual abuse is the major problem for the housemaids, following that Treating with suspicion. We can liken the above subject by using trapezoidal Neutrosophic numbers and octagonal Neutrosophic numbers.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Further Reading