

Ranking Method For Uncertain Problems Using TpFCMs Model

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Abstract:

Occurrence of any situation in the world has its own cause and outcome. The whole process of the situation depends on the decision making of any one person who is authorized for it. The process of decision making is an extremely a tedious job, for any type of person who is dealing with. From the lower category to the higher level, decision making process varies accordingly to the environment. It is possible for anyone to discuss any type of situation theoretically. But, when this situation is modelled mathematically, one could easily find out a solution for the problem accurately. This would enhance the process of decision making in a more appropriate manner. One such type of uncertain problem is analysed in this paper using the fuzzy model Trapezoidal Fuzzy Cognitive Maps. This fuzzy model helps to rank the factors affecting the problem.

Keywords: Decision making, Uncertain, Fuzzy Models, Trapezoidal Fuzzy Number and Domestic workers

1. Introduction:

Uncertain nature prevails between the relationship of domestic workers and the owners. The study has reported that there has been an increase in the domestic workers in India from 1991 till now. All types of family classes have the maids ranging to their level. The treatment of housemaids by their owners varies from person to person and the situation that prevail is vague and uncertain. The sufferings underwent by the maids in their occupation is hard to express in words. The thought of the owners that they are high in level is the basic root cause for such poor condition to happen for the domestic workers in their work. Most of them are treated badly. They aren't even allowed to sit in front of the owners. Most of the female domestic workers come from the background of poor educational and financial status. Hence, in this paper the

problems faced by the domestic workers is analysed using the fuzzy model, "Trapezoidal Fuzzy Cognitive Maps".

2. Method of finding the hidden pattern:

Step1: The nodes of the problem are collected

Step2: The linguistic variables and its trapezoidal fuzzy number is fixed

Step3: The connection matrix consisting of linguistic variables is framed

Step4: The average trapezoidal connection matrix is framed

Step5: The instantaneous state vector is passed and the process is carried out by Fuzzy Cognitive Maps model

Step6: The process is carried out for all the nodes of the problem

Step 7: Based on the fixed point, the weightage of each attribute is calculated and the ranking is arrived at showing the intensity of each attribute.

3. Analysis of the problem:

Using linguistic questionnaire method and through the focus group discussion with the domestic workers, the owners of Chennai, the NGO's and the psychologists who deal with domestic workers, the following attributes were listed for ranking them and to find their dominant impact on the house maids.

The attributes are as follows:

TpC₁ - Pressurized to engage in cooking

TpC₂ - Traditional bound attitude

TpC₃ - Lack of Education

TpC₄ - Public cheating

TpC₅ - Ignorance

TpC₆ - Less salary for heavy work

- TpC₇ - Feeling insecure
- TpC₈ - Treating with suspicions
- TpC₉ - Depression
- TpC₁₀ -Future is a question mark
- TpC₁₁- No freedom from the families
- TpC₁₂- Poverty
- TpC₁₃- Ill treatment
- TpC₁₄ -Health problem
- TpC₁₅- Lack of job security

Figure 1: Connection Matrix –Tp(E)

	TpC1	TpC2	TpC3	TpC4	TpC5	TpC6	TpC7	TpC8	TpC9	TpC10	TpC11	TpC12	TpC13	TpC14	TpC15
TpC1	0	M	H	M	H	VH	H	H	M	L	H	H	H	H	H
TpC2	L	0	M	L	M	M	L	VH	VL	H	H	M	H	M	M
TpC3	M	L	0	H	H	M	L	L	M	L	M	VH	M	H	H
TpC4	VL	L	H	0	H	VH	H	M	L	M	L	H	M	M	M
TpC5	H	H	H	H	0	H	M	H	VH	H	H	H	M	M	H
TpC6	L	L	M	VL	H	0	M	L	M	L	L	H	L	M	VH
TpC7	H	M	H	M	L	H	0	H	H	M	VH	H	L	H	H
TpC8	L	M	H	VL	M	M	H	0	H	H	M	VH	M	H	H
TpC9	M	M	H	M	VH	M	H	H	0	H	H	H	L	H	M
TpC10	M	H	M	H	H	H	VH	H	H	0	H	M	VL	H	H
TpC11	H	H	H	L	M	H	H	H	H	L	0	VH	H	VL	H
TpC12	H	L	H	L	H	H	L	VH	H	M	H	0	L	M	H
TpC13	VL	M	M	L	H	M	VL	M	M	M	H	H	0	VH	H
TpC14	L	M	H	H	VH	M	M	M	M	M	L	H	M	0	H
TpC15	M	M	H	VH	H	M	L	H	H	L	H	H	M	H	0

Figure 2: Connection Matrix –Tp(E)_{average}



	<i>TpC1</i>	<i>TpC2</i>	<i>TpC3</i>	<i>TpC4</i>	<i>TpC5</i>	<i>TpC6</i>	<i>TpC7</i>	<i>TpC8</i>	<i>TpC9</i>	<i>TpC10</i>	<i>TpC11</i>	<i>TpC12</i>	<i>TpC13</i>	<i>TpC14</i>	<i>TpC15</i>
<i>TpC1</i>	0	0.375	0.625	0.375	0.625	0.812	0.625	0.625	0.375	0.188	0.625	0.625	0.625	0.625	0.625
<i>TpC2</i>	0.188	0	0.375	0.188	0.375	0.375	0.188	0.812	0.125	0.625	0.625	0.375	0.625	0.375	0.375
<i>TpC3</i>	0.375	0.188	0	0.625	0.625	0.375	0.188	0.188	0.375	0.188	0.375	0.812	0.375	0.625	0.625
<i>TpC4</i>	0.125	0.375	0.625	0	0.625	0.812	0.625	0.375	0.188	0.375	0.188	0.625	0.375	0.375	0.375
<i>TpC5</i>	0.625	0.625	0.625	0.625	0	0.625	0.375	0.625	0.812	0.625	0.625	0.625	0.375	0.375	0.625
<i>TpC6</i>	0.188	0.188	0.375	0.125	0.625	0	0.375	0.188	0.375	0.188	0.188	0.625	0.188	0.375	0.812
<i>TpC7</i>	0.625	0.375	0.625	0.375	0.188	0.625	0	0.625	0.625	0.375	0.812	0.625	0.375	0.625	0.625
<i>TpC8</i>	0.188	0.375	0.625	0.125	0.375	0.375	0.625	0	0.625	0.625	0.375	0.812	0.375	0.625	0.625
<i>TpC9</i>	0.375	0.375	0.625	0.375	0.812	0.375	0.625	0.625	0	0.625	0.625	0.625	0.188	0.625	0.375
<i>TpC10</i>	0.375	0.625	0.375	0.625	0.625	0.625	0.812	0.625	0.625	0	0.625	0.375	0.125	0.625	0.625
<i>TpC11</i>	0.625	0.625	0.625	0.188	0.375	0.625	0.625	0.812	0.625	0.188	0	0.812	0.625	0.125	0.625
<i>TpC12</i>	0.625	0.188	0.625	0.188	0.625	0.625	0.188	0.375	0.625	0.375	0.625	0	0.188	0.375	0.625
<i>TpC13</i>	0.125	0.375	0.375	0.188	0.625	0.375	0.125	0.375	0.375	0.375	0.625	0.625	0	0.812	0.625
<i>TpC14</i>	0.188	0.375	0.625	0.625	0.812	0.375	0.375	0.375	0.375	0.375	0.188	0.625	0.375	0	0.625
<i>TpC15</i>	0.375	0.375	0.625	0.812	0.625	0.375	0.188	0.625	0.625	0.188	0.625	0.625	0.375	0.625	0

Case (i) For the first attribute “Pressurized to engage in cooking” as instantaneous state vector the following process are carried out.

$$A_0 = (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$$

$$A_0Tp(E)_{average} = (0\ 0.375\ 0.625\ 0.375\ 0.625\ 0.812\ 0.625\ 0.625\ 0.375\ 0.188\ 0.625\ 0.625\ 0.625\ 0.625\ 0.625)$$

$$A_0Tp(E)_{Max.Weight} \rightarrow (0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) = A_1$$

$$A_1Tp(E)_{average} = (0.188\ 0.188\ 0.375\ 0.125\ 0.625\ 0\ 0.375\ 0.188\ 0.375\ 0.188\ 0.188\ 0.625\ 0.188\ 0.375\ 0.812)$$

$$A_1Tp(E)_{Max.Weight} \rightarrow (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1) = A_2$$

$$A_2Tp(E)_{average} = (0.375\ 0.375\ 0.625\ 0.812\ 0.625\ 0.375\ 0.188\ 0.625\ 0.625\ 0.188\ 0.625\ 0.625\ 0.375\ 0.625\ 0)$$

$$A_2Tp(E)_{Max.Weight} \rightarrow (0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) = A_3$$

$$A_3Tp(E)_{average} = (0.125\ 0.375\ 0.625\ 0\ 0.625\ 0.812\ 0.625\ 0.375\ 0.188\ 0.375\ 0.188\ 0.625\ 0.375\ 0.375\ 0.375)$$

$$A_3Tp(E)_{Max.Weight} \rightarrow (0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) = A_4$$

Therefore $A_4 = A_1$ is the fixed point, that shows that attribute sixth i.e., “Less salary for heavy work” come in ON state.

Case (ii) For the third attribute “Lack of Education” as instantaneous state vector the following process are carried out.

$$A_0 = (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$$

$$A_0Tp(E)_{average} = (0.375\ 0.188\ 0\ 0.625\ 0.625\ 0.375\ 0.188\ 0.188\ 0.375\ 0.188\ 0.375\ 0.812\ 0.375\ 0.625\ 0.625)$$

$$A_0Tp(E)_{Max.Weight} \mapsto (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0) = A_1$$

$$A_1Tp(E)_{Max.Weight} \mapsto (0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0) = A_2$$

$$A_2Tp(E)_{average} = (0.188\ 0.375\ 0.625\ 0.125\ 0.375\ 0.375\ 0.625\ 0\ 0.625\ 0.625\ 0.375\ 0.812\ 0.375\ 0.625\ 0.625)$$

$$0.625)$$

$$A_2Tp(E)_{Max.Weight} \mapsto (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0) = A_3$$

Therefore $A_3 = A_1$ is the fixed point, that shows that attribute twelve i.e., “Poverty” come in ON state.

Similarly we carry the same procedures for all the attributes and obtain the corresponding fixed point.

Figure 3: Ranking of Attributes

Attributes	TpC1	TpC2	TpC3	TpC4	TpC5	TpC6	TpC7	TpC8	TpC9	TpC10	TpC11	TpC12	TpC13	TpC14	TpC15
1	0.125	0.375	0.625	0	0.625	0.812	0.625	0.375	0.188	0.375	0.188	0.625	0.375	0.375	0.375
2	0.625	0.188	0.625	0.188	0.625	0.625	0.188	0.812	0.625	0.375	0.625	0	0.188	0.375	0.625
3	0.188	0.375	0.625	0.125	0.375	0.375	0.625	0	0.625	0.625	0.375	0.812	0.375	0.625	0.625
4	0.375	0.375	0.625	0.812	0.625	0.375	0.188	0.625	0.625	0.188	0.625	0.625	0.375	0.625	0
5	0.375	0.375	0.625	0.375	0.812	0.375	0.625	0.625	0	0.625	0.625	0.625	0.188	0.625	0.375
6	0.125	0.375	0.625	0	0.625	0.812	0.625	0.375	0.188	0.375	0.18	0.625	0.375	0.375	0.375
7	0.188	0.375	0.625	0.125	0.375	0.375	0.625	0	0.625	0.625	0.375	0.375	0.375	0.625	0.625
8	0.625	0.188	0.625	0.188	0.625	0.625	0.188	0.812	0.625	0.375	0.625	0	0.188	0.375	0.625

9	0.625	0.625	0.625	0.625	0	0.625	0.375	0.625	0.812	0.625	0.625	0.625	0.375	0.375	0.625
10	0.188	0.375	0.625	0.125	0.375	0.375	0.625	0	0.625	0.625	0.375	0.812	0.375	0.625	0.625
11	0.188	0.375	0.625	0.125	0.375	0.375	0.625	0	0.625	0.625	0.375	0.812	0.375	0.625	0.625
12	0.188	0.375	0.625	0.125	0.375	0.375	0.625	0	0.625	0.625	0.375	0.812	0.375	0.625	0.625
13	0.375	0.375	0.625	0.375	0.812	0.375	0.625	0.625	0	0.625	0.625	0.625	0.188	0.625	0.375
14	0.375	0.375	0.625	0.375	0.812	0.375	0.625	0.625	0	0.625	0.625	0.625	0.188	0.625	0.375
15	0.188	0.188	0.375	0.125	0.625	0	0.375	0.188	0.375	0.188	0.188	0.625	0.188	0.375	0.812
Total	4.753	5.314	9.125	3.688	8.061	6.874	7.564	5.687	6.563	7.501	6.814	8.623	4.503	7.875	7.687
Average	0.316	0.354	0.608	0.245	0.537	0.458	0.504	0.379	0.437	0.500	0.454	0.574	0.3002	0.525	0.512

4. Conclusion:

Hence by using Trapezoidal Fuzzy Cognitive Maps model the listed attributes are ranked as follows $0.608 > 0.574 > 0.537 > 0.525 > 0.512 > 0.504 > 0.500 > 0.458 > 0.454 > 0.437 > 0.379 > 0.354 > 0.316 > 0.3002 > 0.245$.

The process has helped us to rank the fifteen attributes as follows: Lack of Education, Poverty, Ignorance, Health problem, Lack of job security, Feeling insecure, Future is a question mark, Less salary for heavy work, No freedom from the families, Depression, Treating with suspicion, Traditional bound attitude, Pressurized to engage in cooking, Ill treatment and Public cheating.

It is clear that if one is educated, he/she will be free from the rest of the problems, listed in the analysis.

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