Fuzzy Mathematical Models To Remove Poverty Of Gypsies In Tamilnadu

A D Chandrasekaran\(^1\), C Ramkumar\(^2\) E P Siva\(^3\) and N Balaji \(^4\)
Department of Mathematics, S.R.M.Institute of Science and Technology, Kattankulathur-603203, Tamilnadu, INDIA.
\(^2\)Department of Mathematics, Thirumurugan Arts and Science College for Women, Thiruvallur-631203, Tamilnadu, INDIA
E-mail: adchandru1977@gmail.com, siva.e@ktr.srmuniv.ac.in, scpram@gmail.com

Abstract. In the society there are several poor people are living. One of the sympathetic poor people is gypsies. They are moving from one place to another place towards survive of life because of not having any permanent place to live. In this paper we have interviewed 895 gypsies in Tamilnadu using a linguistic questionnaire. As the problems faced by them to improve their life at large involve so much of feeling, uncertainties and unpredictabilities. I felt that it deem fit to use fuzzy theory in general and fuzzy matrix in particular. Fuzzy matrix is the best suitable tool where the data is an unsupervised one. Further the fuzzy matrix is so powerful to identify the main development factor of gypsies. This paper has three sections. In section one the method of application of CEFD matrix. In section two, we describe the development factors of gypsies. In section three, we apply these factors to the CEFD matrix and derive our conclusions. Key words: RD matrix, AFD matrix, CEFD matrix.

1. The method of application of CEFD matrix.
To identify the most affecting factor, we use the AFD data matrix. Using the average \(t_i\) of each \(i^{th}\) row. We choose a parameter \(\beta\) from \([0, 1]\) and form the Refined Average Factor Dependent matrix, using the formula if \(a_{ij}(t_i)\) then \(e_{ij} = -1\) else if \(a_{ij}(t_i)\) then \(e_{ij} = 0\) else if \(a_{ij} \geq (t_i - \beta \sqrt{\frac{t_i}{n}})\) then \(e_{ij} = +1\). We redefine the AFD matrix into Refined Factor Dependent fuzzy matrix. For this matrix the entries are \(-1, 0, 1\). Now the column sum of this matrix gives the main developing factor of the gypsies. We also combine these matrices by varying \(\beta \in [0, 1]\). Hence we get the Combined Effective Factor Dependent matrix. The column sum is obtained from CEFD matrix and conclusion is taken by based on the column sums.

2. Description of the problem
In particularly take 895 gypsies in Tamilnadu state in India. Gypsies need to have certain developments like improving living condition/health condition, changing the reservation of backward community into scheduled caste community, changing the inheritor property, eradicate illiteracy, improving employment opportunity, eradicate child labor, government should take steps to remove the problems faced by gypsies, become owners of any property or land. Here we take the above eight factors as attributes. Hence we use the effective tool fuzzy matrix to identify the most important developing factor of gypsies.
3. **Identification of the most affecting factor of the gypsies by using 10 × 5 matrices**

Using the linguistic questionnaire we have taken the following eight attributes \(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8\):

- \(X_1\) - Improving living condition/health condition.
- \(X_2\) - Changing the reservation of backward community in Scheduled Caste community.
- \(X_3\) - Changing the inheritor property.
- \(X_4\) - Eradicate illiteracy.
- \(X_5\) - Improving employment opportunity.
- \(X_6\) - Eradicate child labor.
- \(X_7\) - Government should take steps remove the problems faced by gypsies
- \(X_8\) - Become ownership of any property or land

We have collected 895 data from gypsies with the six different ranges of age as follows 895 gypsies in the age group 11–20, 21–30, 31–40, 41–50, 51–60, 61–70. The age group of gypsies is taken as rows and the developing factors are taken as columns in the initial Raw Data matrix.

| Attributes Age | \(X_1\) | \(X_2\) | \(X_3\) | \(X_4\) | \(X_5\) | \(X_6\) | \(X_8\) |
|----------------|-------|-------|-------|-------|-------|-------|-------|
| 11–20          | 0     | 28    | 08    | 25    | 03    | 18    | 14    |
| 21–30          | 12    | 10    | 24    | 10    | 20    | 10    | 04    |
| 31–40          | 01    | 08    | 04    | 06    | 06    | 14    | 06    |
| 41–50          | 06    | 06    | 03    | 04    | 06    | 16    | 06    |
| 51–60          | 04    | 04    | 04    | 03    | 02    | 18    | 04    |
| 61–70          | 03    | 04    | 03    | 02    | 10    | 02    | 04    |

The Average Factor Dependent Matrix of order 6 × 8

| Attributes Age | \(X_1\) | \(X_2\) | \(X_3\) | \(X_4\) | \(X_5\) | \(X_6\) | \(X_8\) |
|----------------|-------|-------|-------|-------|-------|-------|-------|
| 11–20          | 0     | 2.8   | 0.8   | 2.5   | 0.3   | 1.8   | 1.4   |
| 21–30          | 1.2   | 1.0   | 2.4   | 1.0   | 2.0   | 1.0   | 0.4   |
| 31–40          | 0.1   | 0.8   | 0.4   | 0.6   | 0.6   | 1.4   | 0.6   |
| 41–50          | 0.6   | 0.6   | 0.3   | 0.4   | 0.6   | 1.6   | 0.6   |
| 51–60          | 0.4   | 0.4   | 0.3   | 0.2   | 1.8   | 0.4   | 0.3   |
| 61–70          | 0.3   | 0.4   | 0.3   | 0.2   | 1.0   | 0.2   | 0.4   |

The average of the AFD matrix

\[
\begin{bmatrix}
1.52 \\
1.20 \\
0.60 \\
0.52 \\
0.38 \\
0.65
\end{bmatrix}
\]

The RFD matrix for \(\beta = 0.25\)

\[
\begin{bmatrix}
-1 & 1 & -1 & 1 & -1 & 1 & -1 & 1 \\
0 & 1 & 1 & -1 & 1 & -1 & -1 & -1 \\
-1 & 1 & -1 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & -1 & -1 & 0 & 1 & 0 & -1 \\
-1 & -1 & -1 & -1 & -1 & 1 & -1 & -1 \\
-1 & 0 & -1 & -1 & -1 & 1 & -1 & 0
\end{bmatrix}
\]

The column sum matrix = \((-4 & 0 & -4 & -3 & -2 & 4 & -4 & -1)\)

\[
\begin{bmatrix}
-1 & 1 & -1 & 1 & -1 & 1 & -1 & 1 \\
0 & 1 & 1 & -1 & 1 & -1 & -1 & -1 \\
-1 & 1 & -1 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & -1 & -1 & 0 & 1 & 0 & -1 \\
-1 & -1 & -1 & -1 & -1 & 1 & -1 & -1 \\
-1 & 0 & -1 & -1 & -1 & 1 & -1 & 0
\end{bmatrix}
\]

The RFD matrix for \(\beta = 0.25\)
The column sum matrix = $\begin{pmatrix} -4 & 0 & -4 & -3 & -2 & 4 & -4 & -1 \\ -1 & 1 & -1 & 1 & -1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 0 & -1 \\ -1 & 0 & -1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & -1 & -1 & 1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{pmatrix}$

The RFD matrix for $\beta = 0.8$

The column sum matrix = $\begin{pmatrix} -2 & 1 & -2 & -1 & -1 & 4 & -1 & -1 \\ -3 & 3 & -3 & 3 & -3 & 2 & -1 & 3 \\ 0 & -2 & 3 & -2 & 3 & -2 & -3 & -3 \end{pmatrix}$

The CEFD matrix for $\beta = 0.8$

The column sum matrix = $\begin{pmatrix} -9 & 0 & -9 & -6 & 5 & 12 & -8 & -3 \end{pmatrix}$

4. Conclusion

1. From the above analysis, we observe that the major factor by which the gypsies have been developed mostly has not changed with the change in the value of parameter from 0 to 1.

2. The mathematical inference is that the major factor is to eradicate the child labor and the Combined Effect Factor Dependent matrix also confirms the same.

References

[1] Klir G J and Yuan B 1995 Fuzzy sets and Fuzzy logic Prentice Hall, New Jersey
[2] Bellman R E and Zadeh I A 1970 Decision Making in Fuzzy Environment Management Science 17 pp.141 – 164
[3] Kosko B 1985 Neural Networks and Fuzzy Systems Prentice Hall
[4] Zimmermann H J 1985 Fuzzy Set theory and its Application Allied Publishing limited 2
[5] Ramkumar C, Ravan R and Narayanamoorthy S 2013 A Fuzzy Mathematical Modeling to Analyse the Major Problems Faced by Gypsies in Tamilnadu International Journal of Mathematical Archive 4(10) pp.101 – 105
[6] Ramkumar C, Ravan R and Narayanamoorthy S 2015 A New Fuzzy Mathematical Approach To Study The Socio-Economic Problems Faced By Gypsies International Journal of Applied Engineering Research 4(6) pp.15661 – 15670
[7] Ramkumar C, Ravan R, Lourdusamy A and Narayanamoorthy S 2015 A Study on Neutrosophic Cognitive Maps(Ncm) and its Applications, International Journal of Mathematical Archive 6(3) pp.209 – 211
[8] Ramkumar C, Ravan R, Lourdusamy A and Narayanamoorthy S 2015 A Fuzzy Mathematical Model to Find the Problems Faced by Gypsies in Tamilnadu International Journal of Emerging Trends in Science and Technology 2(4) pp.2269 – 2272
[9] Vasantha Kandasamy W B and Indira V 2000 Applications of Fuzzy Cognitive Maps to determine the Maximum Utility of Route Journal of Fuzzy Mathematics 8 pp.65 – 67.