

ESTIMATION OF AGE GROUP MOST AFFECTED BY VARIOUS REASONS FOR THE DROP OUTS OF THE STUDENTS IN COIMBATORE BY USING FUZZY MATRIX

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ABSTRACT

In this article, the authors attempted to identify the various reasons for drop outs of the students with different age groups and to ascertain the group of students (based on age groups) worst affected by such reasons.

Key Words: Fuzzy matrix, ATD Matrix, RTD Matrix, CETD Matrix.

1. INTRODUCTION

“Education is the most powerful weapon which you can use to change the world”

Nelson Mandela

Literacy is the proper indicator of economic development. For purpose of census, a person in age limit of seven and above, who can both write and read with understanding in any of the language is considered as a literate in India.

As per Population Census of India 2011, the **Literacy rate of India** has shown as improvement of almost 9 percent. It has gone up to 74.04% in 2011 from 65.38% in 2001, thus showing an increase of 9 percent in the last 10 years. It consists of male literacy rate 82.14% and female literacy rate is 65.46%. Kerala with 93.9% literacy rate is the top state in India. Lakshadweep and Mizoram are at the second and the third position with 92.3% and 91.06% literacy rate respectively. Tamil Nadu with 80.3% literacy rate is at the eighth position in India. Comparing with Kerala the Literacy rate of Tamil Nadu is low. The main reason for this deviation is drop outs of the students in villages of Tamil Nadu. In this paper a research has been conducted for the drop outs of the students in Coimbatore villages with different age groups of various reasons, and inferences were drawn using fuzzy matrices.

2. PRELIMINARIES

Definition 2.1: A fuzzy matrix is a matrix with elements having values in the fuzzy interval.

Definition 2.2: Raw data transform it into a raw time dependent data matrix by taking along the rows the age group and along the columns various reasons for drop outs using the raw data matrix we make it into the **Average Time Dependent Data (ATD) matrix** (a_{ij}) by dividing each entry of the raw data matrix by the number of years i.e., the time period. This matrix represents a data, which is totally uniform. At the third stage we find the average and Standard Deviation (S.D) of every column in the ATD matrix.

Definition 2.3: Using the average μ_j of each j^{th} column and σ_j the S. D of the each j^{th} column we chose a parameter α from the interval $[0, 1]$ and the **Refined Time Dependent Matrix (RTD Matrix)**, Using the formula

$a_{ij} \leq (\mu_j - \alpha * \sigma_j)$ then $e_{ij} = -1$ else

If $a_{ij} \in (\mu_j - \alpha * \sigma_j, \mu_j + \alpha * \sigma_j)$ then $e_{ij} = 0$ else

If $a_{ij} \geq (\mu_j + \alpha * \sigma_j)$ then $e_{ij} = 1$

We redefine the ATD matrix into the Refined time dependent fuzzy matrix for here the entries are -1, 0 or 1. Now the row sum of this matrix gives the maximum age group.

Definition 2.4: We also combine the above RTD matrices by varying the $\alpha \in [0, 1]$, so that we get the **Combined Effective Time Dependent Data (CETD) matrix**. The row sum is obtained for CETD matrix and conclusions are derived based on the row sums. All these are represented by graphs and graphs play a vital role in exhibiting the data by the simplest means, which can be even understood by a layman.

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3. ESTIMATION OF MAXIMUM AGE GROUP USING FUZZY MATRICES

In order to analyze the reasons for the drop outs of the students, an interview schedule was administrated to 225 students in the following three different villages of Coimbatore, Tamil Nadu and were asked to respond to each problem:

- (i) Oomapalyam (100 students),
- (ii) Kaatoor (75 students) and
- (iii) Bellathi (50 students).

The various reasons for the drop outs of the students are listed as follows:

R₁ – Language Problem

R₂ – Friends

R₃ – Lack of Hostel facilities

R₄ – Money Problem

R₅ – Sickness

R₆ – Lack of Transport facility

R₇ – Lack of facilities in Institutions

R₈ – Family Problem

R₉ – Not interested

R₁₀ – Less Capability

Based on their age groups the respondents were grouped into 5 categories as detailed below:

AGE GROUP	NUMBER OF RESPONDENTS
5-10	50
11-15	50
16-17	50
18-20	50
21-22	25

By taking the above five categories as rows and the number of respondents suffering due to each of the 10 reasons as columns, a 5 x 10 initial raw data matrix called Time Dependent Matrix (TD Matrix) [1] was formed.

TD Matrix

AGE GROUP	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	R ₉	R ₁₀
5-10	5	5	15	5	25	5	5	7	40	25
11-15	35	10	20	15	10	20	10	10	15	15
16-17	20	30	10	40	10	40	35	20	45	35
18-20	47	40	39	50	10	25	35	10	25	28
21-22	5	7	4	25	4	3	20	18	2	10

The initial raw data matrix has been converted into the Average Time Dependent Matrix (ATD Matrix) [1] (a_{ij}) by dividing each entry with the width of the respective class-interval.

ATD MATRIX

AGE GROUP	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	R ₉	R ₁₀
5-10	1	1	3	1	5	1	1	1.4	8	5
11-15	7	2	4	3	2	4	2	2	3	3
16-17	10	15	5	20	5	20	17.5	10	22.5	17.5
18-20	15.7	13.3	13	16.7	3.3	8.3	11.7	3.3	8.3	9.3
21-22	2.5	3.5	2	12.5	2	1.5	10	9	1	5

The average (μ_j) and Standard Deviation (σ_j) of every column were worked out as follows:

Average (μ_j)	7.24	6.96	5.40	11.90	3.46	6.96	8.44	5.14	8.56	7.96
Standard Deviation (σ_j)	2.97	2.62	3.96	2.74	5.01	2.53	2.81	3.63	4.01	3.96

Using the average (μ_j) , Standard Deviation (σ_j) and a parameter α from the interval $[0, 1]$, a fuzzy matrix called the Refined Time Dependent Data matrix (RTD Matrix) [1] was formed. The RTD matrix with entries e_{ij} , where $e_{ij} \in \{-1, 0, 1\}$, was formed using the following formula [1]:

If $a_{ij} \leq (\mu_j - \alpha * \sigma_j)$ then $e_{ij} = -1$

else if $a_{ij} \in (\mu_j - \alpha * \sigma_j, \mu_j + \alpha * \sigma_j)$ then $e_{ij} = 0$

else if $a_{ij} \geq (\mu_j + \alpha * \sigma_j)$ then $e_{ij} = 1$,

where a_{ij} 's are entries of Average Time Dependent Matrix

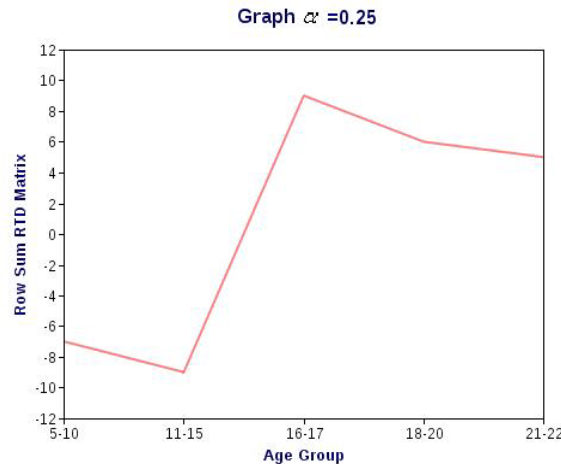
By varying the parameter $\alpha \in [0,1]$, any numbers of Refined Time Dependent Data Matrices can be obtained were as follows:

RTD Matrix for $\alpha = 0.25$

-1	-1	-1	-1	-1	-1	-1	-1	0	-1
0	-1	-1	-1	-1	-1	-1	-1	-1	-1
1	1	0	1	1	1	1	1	1	1
1	1	1	1	0	1	1	-1	0	1
-1	-1	-1	0	-1	-1	1	1	-1	-1

Row Sum Matrix

-7
-9
9
6
-5



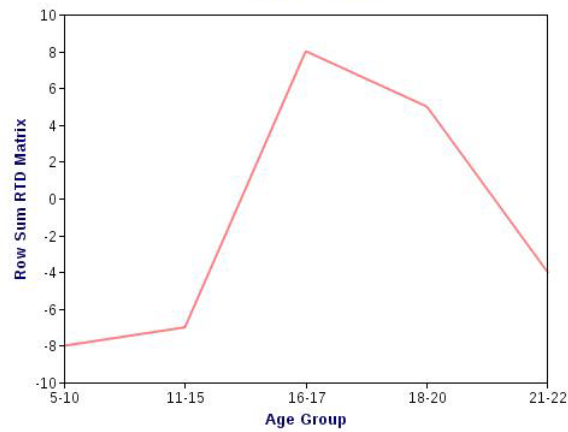
RTD Matrix for $\alpha = 0.50$

-1	-1	-1	-1	0	-1	-1	-1	0	-1
0	-1	0	-1	0	-1	-1	-1	-1	-1
1	1	0	1	0	1	1	1	1	1
1	1	1	1	0	1	1	-1	0	0
-1	-1	-1	0	0	-1	1	1	-1	-1

Row Sum Matrix

-8
-7
8
5
-4

Graph $\alpha = 0.50$



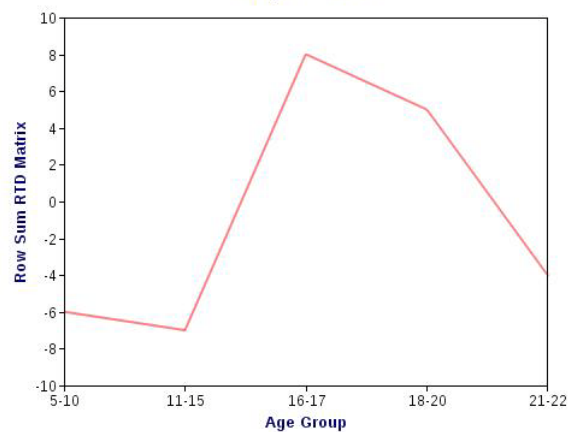
RTD Matrix for $\alpha = 0.75$

$$\begin{bmatrix} -1 & -1 & 0 & -1 & 0 & -1 & -1 & -1 & 0 & 0 \\ 0 & -1 & 0 & -1 & 0 & -1 & -1 & -1 & -1 & -1 \\ 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 \\ -1 & -1 & -1 & 0 & 0 & -1 & 0 & 1 & -1 & 0 \end{bmatrix}$$

Row Sum Matrix

$$\begin{bmatrix} -6 \\ -7 \\ 8 \\ 5 \\ -4 \end{bmatrix}$$

Graph $\alpha = 0.75$



By combining all these three matrices, the Combined Effect Time Dependent Data Matrices (CETD Matrix) [1], which gives the cumulative effect of all these entries was obtained as follows:

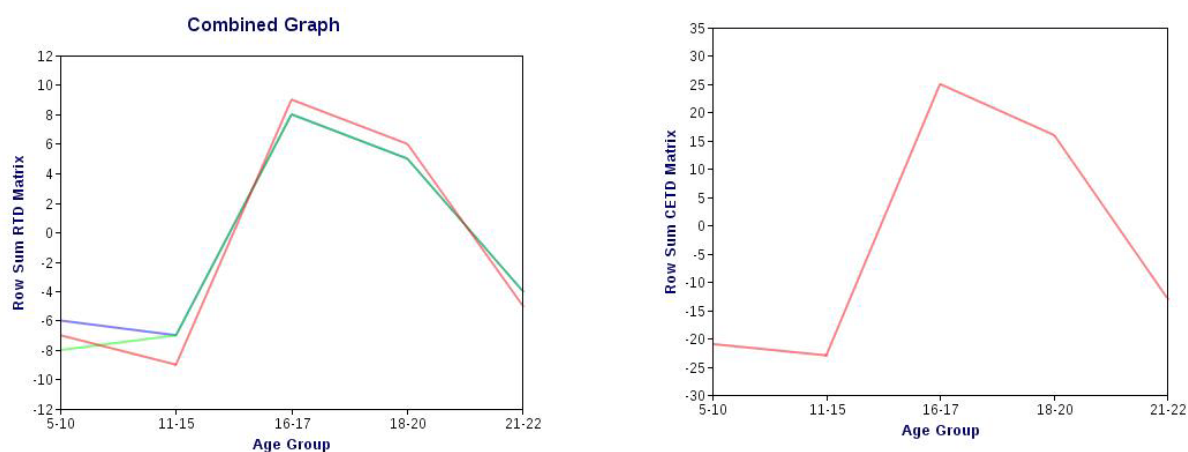
CETD Matrix

$$\begin{bmatrix} -3 & -3 & -2 & -3 & 1 & -3 & -3 & -3 & 0 & -2 \\ 0 & -3 & -1 & -3 & -1 & -3 & -3 & -3 & -3 & -3 \\ 3 & 3 & 0 & 3 & 1 & 3 & 3 & 3 & 3 & 3 \\ 3 & 3 & 3 & 3 & 0 & 2 & 3 & -2 & 0 & 1 \\ -3 & -3 & -3 & 0 & -1 & -3 & 2 & 3 & -3 & -2 \end{bmatrix}$$

Row Sum Matrix

$$\begin{bmatrix} -21 \\ -23 \\ 25 \\ 16 \\ -13 \end{bmatrix}$$

The graph as shown below exhibited the group of respondents (based on age groups) worst affected.



CONCLUSION

From the graph it is observed that the students at the age groups between 15 – 20 were worst affected by such problems.

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