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# STUDY OF STUDENT TEACHER RELATIONSHIP USING SPECIAL SIMPLE RESTRICTED AVERAGE FUZZY RELATIONAL MAPS (SSRAFRMs) MODEL

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**Abstract:**

In this paper the influence of a teacher over the students studying in college in Tamilnadu is analyzed. The class must be made learner centric and the teacher must be devoted to the profession to make the students a better educated generation. Here Fuzzy Relational Maps Model and Special Simple Restricted Average Fuzzy Relational Maps Model are used for this study. SSRAFRMs Model gives integrated opinion when experts work with different sets of attributes. The study is made by a pilot survey. Conclusions based on the study are given.

**Key Words:** Fuzzy Relational Maps (FRMs) Model, Special Simple Restricted Average Fuzzy Relational Maps (SSRAFRMs) Model, Hidden Pattern & Fixed Point

## 1. Introduction:

The study of Teacher Student congenial relation is very vital, for that alone can motivate the students to learn and develop interest in the subject. But in these days college teachers do not motivate the students well and also students do not have the patience and mind to learn. Several attributes which cannot be measured by numbers are associated with this problem. These are intense feelings; emotional or otherwise so at the outset we are justified in using this model. Fuzzy Relational Maps (FRMs) model was first introduced in [5]. This model is best suited when the attributes related with the problem can be divided into two disjoint sets. This paper has four sections. Section one is introductory in nature. In section two description of the problem is given. Section three studies the problem using SSRAFRMs model. Final section gives the conclusions based on this study.

## 2. Description of the Problem:

Here we briefly describe the problem. For this study, a pilot survey is taken from 40 college students and 15 college teachers. The data is analyzed; the attributes are defined by these experts which forms this section. Since this is a problem involving both college teachers and students, the domain space and the range space are disjoint. So, we are justified in using the Fuzzy Relational Maps (FRMs) Model in analyzing the problem. Further the use of FRMs model is justified, as the data is only an unsupervised one [5-7].

The attributes associated with the problem are described in a line or two. Description of the attributes associated with teachers is as follows:

$T_1$ - Motivates the students.
$T_2$ - Kind and approachable.
$T_3$ - Punctual to the class.
$T_4$ - Teacher should be serious and make the class interesting.
$T_5$ - Takes interest in students.
$T_6$ - Rudeness of teacher.

The description of the attributes associated with students are as follows:

$S_1$ - Good and hard working students.
$S_2$ - Regular to class.
$S_3$ - Irregular to class.
$S_4$ - Does not perform well in studies.
$S_5$ - Interested in studies.

There were four experts who were willing to work only with the subsets of the domain attributes D and subsets from the range attributes R. A Teacher, a parent, a student, and an educationalist are the four experts who wished to work on this problem using FRMs.

## 3. Implementation of the Special Simple Restricted Average Fuzzy Relational Maps (SSRAFRMS) Model to this Problem:

In this section we use the four experts to form the SSRAFRMs model to analyze the problem. The specialty of this model is that this gives integrated opinion when experts work with different sets of attributes. The model functions on two techniques viz., completion of connection matrices of an FRM and the restricted average of connection matrices of an FRM. However with completed dynamical system one cannot work with every initial state vector from the domain and range spaces of the FRMs for many of the domain and range nodes may be missing with values but have zero entries. Hence the need for the restricted average is mandatory.

Consider the first expert who is a teacher and who works with the following subsets from $D$ and $R$; $P_1 = \{T_1, T_3, T_5, T_6\} \subseteq \{T_1, T_2, \ldots, T_6\} \subseteq D$ and $Q_1 = \{S_1, S_2, S_3, S_5\} \subseteq \{S_1, S_2, \ldots, S_5\} \subseteq R$ respectively. Let $H_1$ be the bipartite graph given by the first expert which is as follows:

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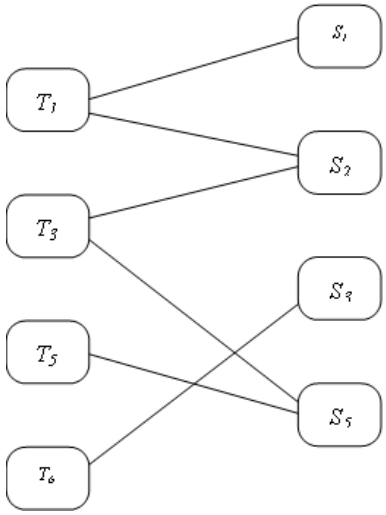
Figure 3.1: Graph $H_1$

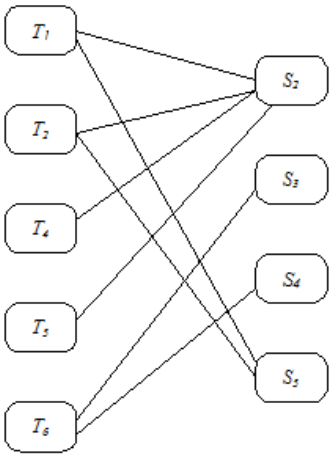



Let $M_1$ be the relational connection matrix associated with the bipartite graph $H_1$ which is as follows:

$$M_1 = \begin{array}{c} \\ T_1 \\ T_3 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{cccc} S_1 & S_2 & S_3 & S_5 \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix} \end{array}.$$

Consider the second expert opinion who is a parent and works with the following subsets of $D = \{T_1, T_2, \ldots, T_6\}$ and $R = \{S_1, S_2, \ldots, S_5\}$. Let $P_2 = \{T_1, T_2, T_4, T_5, T_6\} \subseteq \{T_1, T_2, \ldots, T_6\}$ and $Q_2 = \{S_2, S_4, S_3, S_5\} \subseteq \{S_1, S_3, \ldots, S_5\}$.
Let $H_2$ be the bipartite graph given by the second expert which is as follows:

Figure 3.2: Graph $H_2$




Now let $M_2$ be the connection matrix associated with the bipartite graph $H_2$.

$$M_2 = \begin{array}{c} \\ T_1 \\ T_2 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{cccc} S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix} \end{array}$$

Let $H_3$ be the bipartite graph given by the third expert who is a student and using the subsets $P_3 = \{T_3, T_4, T_5, T_6\} \subseteq \{T_1, \ldots, T_6\} = D$ and $Q_3 = \{S_3, S_4, S_5\} \subseteq \{S_1, \ldots, S_5\} = R$ from the domain and range space respectively.

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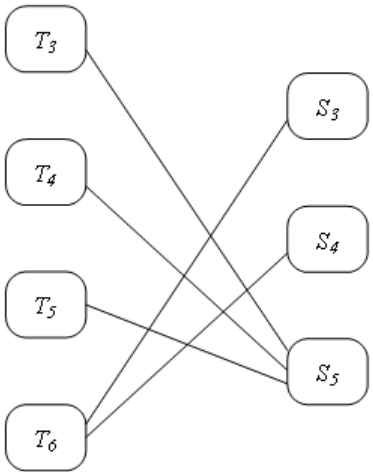
Figure 3.3: Graph $H_3$

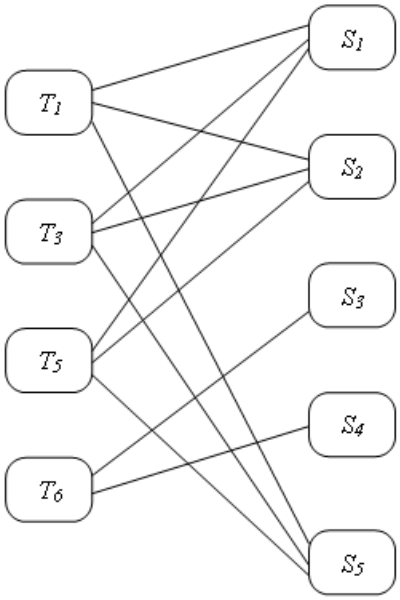



Let $M_3$ be the connection matrix associated with the graph $H_3$.

$$M_3 = \begin{array}{c} \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccc} S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \end{array}.$$

Let the fourth expert be an educationalist who works with the following subset of domain and range nodes $P_4 = \{T_1, T_3, T_5, T_6\} \subseteq D$ and $Q_4 = \{S_1, S_2, S_3, S_4, S_5\} \subseteq R$ respectively. Let $H_4$ be the bipartite graph associated with the subsets $P_4$ and $Q_4$.

Figure 3.4: Graph $H_4$




The connection matrix $M_4$ of the graph $H_4$ is as follows:

$$M_4 = \begin{array}{c} \\ T_1 \\ T_3 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}.$$

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Complete each of the matrices $M_1$, $M_2$, $M_3$ and $M_4$. Let the completion of the matrix $M_1$ be $M_1^c$.

$$M_1^c = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix} \end{array}.$$

Let $M_2^c$ be the completion of the matrix $M_2$.

$$M_2^c = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}$$

Let $M_3^c$ be the completion of the matrix $M_3$.

$$M_3^c = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}.$$

Let $M_4^c$ be the completion of the matrix $M_4$.

$$M_4^c = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}.$$

Let

$$M' = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 2 & 3 & 0 & 0 & 2 \\ 0 & 1 & 0 & 0 & 1 \\ 1 & 2 & 0 & 0 & 3 \\ 0 & 1 & 0 & 0 & 1 \\ 1 & 2 & 0 & 0 & 3 \\ 0 & 0 & 4 & 3 & 0 \end{bmatrix} \end{array}$$

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be the sum of the matrices $M_1^c$, $M_2^c$, $M_3^c$ and $M_4^c$. Let the restricted average of $M'$ be $M$ which is as follows:

$$M = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 0.67 & 1 & 0 & 0 & 0.67 \\ 0 & 1 & 0 & 0 & 1 \\ 0.33 & 0.67 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0.25 \\ 0.25 & 0.5 & 0 & 0 & 0.75 \\ 0 & 0 & 1 & 0.75 & 0 \end{bmatrix} \end{array}$$

Let the parameter $\alpha \in [0, 1]$ is taken as 0.5, If the entries of $M$ are greater than or equal to 0.5 replace it by one if $\alpha$ is less than 0.5 replace it by 0. Let $M^1$ be the threshold matrix of $M$.

$$M^1 = \begin{array}{c} \\ T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \begin{array}{c} \begin{array}{ccccc} S_1 & S_2 & S_3 & S_4 & S_5 \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}.$$

$M^1$ is the connection matrix of the SSRAFRMs model which had made use of the opinions of four experts.

Consider the on state of the domain node $T_1$ when all other nodes are in the off state. Let $X_1$ = (1 0 0 0 0 0); to find the effect of $X_1$ on $M^1$.

$X_1M^1 \quad \rightarrow (1\ 1\ 0\ 0\ 1) \quad = Y_1$ (say)
$Y_1(M^1)^T \rightarrow (1\ 1\ 1\ 1\ 1\ 0) \ = X_2$ (say)
$X_2M^1 \quad \rightarrow (1\ 1\ 0\ 0\ 1) \quad = Y_2$ (say)

The hidden pattern pair is a fixed pair given by{(1 1 1 1 1 0), (1 1 0 0 1)}. Thus if teacher is motivating the student, then that teacher certainly approaches the student with kindness and is punctual to class, makes the class interesting and takes interest in students. Further a motivating teacher, node $T_1$ makes the nodes $S_1$, $S_2$ and $S_5$ of the range space to the on state that is the students become good and hard working students are regular to class and show interest in their studies.

Thus having worked with the on state of all the nodes from both the range and domain spaces using the SSRAFRMs model, the results are tabulated in the Table3.1.

Table 3.1: Average of the hidden pattern pair of the 4 expert's opinion

| Initial state vectors from the domain and range space | Average of the hidden pattern pair of Four experts' opinion after thresholding by 0.5 |
|---|---|
| (1 0 0 0 0 0) | {(1 1 1 1 1 0), (1 1 0 0 1)} |
| (0 1 0 0 0 0) | {(1 1 1 1 1 0), (1 1 0 0 1)} |
| (0 0 1 0 0 0) | {(1 1 1 1 1 0), (1 1 0 0 1)} |
| (0 0 0 1 0 0) | {(1 1 1 1 1 0), (1 1 0 0 1)} |
| (0 0 0 0 1 0) | {(1 1 1 1 1 0), (1 1 0 0 1)} |
| (0 0 0 0 0 1) | {(0 0 0 0 0 1), (0 0 1 1 0)} |
| (1 0 0 0 0) | {(1 1 1 1 1 0), (1 1 0 0 1)} |
| (0 1 0 0 0) | {(1 1 1 1 1 0), (1 1 0 0 1)} |
| (0 0 1 0 0) | {(0 0 0 0 0 1), (0 0 1 1 0)} |
| (0 0 0 1 0) | {(0 0 0 0 0 1), (0 0 1 1 0)} |
| (0 0 0 0 1) | {(1 1 1 1 1 0), (1 1 0 0 1)} |

From the Table 3.1 it is very clear that all the positive nodes of both the domain and range spaces are strongly influencing each other from the SSRAFRMs model. Likewise the negative nodes which describe the bad qualities of the teachers / students only make the bad/negative qualities of the students / teachers come to one state.

**4. Conclusion:**

From the statement of Kosko, the expert opinion only shows his intelligence or ignorance in analyzing the problem is recalled. As the choice of the experts is arbitrary and not chosen but have taken the views of only those who were willing to give their opinion in the study without any bias. The model SSRAFRMs can save time and economy and can give the integrated vision

of all the attributes used; though the experts have only used subsets from the domain space and the range space. Finally the most important factor is that no expert will feel his/her expertise was left out for by this model every expert is given the same or equal importance thereby making the study an unbiased one. But however a good teacher can certainly make a good student, the cause of a bad student makes an inference that a teacher is bad for if a teacher is good certainly he/she can inculcate good values in the students by being punctual to class which will in turn make him/her interested in studies and so on. However if the teacher is irregular and bad it has all chances of transforming a good student into a bad student for he/she may loose interest in studies when the motivating factor is missing.

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