A Study on Inequality of women in Education using Fuzzy Approach

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ABSTRACT
Education plays a major role for the development of human beings to recognize their rights in terms of social, political and economic growth of the country. More than one-third of women around the world who are illiterate are Indian women. Still women are excluded from education due to practices of inequalities in the society. Thus, the inequalities of women in education not only affects the women’s lives but also on the economic developments of the country. The aim of the paper is to identify the factors which creates hurdles for women in getting education by using Fuzzy logic as it helps to study the uncertainties. Here Section one deals with Introduction. Section two gives definitions. In section three description of the problem is explained. Section four deals with the adaptation of the problem. Ultimately section five reveals the conclusion.

Keywords

1. INTRODUCTION
Fuzzy set theory was introduced by L.A.Zadeh [1] in 1965 to deal with vagueness and imprecise. In 1976. Axelrod [2] used cognitive maps to study decision making in social and political system. Later using the concepts of neural networks and fuzzy logic Bart Kosko proposed Fuzzy Cognitive Maps (FCM) in 1986[3]. FCMs is a collection of classes and represent causal relations between classes. It works on the opinions of experts. By using Fuzzy Cognitive Map many researchers have developed the models namely Combined overlap Fuzzy Cognitive Map[4], Combined Disjoint Fuzzy Cognitive Map[5],Triangular Fuzzy Cognitive Map[6] Delphi Adapted Fuzzy Cognitive Bimaps was pioneered by W.B.Vasantha Kandasamy et all in 2005 in the book entitled “Application of bimatrices to some fuzzy and Neutrosophic models”[8]. Fuzzy Cognitive Bimaps was used when two sets of attributes are to be analyzed which may be disjoint or unrelated or overlapping set and works on an unsupervised data. It saves time, simultaneously two experts opinion are compared at each step and ultimately gives bhhiden pattern for the problem. In this paper the factors given by two experts are overlapping. So Fuzzy cognitive Bimaps was chosen to study the inequalities faced by women in education.

2. DEFINITIONS
Definition 2.1: When the two nodes of the Fuzzy Cognitive Bimaps are fuzzy sets then it is called fuzzy binodes.
Definition 2.2: FCBMs with edges weight or causalities from the set [-1,0,1] are called simple FCBMs.

Definition 2.3: A Fuzzy Cognitive Bimaps (FCBMs) are fuzzy signed directed bigraphs with concepts like policies, events etc, as binodes and causalities as edges. It represents causal relationship between the Concepts.

Definition 2.4: Consider the binodes $C_1,C_2,...,C_n$, $C'_1, C'_2,...,C'_n$ of the FCBM. Suppose the directed graph is drawn using edge weight $e_{ij}$ where $e_{ij}$ is the weight of the directed edge $C_i C_j$. M is called the adjacency matrix of Fuzzy cognitive bimaps, also known as the connection bimatrix of the FCBM. It is important to note that all bimatrices associated with an FCBMs are always square matrices with diagonal entries as zero.

Definition 2.5:Let $\{ C_1,C_2,...,C_n\},\{ C'_1, C'_2,...,C'_n \}$ be the two nodes of a FCBM. $A$ is called instantaneous state bivector and it denotes the on-off position of the node at an instant.

$\begin{align*}
a_{ij} &= \begin{cases} 1 & \text{if } j\text{th state is in ON} \\ 0 & \text{if } j\text{th state is in OFF} \end{cases} \\
b_{ij} &= \begin{cases} 1 & \text{if } j\text{th state is in ON} \\ 0 & \text{if } j\text{th state is in OFF} \end{cases}
\end{align*}$

For $\forall j=1,...,n$

Definition 2.6:Let $\{ C_1,C_2,...,C_n, C'_1, C'_2,...,C'_n \}$ be the two nodes of a FCBM. Let $\overline{C_1C_2, C_2C_3,...,C_nC'_1}$, $\overline{C'_1C'_2,C'_2C'_3,...,C'_nC'_1}$ be the two edges of the FCBM $(i>j)$ then the edges form a directed Bicycle. An FCBM is said to be cyclic if it possesses a directed cycle otherwise it is called acyclic.

Definition 2.7: An FCBM is said to be cyclic if it has feedback

Definition 2.8:Where there is a feedback an FCBM ,i.e. when the causal relations flow through a cycle in a revolutionary way, the FCBM is called a dynamical system.

Definition 2.9:Let $\overline{C C_C C'_2, C'_2C'_3,...,C'_nC'_1}$, $\overline{C'_1C'_2,C'_2C'_3,...,C'_nC'_1}$ be a cycle. suppose $C_m$ is switched ON and if the causality flows through the edges of a cycle and if it again comes to $C_m$, then we say that the dynamical system repeats. This true for any node $C_m$ for $\{m=1,2,3,...,n\}$. The equilibrium state for this dynamical system is called the bihidden patterns.
Definition 2.10: If the equilibrium state of a dynamical system is a unique state bivector, then it is called a fixed bipoint.

Definition 2.11: If the state bivector repeats in the form of $A'_1 \rightarrow A'_2 \rightarrow \cdots \rightarrow A'_t \rightarrow A'_s$ where $t=1.2$ then this equilibrium is called limit bicycle.

3. DESCRIPTION OF THE PROBLEM

Education is an instrument for the development of human beings to recognize their rights in terms of social, political and economic growth of the country. Inequality in education is a major infringement of the rights of women and girls. Due to domestic responsibility mostly eldest female child in the family use to discontinue from the school [10]. According to census 2011 in India - literacy rate of Male is 82.14 per cent and female literacy rate is 65.46 per cent[11]. According to United Nations Educational, Scientific and Cultural organisation (UNESCO) released the eAtlas of gender inequality in education in (2016) reveals that Almost 16 million girls between the ages 6 and 11 will never get chance to read or write, 1 out of 8 children between the ages 6 and 15 are denied to basic education and the girls are the first to be excluded, Globally 10 % of all girls between the ages of 6 and 11 are denied to right to education compared to 8 per cent of all boys and 757 million adults and 115 million of youths cannot read or write, 1 out of 8 children between the ages 6 and 11 will never get chance to read or write, 1 out of 8 children between the ages 6 and 15 are denied to basic education and the girls are the first to be excluded, Globally 10 % of all girls between the ages of 6 and 11 are denied to right to education compared to 8 per cent of all boys and 757 million adults and 115 million of youths cannot read or write, 1 out of 8 children between the ages 6 and 11 will never get chance to read or write, 1 out of 8 children between the ages 6 and 15 are denied to basic education and the girls are the first to be excluded, Globally 10 % of all girls between the ages of 6 and 11 are denied to right to education compared to 8 per cent of all boys and 757 million adults and 115 million of youths cannot read or write.

Now the related directed bigraph is given below

With the help of expert’s opinion the connection bimatrix is given as $B$

$B = B_1 \cup B_2$

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

Let us consider an Attribute $X$ is in ON state and other nodes are in OFF state.

\[
X = (1 \ 0 \ 0 \ 0 \ 0) \cup (1 \ 0 \ 0 \ 0 \ 0)
\]

The Impact of $X$ on the dynamical system $B$ is given by

\[
X = (X_1 \cup X_2) (B_1 \cup B_2)
\]

\[
X.B = (1000000) \cup (1000000)
\]

\[
= (011011) \cup (010011)
\]

\[
\nequiv (111011) \cup (110011)
\]

\[
= X_1 \cup X_2
\]

\[
Y = Y_1 \cup Y_2 \circ B
\]

\[
= (111111) \cup (111111)
\]

\[
= Y
\]

\[
Y.B = (Y_1 \cup Y_2) (B_1 \cup B_2)
\]

\[
= (Y_1 B_1) \cup (Y_2 B_2)
\]

Attributes given by first expert

$F_1$ - Poverty

$F_2$ - Domestic Works

$F_3$ - Socio cultural preferences

$F_4$ - Child marriage

$F_5$ - Parental education

$F_6$ - Family Conflicts

Attributes given by second expert

$S_1$ - Poverty

$S_2$ - Insecurity for girls in the society

$S_3$ - Male Dominance

$S_4$ - Father a drunkard/mother dead

$S_5$ - having three or four female children in the family

$S_6$ - Low motivation by parents
4) Though Government has introduced various policies and programs to improve the female literacy. A study can do how the policies and programs are useful to them.

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