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Intutionistic Fuzzy Statistical Study on Professionals Perception of Futuristic Transitional impacts of Digital India on Higher Education

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Abstract

The present status of our nation is becoming upgraded to Digitalization from the conventional trends with the development of technology which supports each phases of the contemporary approaches. The activities pertaining to Economics and Finance, the pillars of our nation's growth are getting transformed from mechanical to machinated trend; recently the Indian nation is witnessing several changes in the existing system that aims in global growth. The experts strongly believe that a nation's empowerment depends on the improvisation of technical aspects and the reflection of it is the propaganda of the slogan DIGITAL INDIA. It is amended with the belief of the occurrence of immense transitions in the present phenomena. To make an analysis about the futuristic transitional impacts on Higher Education and the quantification of the degree of impact, the concept of intutionistic fuzzy statistical analysis is employed. The respondents chosen for this study are the teaching professionals of Information Technology and Computer Science in the colleges located in the areas of Karumathur, Madurai.

Keywords: Digital India, Intutionistic Fuzzy number, Statistical study, Transition impacts

AMS Code: 15B15

INTRODUCTION

The field of Statistics deals with the analysis of the data for inference making in the problems related to science and social. Several researchers have used different statistical methods suiting their needs. The concept of fuzzy was first introduced by Lofti Zadeh to handle the situations of uncertainty and impreciseness which is quite

common with the data chosen for statistical study, to overcome these hurdles and to make the interpretations more sensible in dealing with qualitative aspects, the researchers used fuzzy statistics which also yielded fruitful results. The representation of the data in terms of different types of fuzzy numbers is the prime notion of fuzzy statistical study.

In general the respondents give close responses (i.e either 'yes' or 'no') but in some juncture their reply would be an intermediate one. They sometimes agree and disagree to certain extent simultaneously, such representations of their opinion in numeric form is quantified by Intutionistic fuzzy numbers. These fuzzy numbers comprise of membership values and non-membership values which reflect the actual scenario. The use of such realistic fuzzy numbers will assist in building reliable and consistent generalizations. The main aim of this paper is to throw light on the futuristic transitional impacts of Digital India by using the characterizations of Intutionistic fuzzy number. The literature consists of many descriptions about the attributes of Digitalization but fuzzy statistical studies integrating with Higher education have not yet been undertaken and this paper is a step towards it.

The organization of the work is as follows: section 2 consists of the elementary definitions; section 3 presents the frame work of the method; section 4 contains the inferences and section 5 concludes the paper.

2. ELEMENTARY DEFINITIONS

This section comprises of the necessary definitions and concepts which are as follows:

2.1 Fuzzy Number

A fuzzy set that define on the set R of real numbers having membership functions in the form A:R→[0,1] is know as fuzzy numbers of fuzzy intervals

To qualify as fuzzy number a fuzzy set A on R must possesatlest the following properties:

(i) A must be a normal fuzzy set

(ii) α-cut A($^{\alpha}$A)must be a closed interval for every α∈[0,1]

(iii) The support A($^{0+}$A) must be bounded.

2.2 Intutionistic Fuzzy Set

Let the universal set U be fixed. An intuitionistic fuzzy set Ain $U$is defined as an object of the form $A = \{\langle x, \mu_A(x), \vartheta_A(x)\rangle : x \in U\}$ where the functions$\mu_A : U \to [0,1]$ and $\vartheta_A : U \to [0,1]$ define the degrees of membership and non-membership of the element $x \epsilon U$ in A $0 \leq \mu_A(x) + \vartheta_A(x) \leq 1$ holds. Let for every x$\in U, \pi_A(x) = 1 - \mu_A(x) - \vartheta_A(x)$ denotes the degree of uncertainty

2.3 Intutionistic Fuzzy Number

Let U be the universal set and A=$\{A_1, A_2, A_3, \dots, A_n\}$ be the subset of U then for any $x \in U$,its degrees of membership and non-membership corresponding to $\{A_1, A_2, A_3, \dots, A_n\}$ are respectively $\{\mu_1(x), \mu_2(x), \mu_3(x), \dots, \mu_n(x)\}$ and $\{\vartheta_1(x), \vartheta_2(x), \vartheta_3(x), \dots, \vartheta_n(x)\}$ where $\mu: U \to [0,1]$ and $\vartheta: U \to [0,1]$ are real then the intuitionistic fuzzy number is an object of the form $\{\langle \mathbf{x}, \boldsymbol{\mu}_{\mathbf{A}}(\mathbf{x}), \boldsymbol{\vartheta}_{\mathbf{A}}(\mathbf{x})\rangle : \mathbf{x} \in \mathbf{U}\}$ can be written as

$$\mu_U(x) = \frac{\mu_1(x)}{A_1} + \frac{\mu_2(x)}{A_2} + \cdots + \frac{\mu_n(x)}{A_3}$$

$$\vartheta_U(x) = \frac{\vartheta_1(x)}{A_1} + \frac{\vartheta_2(x)}{A_2} + \cdots + \frac{\vartheta_n(x)}{A_n}$$

where" + " stands for *"or*" and " ÷ " stands for"$\mu_{i(x)}$" on"A_i" it can also be written as

$$A_i(\mu, \vartheta) = \frac{\langle \mu_1(x), \vartheta_1(x)\rangle}{A_1} + \frac{\langle \mu_2(x), \vartheta_2(x)\rangle}{A_2} + \cdots + \frac{\langle \mu_n(x), \vartheta_n(x)\rangle}{A_n}$$

2.4. Intutionistic Fuzzy Mean

The intutionistic fuzzy mean of X, denoted by IF_M is defined as

$$IF_M = \frac{\langle \frac{\sum_{i=1}^n \mu_{i1}}{n}, \frac{\sum_{i=1}^n \vartheta_{i1}}{n}\rangle}{L_1} + \frac{\langle \frac{\sum_{i=1}^n \mu_{i2}}{n}, \frac{\sum_{i=1}^n \vartheta_{i2}}{n}\rangle}{L_2} + \cdots + \frac{\langle \frac{\sum_{i=1}^n \mu_{in}}{n}, \frac{\sum_{i=1}^n \vartheta_{in}}{n}\rangle}{L_n}$$

Where $0 \le \mu_{ij} \le 1$ and $0 \le \vartheta_{ij} \le 1$ for all i and j

$0 \le \frac{\sum_{i=1}^n \mu_{ij}}{n} \le 1 \text{and} 0 \le \frac{\sum_{i=1}^n \vartheta_{ij}}{n} \le 1 \frac{\sum_{i=1}^n \mu_{ij}}{n} + \frac{\sum_{i=1}^n \vartheta_{ij}}{n} \in [0,1]$

2.5. Intuitionistic Fuzzy Geometric Mean

$$IF_{GM} = \frac{\langle (\prod_{i=1}^n \mu_{i1})^{\frac{1}{n}}, 1-(\prod_{i=1}^n 1-\vartheta_{i1})^{\frac{1}{n}}\rangle}{L_1} + \frac{\langle (\prod_{i=1}^n \mu_{i2})^{\frac{1}{n}}, 1-(\prod_{i=1}^n 1-\vartheta_{i2})^{\frac{1}{n}}\rangle}{L_2} + \cdots + \frac{\langle (\prod_{i=1}^n \mu_{in})^{\frac{1}{n}}, 1-(\prod_{i=1}^n 1-\vartheta_{in})^{\frac{1}{n}}\rangle}{L_1}$$

2.6. Intuitionistic Fuzzy Harmonic Mean

The intutionistic fuzzy harmonic mean of X , denoted by IF_{GM} is defined as

$$IF_{H.M} = \frac{\frac{n}{\sum_{i=1}^n \frac{1}{\mu_{i1}}}, 1-\frac{n}{\sum_{i=1}^n \frac{1}{1-\vartheta_{i1}}}}{L_1} + \frac{\frac{n}{\sum_{i=1}^n \frac{1}{\mu_{i2}}}, 1-\frac{n}{\sum_{i=1}^n \frac{1}{1-\vartheta_{i2}}}}{L_2} + \cdots + \frac{\frac{n}{\sum_{i=1}^n \frac{1}{\mu_{ik}}}, 1-\frac{n}{\sum_{i=1}^n \frac{1}{1-\vartheta_{ik}}}}{L_k}$$

3. FRAME WORK OF THE METHOD

This work has been carried out with the main motive of determining the futuristic transitional impacts of Digital India on Higher Education. Presently many changes are taking place in the technological factors. In these days the people are getting influenced by the features of Digital India and the government is making such transformation for bringing technological revolution in all fields to which education is not an exception. The intention of promoting technology oriented education is to enrich the existing pattern to an enhanced level, but the resultant of such synchronization in future has to be predicted for charting out apt measures.

The intutionistic fuzzy data were collected from 70 teaching professionals of IT and Computer Science, a questionnaire was framed to which the respondents were asked to rate the transitional impacts by giving weightage from [0,1]. The quantification of the transitional impacts is classified as follows

L1	Very Low Transition
L2	Low Transition
L3	Moderate Transition
L4	High Transition
L5	Very High Transition

The data collected are tabulated as below

Respondents	**L1**	**L2**	**L3**	**L4**	**L5**
1	**(0.2,0.8)**	**(0.5,0.5)**	**(0.7,0.3)**	**(0.1,0.9)**	**(0.3,0.7)**
2	**(0.3,0.7)**	**(0.8,0.2)**	**(0.9,0.1)**	**(0.1,0.9)**	**(0.4,0.6)**
3	**(0.2,0.8)**	**(0.1,0.9)**	**(0.7,0.3)**	**(0.3,0.7)**	**(0.5,0.5)**
4	**(0.9,0.1)**	**(0.8,0.2)**	**(0.6,0.4)**	**(0.5,0.5)**	**(0.1,0.9)**
5	**(0.9,0.1)**	**(0.8,0.2)**	**(0.7,0.3)**	**(0.1,0.9)**	**(0.2,0.8)**
6	**(0.9,0.1)**	**(0.8,0.2)**	**(0.6,0.4)**	**(0.1,0.8)**	**(0.2,0.8)**
7	**(0.8,0.2)**	**(0.7,0.3)**	**(0.5,0.5)**	**(0.1,0.9)**	**(0.6,0.4)**
8	**(0.9,0.1)**	**(0.1,0.9)**	**(0.2,0.8)**	**(0.5,0.5)**	**(0.6,0.4)**
9	**(0.3,0.7)**	**(0.5,0.5)**	**(0.6,0.4)**	**(0.1,0.9)**	**(0.9,0.1)**
10	**(0.9,0.1)**	**(0.1,0.9)**	**(0.2,0.8)**	**(0.4,0.6)**	**(0.5,0.5)**
11	**(0.1,0.9)**	**(0.2,0.8)**	**(0.3,0.7)**	**(0.4,0.6)**	**(0.7,0.3)**
12	**(0.1,0.9)**	**(0.2,0.8)**	**(0.9,0.1)**	**(0.4,0.6)**	**(0.5,0.5)**
13	**(0.8,0.2)**	**(0.3,0.7)**	**(0.5,0.5)**	**(0.2,0.8)**	**(0.1,0.9)**

14	**(0.7,0.3)**	**(0.5,0.5)**	**(0.6,0.4)**	**(0.3,0.7)**	**(0.9,0.1)**
15	**(0.2,0.8)**	**(0.5,0.5)**	**(0.7,0.3)**	**(0.4,0.6)**	**(0.1,0.9)**
16	**(0.2,0.8)**	**(0.3,0.7)**	**(0.5,0.5)**	**(0.4,0.6**	**(0.1,0.9)**
17	**(0.5,0.5)**	**(0.4,0.6)**	**(0.6,0.4)**	**(0.7,0.3)**	**(0.1,0.9)**
18	**(0.9,0.1)**	**(0.3,0.7)**	**(0.8,0.2)**	**(0.1,0.9)**	**(0.2,0.8)**
19	**(0.1,0.9)**	**(0.4,0.6)**	**(0.3,0.7)**	**(0.2,0.8)**	**(0.5,0.5)**
20	**(0.1,0.9)**	**(0.3,0.7)**	**(0.5,0.5)**	**(0.7,0.3)**	**(0.2,0.8)**
21	**(0.1,0.9)**	**(0.3,0.7)**	**(0.2,0.8)**	**(0.4,0.6)**	**(0.9,0.1)**
22	**(0.3,0.7)**	**(0.1,0.9)**	**(0.2,0.8)**	**(0.7,0.3)**	**(0.5,0.5)**
23	**(0.1,0.9)**	**(0.5,0.5)**	**(0.4,0.6)**	**(0.2,0.8)**	**(0.7,0.3)**
24	**(0.1,0.9)**	**(0.3,0.7)**	**(0.2,0.8)**	**(0.5,0.5)**	**(0.4,0.6)**
25	**(0.3,0.7)**	**(0.1,0.9)**	**(0.2,0.8)**	**(0.4,0.6)**	**(0.5,0.5)**
26	**(0.2,0.8)**	**(0.1,0.9)**	**(0.3,0.7)**	**(0.4,0.6)**	**(0.9,0.1)**
27	**(0.1,0.9)**	**(0.2,0.8)**	**(0.7,0.3)**	**(0.5,0.5)**	**(0.4,0.6)**
28	**(0.1,0.9)**	**(0.2,0.8)**	**(0.3,0.7)**	**(0.9,0.1)**	**(0.5,0.5)**
29	**(0.2,0.8)**	**(0.3,0.7)**	**(0.1,0.9)**	**(0.7,0.3)**	**(0.4,0.6)**
30	**(0.2,0.8)**	**(0.1,0.9)**	**(0.3,0.7)**	**(0.4,0.6)**	**(0.5,0.5)**
31	**(0.7,0.3)**	**(0.2,0.8)**	**(0.3,0.7)**	**(0.1,0.9)**	**(0.7,0.3)**
32	**(0.2,0.2)**	**(0.1,0.9)**	**(0.3,0.7)**	**(0.4,0.6),**	**(0.6,0.4)**
33	**(0.5,0.5)**	**(0.7,0.3)**	**(0.9,0.1)**	**(0.1,0.9)**	**(0.2,0.8)**
34	**(0.6,0.4)**	**(0.8,0.2)**	**(0.5,0.5)**	**(0.3,0.7)**	**(0.1,0.9)**
35	**(0.1,0.9)**	**(0.3,0.7)**	**(0.9,0.1)**	**(0.5,0.5)**	**(0.6,0.6)**
36	**(0.1,0.9)**	**(0.40.6)**	**(0.7,0.3)**	**(0.2,0.8)**	**(0.3,0.7)**
37	**(0.2,0.8)**	**(0.6,0.4)**	**(0.7,0.3)**	**(0.1,0.9)**	**(0.2,0.8)**
38	**(0.9,0.1)**	**(0.8,0.2)**	**(0.5,0.5)**	**(0.3,0.7)**	**(0.7,0.3)**
39	**(0.8,0.2)**	**(0.5,0.5)**	**(0.6,0.4)**	**(0.2,0.8)**	**(0.1,0.9)**
40	**(0.6,0.4)**	**(0.7,0.3)**	**(0.9,0.1)**	**(0.3,0.7)**	**(0.1,0.9)**
41	**(0.8,0.2)**	**(0.6,0.4)**	**(0.9,0.1)**	**(0.5,0.5)**	**(0.3,0.7)**
42	**(0.9,0.1)**	**(0.8,0.2)**	**(0.5,0.5)**	**(0.2,0.8)**	**(0.1,0.9)**
43	**(0.9,0.1)**	**(0.5,0.5)**	**(0.8,0.2)**	**(0.3,0.7)**	**(0.2,0.8)**
44	**(0.2,0.8)**	**(0.6,0.4)**	**(0.5,0.5)**	**(0.1,0.9)**	**(0.1,0.9)**
45	**(0.5,0.5)**	**(0.6,0.4)**	**(0.9,0.1)**	**(0.2,0.8)**	**(0.3,0.7)**
46	**(0.1,0.9)**	**(0.3,0.7)**	**(0.9,0.1)**	**(0.5,0.5)**	**(0.2,0.8)**
47	**(0.7,0.3)**	**(0.2,0.8)**	**(0.6,0.4)**	**(0.3,0.7)**	**(0.1,0.9)**
48	**(0.9,0.1)**	**(0.4,0.6)**	**(0.5,0.5)**	**(0.1,0.9)**	**(0.3,0.7)**
49	**(0.9,0.1)**	**(0.5,0.5)**	**(0.7,0.3)**	**(0.1,0.9)**	**(0.1,0.9)**

50	**(0.6,0.4)**	**(0.9,0.1)**	**(0.8,0.2)**	**(0.2,0.8)**	**(0.3,0.7)**
51	**(0.5,0.5)**	**(0.6,0.4)**	**(0.9,0.1)**	**(0.2,0.8)**	**(0.2,0.8)**
52	**(0.7,0.3)**	**(0.1,0.9)**	**(0.9,0.1)**	**(0.4,0.6)**	**(0.3,0.7)**
53	**(0.1,0.9)**	**(0.3,0.7)**	**(0.9,0.1)**	**(0.2,0.8)**	**(0.4,0.6)**
54	**(0.2,0.8)**	**(0.5,0.5)**	**(0.8,0.2)**	**(0.1,0.9)**	**(0.3,0.7)**
55	**(0.5,0.5)**	**(0.9,0.1)**	**(0.6,0.4)**	**(0.4,0.6)**	**(0.1,0.9)**
56	**(0.8,0.2)**	**(0.5,0.5)**	**(0.7,0.3)**	**(0.9,0.1)**	**(0.3,0.7)**
57	**(0.1,0.9)**	**(0.2,0.8)**	**(0.6,0.4)**	**(0.7,0.3)**	**(0.9,0.1)**
58	**(0.9,0.1)**	**(0.8,0.2)**	**(0.7,0.3)**	**(0.6,0.4)**	**(0.5,0.5)**
59	**(0.1,0.9)**	**(0.2,0.8)**	**(0.5,0.5)**	**(0.6,0.4)**	**(0.9,0.1)**
60	**(0.1,0.9)**	**(0.2,0.8)**	**(0.3,0.7)**	**(0.8,0.2)**	**(0.9,0.1)**
61	**(0.1,0.9)**	**(0.2,0.8)**	**(0.4,0.6)**	**(0.8,0.2)**	**(0.9,0.1)**
62	**(0.2,0.8)**	**(0.3,0.7)**	**(0.4,0.6)**	**(0.5,0.5)**	**(0.9,0.1)**
63	**(0.9,0.1)**	**(0.8,0.2)**	**(0.6,0.4)**	**(0.5,0.5)**	**(0.1,0.1)**
64	**(0.9,0.1)**	**(0.7,0.3)**	**(0.5,0.5)**	**(0.4,0.6)**	**(0.1,0.9)**
65	**(0.9,0.1)**	**(0.8,0.2)**	**(0.6,0.4)**	**(0.5,0.5)**	**(0.3,0.7)**
66	**(0.9,0.1)**	**(0.8,0.2)**	**(0.6,0.4)**	**(0.5,0.5)**	**(0.1,0.9)**
67	**(0.2,0.8)**	**(0.5,0.5)**	**(0.7,0.3)**	**(0.8,0.2)**	**(0.9,0.1)**
68	**(0.3,0.7)**	**(0.4,0.6)**	**(0.5,0.5)**	**(0.7,0.3)**	**(0.9,0.1)**
69	**(0.9,0.1)**	**(0.8,0.2)**	**(0.6,0.4)**	**(0.5,0.5)**	**(0.1,0.9)**
70	**(0.9,0.1)**	**(0.7,0.3)**	**(0.5,0.5)**	**(0.3,0.7)**	**(0.2,0.8)**

Intutionistic Fuzzy Mean	(0.47,0.51)	(0.45,0.54)	(0.5,0.42)	(0.38,0.62)	(0.4,0.58)
Score Function	-0.04	-0.09	0.08	-0.24	-0.18
Intutionistic Fuzzy Geometric Mean	(0.34,0.66)	(0.37,0.63)	(0.52,0.48)	(0.31,0.69)	(0.31,0.69)
Score Function	-0.32	-0.26	0.04	-0.38	-0.38
Intutionistic Fuzzy Harmonic Mean	(0.25,0.75)	(0.29,0.71)	(0.43,0.42)	(0.24,0.76)	(0.23,0.77)
Score Function	-0.5	-0.42	0.01	-0.52	-0.52

4. RESULTS AND DISCUSSION

The above table contains the calculations of intutionistic fuzzy measures of central tendency and the score function clearly indicates that L3 gets high score in all the three computations. This vividly shows that the futuristic transitional impact of Digital India on higher education is moderate.

CONCLUSION

This paper mainly focuses on the predictions of the futuristic impacts of digital India from the view point of the educational institutions. The data collected was analyzed and quantified using intutionistic fuzzy statistics to overcome the vagueness and inconsistency of the raw data. This article initiates the application of intutionistic fuzzy statistical tools in preparing suitable frameworks for the enhancement of Digital India's role in higher education by getting educators and teaching professional's feedback as input for this transforming system.

REFERENCES

[1] Atanassov, K. T. (1999) Intuitionistic Fuzzy Sets: Theory and Applications, Springer Physica–Verlag, Heidelberg.

[2] Atannasov, K. T., & Gargov, G. (1989) Interval-valued intuitionistic fuzzy sets, Fuzzy Sets and Systems, 31(3), 343–349.

[3] Buckley, J. J. (2006) Fuzzy Probabilities and Statistics, Springer, Berlin.

[4] Gupta Neeru and Arora Kirandeep (2015). Digital India: A Roadmap for the development of Rural India. International Journal of Business Management, vol(2)2, pp1333-1342.

[5] Kadam Avinash (2015). Why cyber security is important for digital India. Retrieved from http://www.firstpost.com/business/why-cyber-security-is-important-for-digital-india-2424380.html

[6] Midha Rahul (2016). Digital India: Barriers and Remedies . International Conference on Recent Innovations in Sciences, Management , Education and Technology. Retrieved from http:// data. Conference world .in/ICISMET/P256-261

[7] Saeidifar, A. (2013) New approximations of fuzzy numbers and their applications, Journal of Applied Science and Agriculture, 7(13), 911–931.

[8] Sivaraman, G., Lakshmana Gomathi Nayagam, V., & Ponalagusamy, R. (2012) Intuitionistic fuzzy Interval information system, International Journal of Computer Theory and Engineering, 4(3), 459–461. [6] Fisz, M. (1963) Probability Theory and Mathematical Statistics, Wiley Publication, London.

[9] Sun, C.-M., & Wu, B. (2013) New Statistical approaches for fuzzy data, International Journal of Uncertainty, Fuzziness and Knowledge Based Systems, 15, 89–106.

[10] Zadeh, L. A. (1965) Fuzzy sets, Information and Control, 8, 338–353.