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Application of Intuitionistic Fuzzy Sets: Strong and Weak Criteria in Schooling during COVID-19

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Abstract
Introduction: Multi-criteria is a challenging topic due to multiple competing criteria, and decision makers' information is frequently inaccurate and ambiguous. The important contributions of this study are used to determine the stronger and weaker criteria.

Objectives: This paper proposes a strategy for solving multi-criteria decision making (MCDM) issues and sorting the criteria based on survey data that blends grey relational analysis (GRA) approaches with weighted intuitionistic fuzzy entropy.

Methods: Here, the numerical example to select the strong and weaker criteria to demonstrate how the intuitionistic fuzzy coupled with entropy approach mixed with GRA methodologies effectively. These GRA analytical methods are helpful in discovering the challenges facing the schooling system during a pandemic.

Results: In the proposed research, an overview is provided by compiling 28 Criteria and categorizing them into 7 Dimensions, which serve as the foundational elements of the educational system in pandemic scenarios. Seven criteria have been identified as the strongest standards for the educational system during the pandemic situation.

Conclusions: This method blends grey relational analysis (GRA) approaches with weighted intuitionistic fuzzy entropy included several phases for locating obstacles as well as Strong and Weak criteria. In future, to assess criteria, a variety of weighting strategies might be used. The Governance and Corporate are advised to use the suggested approach in future.

Keywords: Intuitionistic Fuzzy set, Grey Relational Analysis (GRA), Multi-Criteria decision making, Entropy, Ranking.

1. Introduction

A multi-criteria assessment methodology may be appropriate for tackling complicated situations. There are a range of multi-standard technologies that facilitate decision making in the event of numerous standards. Decision makers in multi-criteria decision making select the most appropriate criteria after rationally evaluating a restricted selection of independent or interdependent criteria. To rate online learning platforms, Astuti et al. [1] presented the intuitionistic fuzzy Topsis approach, which assigns membership functions, non-membership functions, and doubt values. Since 1986, Atanassov [2-3] has enhanced standard fuzzy sets to intuitionistic fuzzy sets (IFS) in terms of the degree of hesitation, which is a generalisation of fuzzy sets theory. IFS theory has been frequently utilised to handle problems involving multi-criteria decision making. By assessing their existing situation, MCDM will help them discover their strengths and shortcomings. To bring uncertainty to real-world circumstances, intuitionistic fuzzy sets might be useful. The Intuitionistic Fuzzy Set (IFS) proves the correctness of the answer. Chen, C. H [4] proposed in 2019 a multi-criteria assessment model that combines grey relational analysis (GRA) techniques with the intuitionistic fuzzy entropy-based Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method to solve multi-criteria decision making (MCDM) problems and sort the alternatives. In 2021, Coronicova Hurajova, J., and Hajduova, Z [5] introduced two multi-criteria analysis methodologies, TOPSIS and WSA, to describe how the eight areas of Slovakia were rated based on nine major characteristics of quality of life. Hongjiu, L., Qingyang, L., and Yanrong, H [6] proposed a grey relational analysis based on IVIFULIV to rank options in 2019. At the same time, they discovered how to calculate weights using a linear programming model when just a portion of the weight information for characteristics is given.

Grey system theory [7] is a way for investigating uncertainty in the case of sparse data, and it offers benefits in the deductive analysis of uncertain information situations. It has been used successfully in circumstances of incomplete knowledge or uncertainty. Joshi D. and Kumar S [8] suggested an intuitionistic fuzzy TOPSIS technique for ranking alternatives in a multi-criteria decision making (MCDM) issue based on distance measure and intuitionistic fuzzy entropy. Pramanik, S., and Mukhopadhyaya, D. [9] proposed developing an intuitionistic fuzzy multi-criterion grouping technique with grey relational analysis for teacher selection in higher education. The intuitive fuzzy weighted averaging operator is used to aggregate individual decision makers' ideas into a collective opinion. In 2021, Roszkowska, E., Kusterka-Jefmaska, M., and Jefmaski, B. [10] use questionnaire surveys to solve the challenge of complicated socioeconomic phenomenon evaluation.

The information is given on an ordinal scale. The Euclidean and Hamming distances are used. The concept of subsethood, entropy, and cardinality for interval-valued fuzzy sets (IVFSs) was provided by Vlachos, I. K., and Sergiadis, G. D [11]. For subsethood to reduce to an entropy measure, an axiomatic skeleton for subsethood measures in the interval-valued fuzzy context is presented. To evaluate survey responses in this suggested study, a unique entropy-weighted approach was created. This paper proposes a unique way of finding weak characteristics by leveraging GRA in the form of weighted entropy in an intuitionistic fuzzy environment.

2. Preliminaries

2.1 Intuitionistic Fuzzy Set:[3]

As suggested by (Atanassov, K. T., & Stoeva, S. 1986), IFS has various levels of membership and non-membership. A is a collection of intuitionistic fuzzy sets, and set X in the given universe follows the following pattern:

$$\mathbf{A = \{< x/\mu_A(x)\ ,\ \nu_A(x) >\ \ \&\ 0 \leq \mu_A(x) + \nu_A(x) \leq 1\}}$$

In this case, $\nu_A(x)$ - Degree of non-membership. $\mu_A(x)$ - Degree of membership.

2.2 IF Properties: [2]

IF properties state as follows,

1. $\mathbf{A \oplus B = (T_A(x) + T_B(x) - T_A(x) * T_B(x),\ F_A(x) * F_B(x))}$
2. $\mathbf{A \otimes B = (T_A(x) * T_B(x),\ F_A(x) + F_B(x) - F_A(x) * F_B(x))}$
3. $\mathbf{\lambda A = (1 - (1 - T_A)^{\lambda},\ F_A{}^{\lambda})}$

3. Grey Relational Analysis (GRA) approaches with weighted intuitionistic fuzzy entropy

3.1 Procedure

Step 1: Transform survey Responses into Intuitionistic Fuzzy Decision Matrix (IFDM)

Step 2: Calculate the fuzzy entropy value and convert it to an Intuitionistic Fuzzy Entropy Value Decision matrix (IFEVDM)

Step 3: Determine the normalisation of the IFEVDM and convert it NIFEVDM

Step 4: Find the Weight Vector (WV) of the Respondent Category

Step 5: Construct Weighted Normalized Fuzzy Intuitionistic Entropy Value Decision Matrix (WNFIEVDM)

Step 6: Determine the Intuitionistic Fuzzy Reference Sequence (IFRS)

Step 7: Find the Grey Relational Coefficient (GRC), Grey Relational Grade (GRG) & Rank

4. Case study

The suggested Research created a survey questionnaire, to which 786 teachers employed by Tamilnadu's government schools responded. In the context of the COVID scenario, the whole educational system was evaluated across seven dimensions: learning mode, beneficiary, learning continuity, Kalvi channel, opportunity, Specialized training is required for both students and teachers. The school educational system during the epidemic time is evaluated using 7 dimensions and 28 criteria in this research using an entropy weighting technique and grey relational analysis. Table 1 shows the School Educational System Criteria and Dimension during Covid 19 situation.

Table: 1 Schooling System Criteria and Dimension during Covid 19 situation

Criteria	Criteria Code	Descri
alvi channel	SEDC11	Majority of Student learned through Kalvi Channel
nline class	SEDC12	Majority of Student learned through Online Class
hatsApp	SEDC13	Majority of Student learned through WhatsApp
ome Schooling	SEDC14	Majority of Student learned as Home-schooling mode
alvi Channel Beneficiary	SEDC21	Learning benefited by Kalvi channel
hatsApp Beneficiary	SEDC22	Learning benefited by WhatsApp
nline class Beneficiary	SEDC23	Learning benefited by Online Class
ome Schooling Beneficiary	SEDC24	Learning benefited by Home-schooling
hatsApp at Home	SEDC31	Learning Continues because WhatsApp is available
alvi Channel Broadcast at Home	SEDC32	Learning Continues because Kalvi channel broadcast is available a
alvi Channel Broadcast at School	SEDC33	Learning Continues due to Kalvi channel broadcast is available at
nart Phone & Network	SEDC34	Learning Continues due to smartphone / network
inority Language	SEDC41	Kalvi channel programs were designed to Minority language stude
earning Eagerly	SEDC42	Students were eager to learn through Kalvi channel
nderstanding of Content Easily	SEDC43	Kalvi channel programs were designed to be easily understood the
arents support	SEDC44	Parents support to watch kalvi channel
iscussion opportunity	SEDC51	Discussion Opportunity is available in online class
eer Learning opportunity	SEDC52	Opportunity is available for Peer Learning
WSN Learning opportunity	SEDC53	Learning Opportunity is available for CWSN Students
onitoring opportunity	SEDC54	Students monitoring opportunity is available in online class
asic Skill	SEDC61	Requirement of Basic skill development (Reading, Writing and ma
ook based Curriculum	SEDC62	Requirement of Book based curriculum training for Students
ridge course	SEDC63	Requirement of Bridge course training for Students (Prerequisite
sychological Counselling	SEDC65	Requirement of Psychological Counselling training for Students
otivation Training	SEDC71	Require Motivation training for Teachers
asic skill development training	SEDC72	Require Basic skill development training (Reading, Writing and m
ook based Training	SEDC73	Require Book based training for Teachers
ridge course Training	SEDC74	Require Bridge course Training for Teachers (Prerequisite Knowle

4.1. Numerical Example

Step :1 Intuitionistic Fuzzy Decision Matrix (IFDM)

28 criteria (m) and 4 respondent categories (n) are included in the proposed research. Each component of the IFDM shown below is written in the form (α, β), where X stands for Respondent Category and C for Criteria. In this phase, $\hat{c}_1$Criteria, x_1Category of Respondent has (α, β) of (0.6085, 0.3915). Table 2 shown as follows.

Table: 2 Intuitionistic Fuzzy Decision Matrix (IFDM)

IFDM								
Criteria	x_1		x_2		x_3		x_4	
	α	β	α	β	α	β	α	β
$\hat{c}_1$	.6085	.3915	.7125	.2875	.5287	.4713	.0000	1.0000
$\hat{c}_2$	.0930	.9070	.2000	.8000	.3376	.6624	.9118	.0882
$\hat{c}_3$	.5211	.4789	.5750	.4250	.6178	.3822	.3235	.6765
$\hat{c}_4$	.1775	.8225	.0625	.9375	.0064	.9936	.0588	.9412
$\hat{c}_5$	.2567	.7433	.5040	.4960	.2923	.7077	.2817	.7183
$\hat{c}_6$	.2521	.7479	.2448	.7552	.4212	.5788	.3024	.6976
$\hat{c}_7$	.2419	.7581	.1077	.8923	.1899	.8101	.2582	.7418
$\hat{c}_8$	.2492	.7508	.1436	.8564	.0966	.9034	.1578	.8422
$\hat{c}_9$	.5070	.4930	.4000	.6000	.3631	.6369	.4412	.5588
$\hat{c}_{10}$	.8761	.1239	.8750	.1250	.8217	.1783	.8235	.1765
$\hat{c}_{11}$	.2986	.7014	.4542	.5458	.3885	.6115	.5000	.5000
$\hat{c}_{12}$	.4169	.5831	.3708	.6292	.2739	.7261	.2941	.7059
$\hat{c}_{13}$	.7211	.2789	.7208	.2792	.4968	.5032	.6765	.3235
$\hat{c}_{14}$	.7099	.2901	.8042	.1958	.7898	.2102	.8235	.1765
$\hat{c}_{15}$	.8676	.1324	.9375	.0625	.9554	.0446	.9118	.0882
$\hat{c}_{16}$	.7099	.2901	.8083	.1917	.7771	.2229	.7941	.2059
$\hat{c}_{17}$	.1211	.8789	.1792	.8208	.1465	.8535	.3529	.6471
$\hat{c}_{18}$	.4592	.5408	.4417	.5583	.4204	.5796	.4706	.5294
$\hat{c}_{19}$	.0451	.9549	.1042	.8958	.1401	.8599	.2647	.7353
$\hat{c}_{20}$	.0563	.9437	.1250	.8750	.1656	.8344	.2941	.7059
$\hat{c}_{21}$	.8056	.1944	.7000	.3000	.4904	.5096	.0882	.9118
$\hat{c}_{22}$	.0479	.9521	.0083	.9917	.0318	.9682	.0588	.9412
$\hat{c}_{23}$	.0986	.9014	.1917	.8083	.2038	.7962	.2059	.7941
$\hat{c}_{24}$	.8817	.1183	.9583	.0417	.9745	.0255	.0000	.0000
$\hat{c}_{25}$	.8563	.1437	.8208	.1792	.8662	.1338	.8824	.1176
$\hat{c}_{26}$	.6225	.3775	.4667	.5333	.2803	.7197	.0294	.9706
$\hat{c}_{27}$	.0704	.9296	.1250	.8750	.1975	.8025	.1471	.8529
$\hat{c}_{28}$	.1972	.8028	.3042	.6958	.2611	.7389	.1765	.8235

Step:2 Intuitionistic Fuzzy Entropy Value Decision Matrix (IFEVDM)

In this step, $\hat{c}_1$ criteria, x_1 Respondent Category, we have (0.6085,0.3915). IFEVDM as follows, $V_{11}(x_1) = 0.6435$. Each Entropy Value are calculated, Then IFEVDM shown in table 3.

Step:3 Normalization Intuitionistic Fuzzy Entropy Value Decision Matrix (NIFEVDM)

Divide the matrix by the maximum value of each column in above. Then we will get Normalization of Intuitionistic Fuzzy Entropy Value. For example, the maximum value in the first column is 0.9722. Divide each value of the first column by 0.9722. NIFEVDM determined in table 3 as follows,

Table: 3 IFEVDM & NIFEVDM

Criteria	IFEVDM				NIFEVDM			
	x_1	x_2	x_3	x_4	x_1	x_2	x_3	x_4
$\hat{c}_1$	.6435	.4035	.8916	.0000	.6619	.4099	.9030	.0000
$\hat{c}_2$	.1025	.2500	.5096	.0968	.1054	.2540	.5161	.0968
$\hat{c}_3$	.9189	.7391	.6186	.4783	.9452	.7509	.6265	.4783
$\hat{c}_4$	.2158	.0667	.0064	.0625	.2219	.0677	.0065	.0625
$\hat{c}_5$	.3453	.9843	.4130	.3921	.3552	1.0000	.4183	.3921
$\hat{c}_6$	.3371	.3241	.7277	.4335	.3468	.3293	.7370	.4335
$\hat{c}_7$	.3192	.1206	.2345	.3480	.3283	.1226	.2375	.3480
$\hat{c}_8$	.3319	.1677	.1069	.1873	.3414	.1703	.1083	.1873
$\hat{c}_9$	.9722	.6667	.5700	.7895	1.0000	.6773	.5773	.7895
$\hat{c}_{10}$	.1415	.1429	.2171	.2143	.1455	.1451	.2198	.2143
$\hat{c}_{11}$	.4257	.8321	.6354	1.0000	.4379	.8453	.6436	1.0000
$\hat{c}_{12}$	.7150	.5894	.3772	.4167	.7354	.5988	.3820	.4167
$\hat{c}_{13}$	.3867	.3873	.9873	.4783	.3978	.3935	1.0000	.4783
$\hat{c}_{14}$	.4087	.2435	.2661	.2143	.4204	.2474	.2695	.2143
$\hat{c}_{15}$	.1526	.0667	.0467	.0968	.1570	.0677	.0473	.0968
$\hat{c}_{16}$	.4087	.2371	.2869	.2593	.4204	.2409	.2906	.2593
$\hat{c}_{17}$	.1378	.2183	.1716	.5455	.1418	.2218	.1738	.5455
$\hat{c}_{18}$	.8490	.7910	.7253	.8889	.8732	.8037	.7346	.8889
$\hat{c}_{19}$	.0472	.1163	.1630	.3600	.0485	.1181	.1651	.3600
$\hat{c}_{20}$	.0597	.1429	.1985	.4167	.0614	.1451	.2010	.4167
$\hat{c}_{21}$	.2413	.4286	.9625	.0968	.2482	.4354	.9748	.0968
$\hat{c}_{22}$	.0503	.0084	.0329	.0625	.0517	.0085	.0333	.0625
$\hat{c}_{23}$	.1094	.2371	.2560	.2593	.1125	.2409	.2593	.2593
$\hat{c}_{24}$	.1342	.0435	.0261	.0000	.1380	.0442	.0265	.0000
$\hat{c}_{25}$	.1678	.2183	.1544	.1333	.1726	.2218	.1564	.1333
$\hat{c}_{26}$	.6063	.8750	.3894	.0303	.6237	.8890	.3944	.0303
$\hat{c}_{27}$	.0758	.1429	.2460	.1724	.0779	.1451	.2492	.1724
$\hat{c}_{28}$	.2456	.4371	.3534	.2143	.2526	.4441	.3580	.2143

Step:4 Weight Vector (WV)

a_j - Sum of Normalized Intuitionistic Fuzzy Entropy Value.

For Example, $9.823 = a_1$

Then $a_k = (a_1, a_2, a_3, a_4) = (9.823, 10.038, 10.710, 8.647)$

T = 39.218

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$$w_1 = \frac{1}{(n_{-T})} \; x \; _{(1-a_1)} \quad = 0.2505$$

Similarly WV (W) = (.2505, .2566,.2757,.2171)

Step:5 WNIFEVDM

WNIFEV calculated by using (Atanassov. K.T, 1994), as follows for $\hat{c}_1$ criteria, x_1 Respondent category (0.6085,0,3915),

$$w_1 = 0.2505$$

$$(\beta_{11w}(x_1), \alpha_{11w}(x_1)) = (1-(1-\beta_1)^{w_1}, (\alpha_1)^{w_1})$$

$$= (0.2903, 0.7907)$$

Calculate the above method for all values in the matrix. Then WNIFEVDM determined in table 4 as follows,

Table:4 WNIFEVDM

WNIFEVDM								
Criteria	x_1		x_2		x_3		x_4	
	α	β	α	β	α	β	α	β
$\hat{c}_1$	.209	.7907	.2738	.7262	.1873	.8127	.0000	1.0000
$\hat{c}_2$	.0241	.9759	.0557	.9443	.1073	.8927	.4097	.5903
$\hat{c}_3$	.1684	.8316	.1972	.8028	.2329	.7671	.0814	.9186
$\hat{c}_4$	.047	.9522	.0164	.9836	.0018	.9982	.0131	.9869
$\hat{c}_5$	.0716	.9284	.1647	.8353	.0909	.9091	.0693	.9307
$\hat{c}_6$	.070	.9298	.0695	.9305	.1399	.8601	.0752	.9248
$\hat{c}_7$	.067	.9330	.0288	.9712	.0564	.9436	.0628	.9372
$\hat{c}_8$	.069	.9307	.0390	.9610	.0276	.9724	.0366	.9634
$\hat{c}_9$	.1624	.8376	.1229	.8771	.1169	.8831	.1187	.8813
$\hat{c}_{10}$	.407	.5927	.4136	.5864	.3783	.6217	.3138	.6862
$\hat{c}_{11}$	.085	.9150	.1439	.8561	.1268	.8732	.1397	.8603
$\hat{c}_{12}$	.1264	.8736	.1121	.8879	.0845	.9155	.0728	.9272
$\hat{c}_{13}$	.2738	.7262	.2793	.7207	.1725	.8275	.2173	.7827
$\hat{c}_{14}$	.266	.7335	.3419	.6581	.3495	.6505	.3138	.6862
$\hat{c}_{15}$	.3974	.6026	.5091	.4909	.5758	.4242	.4097	.5903
$\hat{c}_{16}$	.266	.7335	.3456	.6544	.3389	.6611	.2905	.7095
$\hat{c}_{17}$	.0318	.9682	.0494	.9506	.0427	.9573	.0902	.9098
$\hat{c}_{18}$	.1427	.8573	.1389	.8611	.1396	.8604	.1290	.8710
$\hat{c}_{19}$	.0115	.9885	.0278	.9722	.0408	.9592	.0646	.9354
$\hat{c}_{20}$	.0144	.9856	.0337	.9663	.0487	.9513	.0728	.9272
$\hat{c}_{21}$	.336	.6634	.2658	.7342	.1696	.8304	.0199	.9801
$\hat{c}_{22}$	.0122	.9878	.0021	.9979	.0089	.9911	.0131	.9869
$\hat{c}_{23}$	.0257	.9743	.0531	.9469	.0609	.9391	.0488	.9512
$\hat{c}_{24}$	.4142	.5858	.5576	.4424	.6364	.3636	1.0000	.0000
$\hat{c}_{25}$	.385	.6150	.3568	.6432	.4257	.5743	.3717	.6283
$\hat{c}_{26}$	.2166	.7834	.1490	.8510	.0867	.9133	.0065	.9935
$\hat{c}_{27}$	.0181	.9819	.0337	.9663	.0588	.9412	.0340	.9660
$\hat{c}_{28}$	.053	.9465	.0889	.9111	.0801	.9199	.0413	.9587

Step:6 Determine the Intuitionistic Fuzzy Reference Sequence (IFRS)

The Intuitionistic Fuzzy Reference Sequence (IFRS) determined for Respondent Category (n=4) as follows,

S = {(1,0), (1,0), ……… (1,0), (1,0)}

Step:7 Find Grey Relational Coefficient (GRC), Grey Relational Grade (GRG) & Rank

We must calculate $|x_0(k) - x_j(k)|$, Min & Max. as shown below table 5,

Table: 5 Calculation of Min & Max

Criteri	x_1	x_2	x_3	x_4	Min	Max
$\hat{c}_1$	.7907	.7262	.8127	1.0000	.7262	1.0000
$\hat{c}_2$	.9759	.9443	.8927	.5903	.5903	.9759
$\hat{c}_3$	.8316	.8028	.7671	.9186	.7671	.9186
$\hat{c}_4$	.9522	.9836	.9982	.9869	.9522	.9982
$\hat{c}_5$	.9284	.8353	.9091	.9307	.8353	.9307
$\hat{c}_6$	.9298	.9305	.8601	.9248	.8601	.9305
$\hat{c}_7$	.9330	.9712	.9436	.9372	.9330	.9712
$\hat{c}_8$	.9307	.9610	.9724	.9634	.9307	.9724
$\hat{c}_9$	.8376	.8771	.8831	.8813	.8376	.8831
$\hat{c}_{10}$	.5927	.5864	.6217	.6862	.5864	.6862
$\hat{c}_{11}$	.9150	.8561	.8732	.8603	.8561	.9150
$\hat{c}_{12}$	.8736	.8879	.9155	.9272	.8736	.9272
$\hat{c}_{13}$	.7262	.7207	.8275	.7827	.7207	.8275
$\hat{c}_{14}$	.7335	.6581	.6505	.6862	.6505	.7335
$\hat{c}_{15}$	.6026	.4909	.4242	.5903	.4242	.6026
$\hat{c}_{16}$	.7335	.6544	.6611	.7095	.6544	.7335
$\hat{c}_{17}$	.9682	.9506	.9573	.9098	.9098	.9682
$\hat{c}_{18}$	.8573	.8611	.8604	.8710	.8573	.8710
$\hat{c}_{19}$	.9885	.9722	.9592	.9354	.9354	.9885
$\hat{c}_{20}$	.9856	.9663	.9513	.9272	.9272	.9856
$\hat{c}_{21}$	.6634	.7342	.8304	.9801	.6634	.9801
$\hat{c}_{22}$	.9878	.9979	.9911	.9869	.9869	.9979
$\hat{c}_{23}$	.9743	.9469	.9391	.9512	.9391	.9743
$\hat{c}_{24}$	.5858	.4424	.3636	.0000	.0000	.5858
$\hat{c}_{25}$	.6150	.6432	.5743	.6283	.5743	.6432
$\hat{c}_{26}$	.7834	.8510	.9133	.9935	.7834	.9935
$\hat{c}_{27}$	.9819	.9663	.9412	.9660	.9412	.9819
$\hat{c}_{28}$	.9465	.9111	.9199	.9587	.9111	.9587
					Del Min .0000	
					Del Max	1.0000

Substitute all the values, GRC as follows table 7, Where ρ = 0.5 ,

$$min\ j\ \ min\ k\ \left|\hat{X}_0(k) - \hat{X}_j(k)\right| = 0.0000\ , \qquad max\ j\ \ max\ k\ \left|\hat{X}_0(k) - \hat{X}_j(k)\right| = 1.0000$$

Step:8 & 9 GRG & Ranking

Substitute all the values, GRG as shown in the given below table 7. As well as calculate Rank Criteria Individual Level (CIL)and Criteria within Dimension level (CDL).

Table:7 Calculation of GRC, GRG & Ranking

S.No	Criteria	$GRC\ x_1$	$GRC\ x_2$	$GRC\ x_3$	$GRC\ x_4$	GRG	Rank (CIL)	Rank (CDL)
1	$\hat{c}_1$	.3874	.4078	.3809	.3333	.3923	9	1
	$\hat{c}_2$	.3388	.3462	.3590	.4586	.3904	11	3
	$\hat{c}_3$	.3755	.3838	.3946	.3525	.3918	10	2
	$\hat{c}_4$	.3443	.3370	.3337	.3363	.3511	27	4
2	$\hat{c}_5$	.3500	.3744	.3548	.3495	.3713	16	1
	$\hat{c}_6$	.3497	.3495	.3676	.3509	.3687	18	2
	$\hat{c}_7$	.3489	.3399	.3464	.3479	.3594	20	3
	$\hat{c}_8$	.3495	.3422	.3396	.3417	.3567	24	4
3	$\hat{c}_9$	.3738	.3631	.3615	.3620	.3794	13	2
	$\hat{c}_{10}$	.4576	.4602	.4458	.4215	.4638	4	1
	$\hat{c}_{11}$	.3534	.3687	.3641	.3676	.3779	14	3
	$\hat{c}_{12}$	.3640	.3603	.3532	.3503	.3709	17	4
4	$\hat{c}_{13}$	.4078	.4096	.3766	.3898	.4112	7	4
	$\hat{c}_{14}$	.4054	.4318	.4346	.4215	.4404	5	2
	$\hat{c}_{15}$	.4535	.5046	.5410	.4586	.5100	2	1
	$\hat{c}_{16}$	.4054	.4331	.4306	.4134	.4375	6	3
5	$\hat{c}_{17}$	.3406	.3447	.3431	.3547	.3594	21	2
	$\hat{c}_{18}$	.3684	.3674	.3675	.3647	.3815	12	1
	$\hat{c}_{19}$	.3359	.3396	.3426	.3483	.3552	26	4
	$\hat{c}_{20}$	.3366	.3410	.3445	.3503	.3567	23	3
6	$\hat{c}_{21}$	.4298	.4051	.3758	.3378	.4019	8	2
	$\hat{c}_{22}$	.3361	.3338	.3353	.3363	.3486	28	4
	$\hat{c}_{23}$	.3391	.3456	.3474	.3445	.3579	22	3
	$\hat{c}_{24}$	.4605	.5306	.5790	1.0000	.6678	1	1
7	$\hat{c}_{25}$	.4484	.4374	.4654	.4431	.4666	3	1
	$\hat{c}_{26}$	.3896	.3701	.3538	.3348	.3760	15	2
	$\hat{c}_{27}$	.3374	.3410	.3469	.3411	.3552	25	4
	$\hat{c}_{28}$	.3457	.3543	.3521	.3428	.3626	19	3

5. Results and Discussion

In the proposed research, an overview is provided by compiling 28 Criteria and categorizing them into 7 Dimensions, which serve as the foundational elements of the educational system in pandemic scenarios. Seven criteria have been identified as the strongest standards for the educational system during the pandemic situation. It suggests that policy makers need to develop a strategy for offering psychological training to students. we discovered that seven criteria are weaker in the pandemic scenario The figure 1 depicts them.

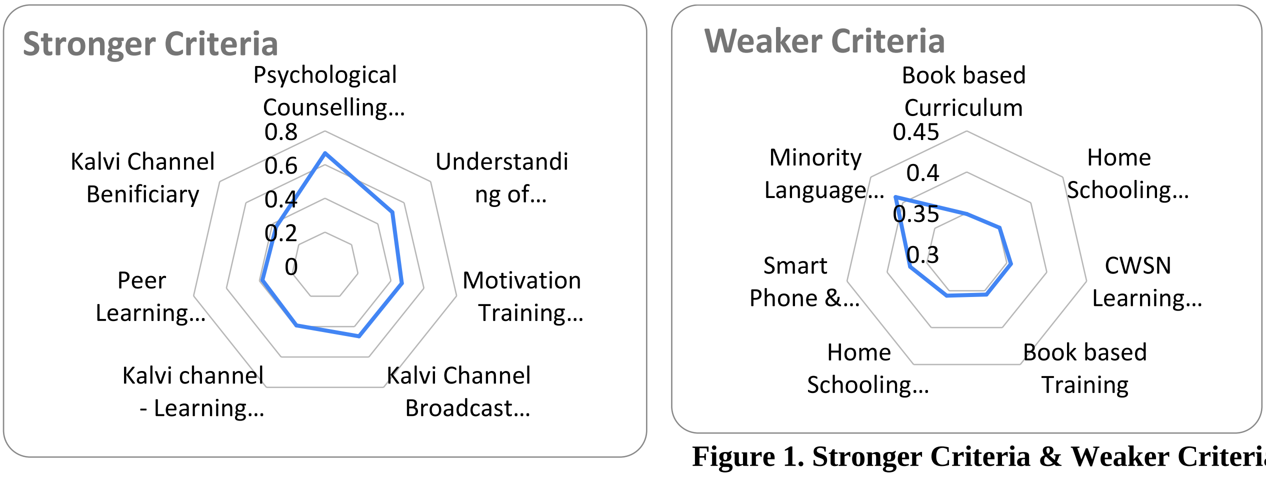

Figure 1. Stronger Criteria & Weaker Criteria

There is a learning gap among the students in a covid scenario. These GRA analytical methods are helpful in discovering the challenges facing the schooling system during a pandemic. The barriers to meeting the Criteria at each level of dimension are depicted in the Figure 2 indicated are the barriers created by the Criteria at each level of the dimension. This Grey Relational Analysis (GRA) approaches with weighted intuitionistic fuzzy entropy included several phases for locating obstacles as well as Strong and Weak criteria. This is a novel method finding Strong and Weak criteria.

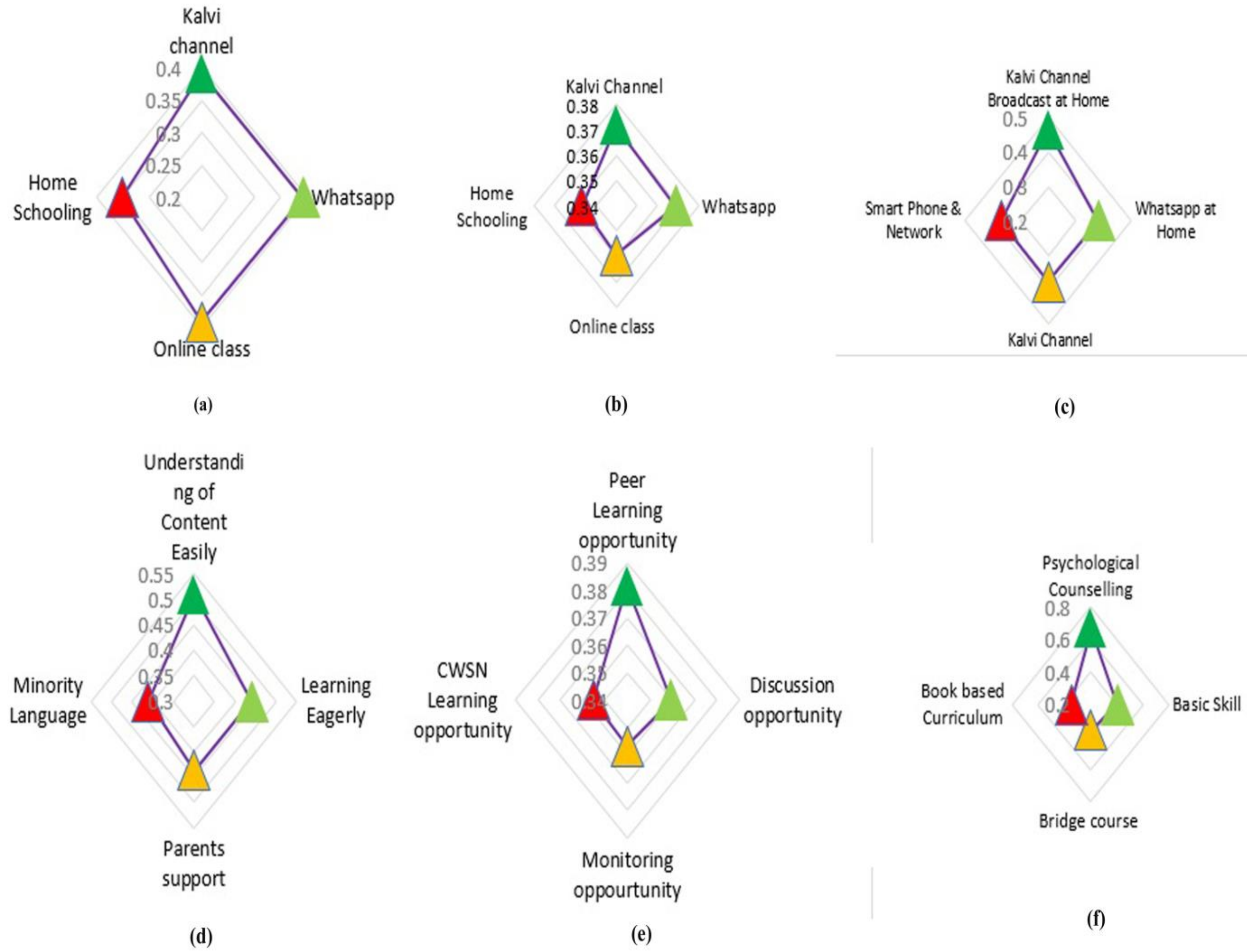

Figure 2 Obstacles of Learning Mode

5. Conclusion

The suggested MCTM under IF is presented in this work. There are no suitable methods available to evaluate each criterion separately and at the level of the dimension. The need for a new evaluation model to analyses criteria is driven by this gap. This blends grey relational analysis (GRA) approaches with weighted intuitionistic fuzzy entropy included several phases for locating obstacles as well as Strong and Weak criteria. The difficulties will be easier to find using Grey relational analysis. The policy makers will find this model useful in assessing the system. Seven characteristics are noted in the suggested research as being weaker criteria. The system will perform better if the weaker criteria are improved. The respondents' minds significantly contributed to the outcome in this case. To assess criteria, a variety of weighting strategies might be used. Governance and Corporate are advised to use the suggested approach.

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