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*Research article*

# Disaster decision-making with a mixing regret philosophy DDAS method in Fermatean fuzzy number

**Aliya Fahmi[1,*], Rehan Ahmed[2], Muhammad Aslam[3], Thabet Abdeljawad[4,5,*] and Aziz Khan[4]**

[1] Department of Mathematics, Department of mathematics, University of Faisalabad, Faisalabad
[2] Department of Meteorology, COMSATS University, Islamabad, Pakistan
[3] Department of Mathematics, College of Sciences, Khalid University Abha, Saudi Arabia
[4] Department of Mathematics and Sciences, Prince Sultan University, P.O. Box 66833, 11586 Riyadh, Saudi Arabia
[5] Department of Medical Research, China Medical University, Taichung 40402, Taiwan

* **Correspondence:** Email: aliya.fahmi@tuf.edu.pk, tabdeljawad@psu.edu.sa; Tel: +923155485678.

**Abstract:** In this paper, the use of the Fermatean fuzzy number (FFN) in a significant research problem of disaster decision-making by defining operational laws and score function is demonstrated. Generally, decision control authorities need to brand suitable and sensible disaster decisions in the direct conceivable period as unfitting decisions may consequence in enormous financial dead and thoughtful communal costs. To certify that a disaster comeback can be made, professionally, we propose a new disaster decision-making (DDM) technique by the Fermatean fuzzy Schweizer-Sklar environment. First, the Fermatean fuzzy Schweizer-Sklar operators are employed by decision-makers to rapidly analyze their indefinite and vague assessment information on disaster choices. Then, the DDM technique based on the FFN is planned to identify highly devastating disaster choices and the best available choices. Finally, the proposed regret philosophy DDM technique is shown functional to choose the ideal retort explanation for a communal fitness disaster in Pakistan. The dominance and realism of the intended technique are further defensible through a relative study with additional DDM systems.

**Keywords:** disaster decision making; aggregation operators; Fermatean fuzzy number
**Mathematics Subject Classification:** 03B52, 03E72

## 1. Introduction

Ding et al. [1] recommended resolving the group emergency decision-making (GEDM) complications in the setting of hesitant triangular fuzzy sets. Batool et al. [2] employed Evaluation Distance Average Solution (EDAS) technique based on Pythagorean probabilistic hesitant fuzzy data. Hou et al. [3] defined creative and powerful countries, organizations, and investigators. The COVID-19 commotion harshly limited the development of concerning conventional economy and bluff the permanency concerning class [4]. Rong et al. [5] introduced the enterprise of an original decision practice. Li et al. [6] defined zero competition to ensure abundant more effective responses in truthful cases. The means over action along with a fortuitousness event, insufficient decision records, and constricted time straining to redact that firm for assortment creators in simulated execution realistic and productive excellence under an erratic decision environment has been also focused on [7,8]. Sun et al. [9] introduced complete sets. Liu et al. [10] proposed the gain of the attribute weights.

Zhang et al. [11] found the unlike Pythagorean fuzzy TOPSIS organizations in agreement with the multi-attribute decision-making difficulties. Ding et al. [12] introduced rank extra resolutions. Normally, prime makers incline to the artificial usage of linguistic phrases affording unconditional sentiments concerning age pressure or shortage of data [13–15]. Herrera et al. [16] introduced how to signify any data gotten in an aggregation process. Liu et al. [17] introduced the original Failure Mode and Effect Analysis (FMEA) attitude uniting interval 2-tuple linguistic variables with gray interpersonal examination to imprisonment FMEA team members of the efficiency of the traditional FMEA. Liu et al. [18] proposed the objective weights of risk issues in the risk position process. Zhang et al. [19] proposed the TODIM technique founded on Cumulative Prospect Theory (CPT) for multiple attribute group decision-making with 2TLPFSs. Labella et al. [20] proposed the 2-tuple Best-Worst method (BWM) to decrease the number of pairwise contrasts in Multi-Criteria Group Decision-Making (MCGDM) difficulties and perfect the indecision related through them to achieve precise calculations and get interpretable outcomes.

Wang et al. [21] defined categorizing DMs into some subcategories to order more competently the great quantity of DMs. Wang et al. [22] claimed that their proposed technique outstrips other existing state-of-the-art methods. Faizi et al. [23] proposed the intuitionistic 2-tuple linguistic Hamacher weighted average, and the intuitionistic 2-tuple linguistic Hamacher weighted geometric operators. Besides, imperfect research bears perform counting the modified solitary semantics issue founded on the 2-tuple linguistic mannequin [24–26]. Abdullah et al. [27] as inclusion over the 2-tuple linguistic approach, then presented spherical fuzzy sets [28]. The 2-tuple spherical linguistic technique, as is considered by the method of linguistic optimistic; unbiased, yet dreadful membership grades perform efficaciously, evade any opening concerning statistics as formerly happened all finished linguistic facts processing. It is more elastic or faithful because each arithmetical, yet linguistic data are completed planning [29].

Stability, usually the decision of the greatest suitable report rendering to a chance contest be able to attitude distributed with so an additional than one criteria choice construction technique [30,31]. Thus, Multi-criteria decision-making (MCDM) plans are high-quality gears [14,32,33]. Idea of considering psychological performances of assortment makers was delivered via Loomes and Sugden [34]. To detention then counting assortment makers' psychological performances idea was delivered via Loomes and Sugden [34]. Since then, the guilt idea has varied lengthways with many MCDM approaches since of better decision making, which includes the wanted assessment enterprise technique since of bonanza contrast [35], the TODIM [36], and then the multi-attributive border approximation location evaluation [37]. In addition, the contrast-based completely on the choice from the common solution technique put on frontward via Ghorabaee et al. [38], is an instant MCDM technique. The most valuable alternative is demarcated with bigger values concerning operative distances than lower ideals regarding underprivileged distances. When related laterally with vile MCDM systems, due to the fact it solely needs rendering to compute the foretold function beside the regular solution [39,40]. Owing to ensuring its welfare, a lot regarding practical decision-making issues, such as abundant stock organization [41], sustainable working presentation assessment [42], renewable power backing assessment [43], then excellence purpose expansion [44].

Hardiness trusts the consecrations of the pair choice-making methods, it is of great rank to understand an addition about the regret philosophy approach because of decisive urgencies regarding chance assortments between DDM. Besides the examination above, the meaning concerning this instruction is to develop a remorseful idea DDAS method inside the environs of FFNs for the treatment of DDM problems. First, the FFNs are devoted in mock supervising decision makers' dark then unsure contrast truths on change alternatives. Second, the gratitude of the normal finished inter-criteria relation technique is adopted since of the determination of impartial criteria weights. Third, a built-in method uniting the feel apologetic around code with the regret philosophy technique is proposed since of assessment of extra alternatives then causal the maximum superiority convinced for DDM. At last, an experimental case regarding COVID-19 as correctly as much a relative appraisal collected with existing DDM strategies are familiarized for modifying efficacy and pre-eminence concerning our projected repentant about the theory-DDAS method.

The remainder of its demands bill is structured as follows. In Section 2, the fundamental principles regarding the FFS and being apologetic about the concept are presented. In Section 3, the frame regarding the integrated regret philosophy DDAS approach is added because of resolving DDM problems. Section IV affords a realistic example and a comparative presentation for authenticating the proposed novel DDM model. Section 5 ends it paper together with conclusions and instructions because after research. The MCDM technique is below in Figure 1 and network Figure 2.

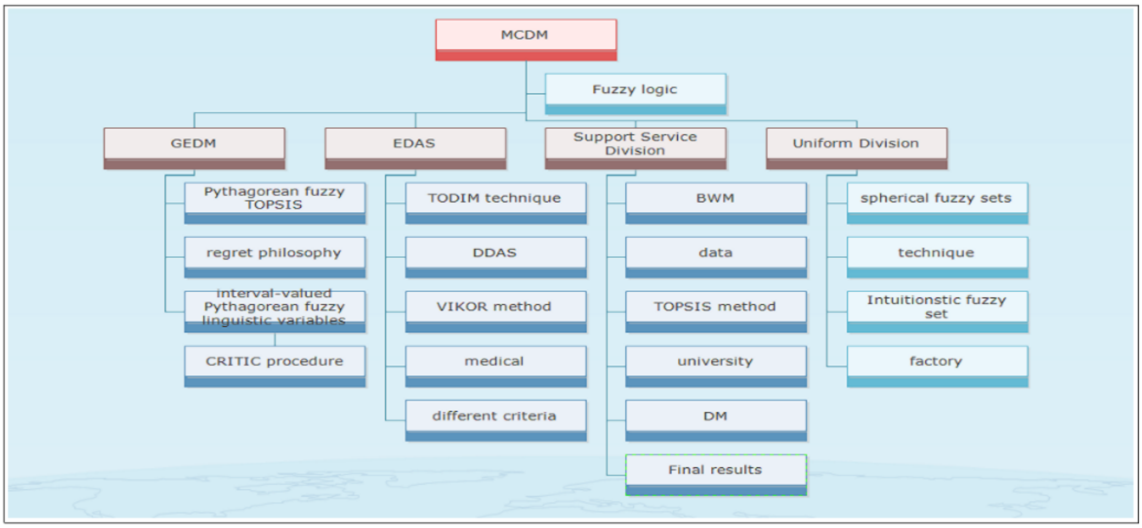


**Figure 1.** MCDM technique.

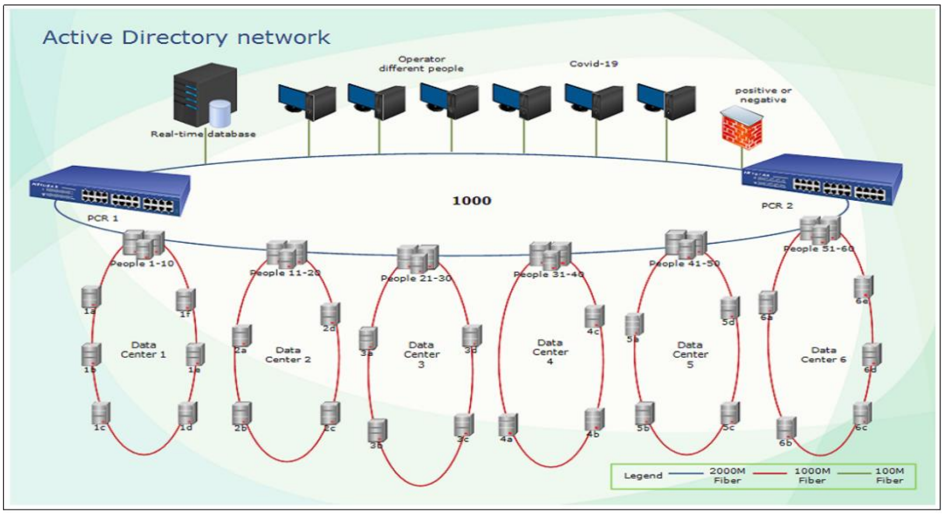


**Figure 2.** Different networks.

*1.1. Literature review*

Durability over the preceding periods has been focussed on by a variety of MCDM strategies utilized because of the ordering regarding affluence selections of DDM. For example, Yu Lai [45] proposed a distance-based model in simulated speaking multi-criteria collection emergency decision-making difficulties. Ju and Wang [46] proposed a method about joining Dempster-Shafer theory with the method for correcting favorites using mill in conventionality with an ideal answer in conformism with seeing a coincidence substitute decision difficulty composed with incomplete data. Ju et al. [47] put to foremost a minimum uniting logical public method, decision-making exam or assessment laboratory system, then 2-tuple linguistic TOPSIS technique because of spare alternative contrast or assortment. In [48], a separate conflict-eliminating model was used to promote because of emergency decision-making (EDM), into which the informal preservative weight method was once matured to agree to the good fortuitousness alternate. Besides, Liu et al. [49] presented a system mainly based on the accretive assessment idea for threat decision structure discerning optimal creators' inner manner of chance response. Xu et al. [50] notified a significant staff tactic since threat energetic EDM is based perfectly on the accretive side theory. Wang et al. [51] gave a vision theory constructed end compelling communication factor slant to unraveling the calamity alternative disparity yet decision problem, then Wang et al. [30] proposed a psychosomatic demeanor of the group decision process. In [52], linear encoding perfect was once intended since of exact change positions.

Permanently more or more investigators joined dark theories with MCDM strategies to contract with the nebulosity and hesitation histories between coincidence problems. For illustration, the 2-dimension uncertain linguistic variables have been integral counting sight idea then VIKOR [14]. The interval-valued Pythagorean fuzzy linguistic variables were primeval to increase the vision idea [12]. The weighted distance-based estimate, combinative distance-based valuation, and agreement dimension were proposed within [53]. Sun [31] combined the even incomprehensible uneven components with the TOPSIS technique to estimate unintended tactics because of unusual alternative proceedings.

H. Li and M. Yazdi [59] introduced the approaches, Case Studies, and Multi-criteria decision-making. M. Yazdi [60] introduced the analysis the system safety. M. Yazdi [61] introduced the safety and reliability analysis, conventional safety and reliability assessment techniques like fault tree analysis have been widely used in this regard; however, in the practical knowledge acquisition process, domain experts tend to express their judgments using multi-granularity linguistic terms sets, and there usually exists uncertain and incomplete information since expert knowledge, although the technical capabilities of expert systems based on fuzzy set theory are expanding.

M. Akram et al. [62] introduced the Fermatean fuzzy soft expert knowledge. M. Akram et al. [63] introduction complex Fermatean fuzzy N-soft sets. G. Shahzadi et al. [64] introduced the extended MOORA method based on Fermatean fuzzy information. M. Akram et al [65] introduced the objective functions that should be maximized. M. Akram et al. [66] introduced the concept of fuzzy fractional calculus facts and relationships. M. Akram et al. [67] introduced managing multiple attribute group decision-making (MAGDM) issues. M. Akram et al. [68] provided an algorithm for multi-criteria group decision-making whose productiveness and authenticity. M. Akram et al. [69] introduced the theoretical standpoint, we demonstrate some essential properties and define operations for this setting. J. C. R. Alcantud et al. [70] produce the first algorithms for multi-agent decisions based on N-soft sets. The Table 1 is present in fuzzy number and define given below.

**Table 1.** Fuzzy number.

| Terms | Fuzzy Number |
|---|---|
| Strongly important | 2 |
| Absolutely unimportant | 3 |
| Weakly unimportant | 5 |
| Weakly important | 7 |
| Very Strongly important | 9 |

The work observation upstairs designates that contemporary investigation about DDM grips complete considerable charities to fortuitousness management underneath the intricate and indeterminate excellent situation. On the one hand, separate unclear philosophies grip been working in simulated detention and portray the hairiness or doubtfulness of extra analyses collected from nearby decision-makers. Although these uncertain methods bear imperfect appropriate belongings in commerce with uncertain assortment creation data, even though current situations where complex valuations cannot be represented sufficiently and record disruption within the knowledge technique cannot be resolved well. On the nasty hand, many MCDM policies bear been used then prolonged ensuing management with detailed varieties of fortuitousness measures. To the promising regarding our data, however, the DDAS, specifically a vigorous and relaxed MCDM process, has nowadays assorted counting sensitivity remorseful about concept because undertaking DDM complications. To connect these breaks, the aim regarding its bill is to advise a new approach via integrating the regret principle with the DDAS procedure for DDM lower the FF situation. In calculation, the CRITIC procedure is stretched and employed resulting choose the weights of ideals accurately mostly based on the charge archives regarding coincidental proceedings.

### *1.2. Novelty*

In this article, we mark an effort to integrate and speech the following ideas:

(i) To describe innovative operational law for Fermatean fuzzy data, which is a valuable complement

of standing operational law, and examine their arithmetical possessions.
(ii) To define the regret theory.
(iii) To present a new regret philosophy skill DDM assortment problem; a proposed DDM method.
(iv) FF-AHP-SST case history on regret philosophy.
(v) To demonstrate the proposed method, we have solved a numerical problem based on a real-life problem.
(vi) A sensitivity analysis is performed to show the utility and efficiency of the designed method.

### *1.3. Contributions*

This research has contributed to the exploration of MCGDM under uncertainty in the following aspects:

The FF is introducing FS as a new generalization in FS theory to tackle the complexities in numerical data by FFN.

The disaster decision-making technique is proposed by the integration of the Fermatean fuzzy Schweizer-Sklar environment.

A MCGDM innovation for the regret philosophy skill DDM assortment problem is established.

An assessment framework of the blockchain selection scheme using the proposed MCGDM innovation is constructed. The essential innovations of this object associated with the current blockchain evaluative standards and approaches container be drawn as surveys.

A sequence of regular standards is created to choose the appropriate DDM in Pakistan for main sets.

## 2. Preliminaries

**Definition 2.1.** *Let us consider:* $\Phi \neq X$ *. By a fuzzy set* $\gamma$ *we mean the set* $\left\{ \begin{matrix} \left\langle x, \mu_{\gamma(x)} \right\rangle \\ : x \in X \end{matrix} \right\}$, *is a mapping from* $X$ *to* $[0,1]$ *representing membership function of an element* $x$ *in* $X$ *.*
*The Fermatean fuzzy set is used in different technique Figure 3.*

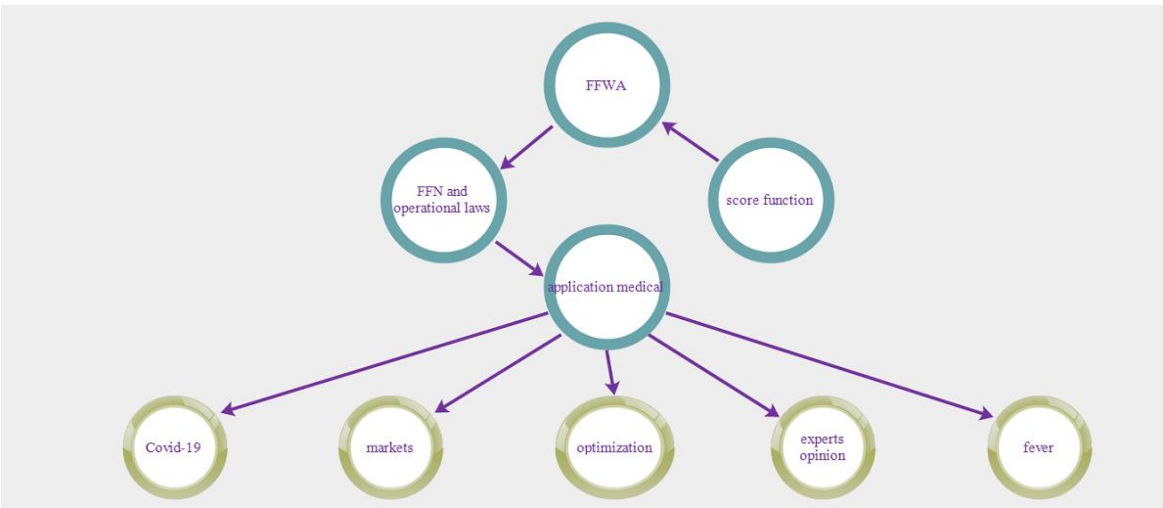


**Figure 3.** History of FFN.

*2.1. FFN and operational laws*

**Definition 2.1.1.** *With the fixed set* $C$, *the FFN* $A$ *is defined as* $A=\left\{\begin{matrix}\langle\varsigma_A(x),\\ \chi_A(x)\rangle\\ :\ x\in C\end{matrix}\right\}$, *where* $\varsigma_A(x)$ *and* $\chi_A(x)$ *represent the MED and NOMED, and* $\varsigma_A(x)\in[0,1]$ , $\chi_A(x)\in[0,1]$ *and* $0\le\varsigma_A(x)^3+\chi_A(x)^3\le 1.$ *The degree of indeterminacy is defined as* $\pi_A(x)=\sqrt[3]{(\varsigma_A(x)^3+\chi_A(x)^3-\varsigma_A(x)^3\chi_A(x)^3)}.$ *The FFN is denoted as* $A=\langle\varsigma_A,\chi_A\rangle.$

**Definition 2.1.2.** *Let* $a_1=\{\varsigma_1,\chi_1\}$ *and* $a_2=\{\varsigma_2,\chi_2\}$ *be two FFNs,* $\lambda>0$, *then*

$$a_1\oplus a_2=\left[\sqrt[3]{(\varsigma_1^3+\varsigma_2^3-\varsigma_1^3\varsigma_2^3)},\chi_1\chi_2\right];$$

$$a_1\otimes a_2=\left[\varsigma_1\varsigma_2,\sqrt[3]{(\chi_1^3+\chi_2^3-\chi_1^3\chi_2^3)}\right];$$

$$\lambda a_1=\left[\sqrt[3]{1-(1-\varsigma_1^3)^\lambda},\chi_1^\lambda\right];$$

$$a_1^\lambda=\left[\varsigma_1^\lambda,\sqrt[3]{1-(1-\chi_1^3)^\lambda}\right].$$

**Definition 2.1.3.** *Let* $a=\{\varsigma,\chi\}$ *be the FFNs, then the score function is* $a=\varsigma_\alpha^3-\chi_\alpha^3.$

**Definition 2.1.4.** *Let* $a=\{\varsigma,\chi\}$ *be the FFNs, then the accuracy function is* $a=\varsigma_\alpha^3+\chi_\alpha^3.$

**Definition 2.1.5.** *The gathering of FFNs are* $c_j=\{\varsigma,\chi\}$ *and the weight vector is* $\gamma=(\gamma_1,\gamma_2,...,\gamma_n)^T$ *with* $\gamma_j\in[0,1]$ *and* $\sum_{j=1}^n\gamma_j=1$. *Then FFWA* $(c_1,c_2,...,c_n)=\oplus_{j=1}^n\gamma_jc_j$ *is said FFWA operator.*

**Theorem 2.1.6.** *The collection of FFNs is* $a_j=\{\varsigma,\chi\}$ *and the weight vector is* $\gamma=(\gamma_1,\gamma_2,...,\gamma_n)^T$ *with* $\gamma_j\in[0,1]$ *and* $\sum_{j=1}^n\gamma_j=1.$ *Then it is said FFWA operator and*

$$\text{FFWA}(a_1,a_2,...,a_n)=\left[\sqrt[3]{1-\prod_{j=1}^n(1-\varsigma_j^3)^{\gamma_j}},\prod_{j=1}^n\chi_j^{\gamma_j}\right].$$

**Definition 2.1.7.** *The gathering of FFNs are* $d_j=\{\varsigma,\chi\}$ *and the weight vector is* $\gamma=(\gamma_1,\gamma_2,...,\gamma_n)^T$ *with* $\gamma_j\in[0,1]$ *and* $\sum_{j=1}^n\gamma_j=1.$ *Then FFWG* $(d_1,d_2,...,d_n)=\oplus_{j=1}^n d_j^{\gamma_j}$ *is said FFWG operator.*

**Theorem 2.1.8.** *The collections of FFNs are* $a_j=\{\varsigma,\chi\}$ *and the weight vector is* $\lambda=(\lambda_1,\lambda_2,...,\lambda_n)^T$ *with* $\lambda_j\in[0,1]$ *and* $\sum_{j=1}^n\lambda_j=1.$ *Then it is said FFWG operator and*

$$\text{FFWG}(a_1,a_2,...,a_n)=\left[\prod_{j=1}^n\varsigma_j^{\lambda_j},\sqrt[3]{1-\prod_{j=1}^n(1-\chi_j^3)^{\lambda_j}}\right].$$

*2.2. Regret philosophy*

The regret theory [34] is a behavioural decision philosophy that considers people have restricted prudence. When the particular alternative is inferior to others, decision makers would be composition remorseful for the optimal on the divergent.

**Definition 2.2.1.** *If* $n$ *is the significance of choosing marginal* $N$, *the utility charge resulting from* $N$ *can be calculated by* $t(n)=n^{\theta}$ *where* $\theta(0<\theta<1)$ *presents decision makers' hazard dislike. When a decision maker has a complex grade of peril dislike, the charge of* $\theta$ *should be set smaller.*

**Definition 2.2.2.** *Let* $a_1$ *and* $a_2$ *be the consequences of selecting alternatives* $A_1$ *and* $A_2$, *and the corresponding utility values are* $u(a_1)$ *and* $u(a_2)$, *respectively. Then the regret-rejoice value of selecting* $A_1$ *rather than* $A_2$ *is defined as:* $r(a_1,a_2)=1-e^{-\vartheta(u(a_1)-u(a_2))}$, *where* $\vartheta>0$ *represents decision makers' regret aversion, and* $u(a_1)-u(a_2)\le 0, r(a_1,a_2)$ *is a representative of regret value; otherwise, it denotes rejoice value.*

**Definition 2.2.3.** *Let* $a_i(i=1,2,\cdots,m)$ *be the consequences of selecting* $A_i(i=1,2,\cdots,m)$ *the overall utility value of choosing* $A_i$ *can be calculated by* $v(a_i)=u(a_i)+r(a_i,a^*)$, *here* $a^*=\max_{i=1,2,\ldots m} a_i$ *and* $r(a_i,a^*)\le 0.$

## 3. FF-AHP-SST for regret philosophy procedure selection

This section is offering an original mixture technique joining Analytic Hierarchy Process (AHP) with SST by using FF data to discourse DDM technique provider collection difficulties for main monetary organizations. First, a hierarchical evaluative criteria scheme is constructed in the opinion of the works appraisal and single feature of a DDM technique, which can ration together a great presentation and apparent hazards. Following, the AHP is comprehensive to the FF setting to fast DMs' doubts of the pairwise assessment finished applicable criteria, and the container is consumed to classify the consistent criterion weights of the DDM technique suppliers. Then, the SST system is extended to the FF scenario to increase the general supremacy grades of the suppliers seeing the DMs' risk dislike concerning DDM technology, and the position consequences can rapid both impartial valuations regarding the criteria and DMs' supple personal risk brashness finished the DDM. Therefore, the planned FF-AHP-SST method can widely reflect material topographies of DDM skill and DMs' reasoning and emotional performance and more effectually address the DDM worker collection problem.

*3.1. Regret philosophy skill DDM assortment problem*

DDM selection, as a characteristic MCDM problem, is applied through a collection of decision matrices. Let $A=\{A_1,A_2,\ldots,A_n\}$ represent sure latent DDM providers $PS=\{PS_1,PS_2,\ldots,PS_n\}$ denote significant evaluative criteria delivered by numerous experts $DM=\{DM_1,DM_2,\ldots,DM_n\}$, and the corresponding rank of specialists is denoted $\Delta=(\Delta_1,\Delta_2,\ldots,\Delta_n)^T$ satisfying the environments $\sum_{j=1}^{n}\Delta_j=1.$ Moreover, the rank of the evaluative criteria is represented by $W=(W_1,W_2,\cdots,W_n)^T$, meeting the following situations: $\sum_{j=1}^{n}W_j=1.$ Each component in the decision matrix means the applicable candidate's evaluative assessment on a convinced criterion from the DM.

*3.2. The proposed DDM method*

**Step 1:** Construct the group FF evaluation matrix.

**Step 2:** Describe the Fermatean fuzzy weighted average (FFWA) operator and $\lambda = (\lambda_1, \lambda_2, ..., \lambda_n)$.

$$\text{FFWA}(a_1, a_2, ..., a_n) = \left[ \sqrt[3]{1 - \prod_{j=1}^{n} (1 - \varsigma_j^3)^{\lambda_j}}, \prod_{j=1}^{n} \chi_j^{\lambda_j} \right].$$

**Step 3:** Make the criteria concerning the correlation coefficient matrix

$$r_{jj'} = \frac{\sum_{j=1}^{n} \varsigma_j - \sum_{j=1}^{n} \chi_j}{\sqrt{\sum_{j=1}^{n} (\varsigma_j - \chi_j)^2}}.$$

**Step 4:** Compute the criteria standard assessment. The standard assessment of each criterion $\sigma_j$ $(j = 1, 2, \cdots, n)$ can be computed by

$$\sigma_j = \sqrt{\frac{\sum_{j=1}^{n} \varsigma_j + \sum_{j=1}^{n} \chi_j}{m}}.$$

**Step 5:** Regulate the quantity of data contained in each criterion.

The quantity of data of each criterion $\sigma_j$ is determined by the following formula: $\sigma_j = \sigma_j \sum_{j=1}^{n} (1 + r_j)$.

**Step 6:** Compute the absolute weights of criteria. Based on dissimilar quantity of data between criteria, the weights of criteria are designed by

$$w_j = \frac{\sigma_j}{\sum_{j=1}^{n} \sigma_j}.$$

**Step 7:** Derive the utility matrix of disaster alternatives. $U = [u_{ij}]_{m \times n}$ can be calculated by $u_{ij} = [u_{ij}]^{\theta}$.

**Step 8:** The vector of ideal points is $v_{ij} = u_{ij} + t_{ij}$.

**Step 9:** Acquire the regret matrix $T$ of disaster choices. $T = [t_{ij}]$ is obtained by $t_{ij} = 1 - [u - u^{+}]$.

**Step 10:** Compute the total utility matrix $V$ of disaster choices. $V = [v_{ij}]_{m \times n}$ is constructed as $v_{ij} = u_{ij} + t_{ij}$.

**Step 11:** Acquire the vector of ordinary result by $A = \sum_{j=1}^{n} \frac{v_{ij}}{m}$.

**Step 12:** Create the positive and the negative distance matrices from the ordinary result by

$$v^{+} = \max \frac{(0,(v_{ij} - A_j^{*}))}{A_j^{*}}$$

$$v^{-} = \min \frac{(0,(A_j^{*} - v_{ij}))}{A_j^{*}}.$$

**Step 13:** Compute the disaster choices of the appraisal scores by

$$AS_i = \frac{1}{2}\left[\frac{\sum_{j=1}^{n} w_i v_{ij}^{+}}{\max_{i=1,2,\ldots,m}\left(\sum_{j=1}^{n} w_i v_{ij}^{+}\right)} + \left(1 - \frac{\sum_{j=1}^{n} w_i v_{ij}^{+}}{\max_{i=1,2,\ldots,m}\left(\sum_{j=1}^{n} w_i v_{ij}^{-}\right)}\right)\right].$$

*3.3. FF-AHP-SST case history on regret philosophy*

TE-FOOD is a community-permissioned nourishment traceability system that enables all supply chain participants to blockchain-based farm-to-table and customer trace of the food's data. The Food Chain is a community-permissioned block-chain that lets supply chain performers and patrons uphold chief bulges to disperse traceability data. Clienteles of TE-FOOD consume the suppleness to improve painstaking visions into the nourishment manufacturing's supply chain.

TFD is TE-ERC FOOD's symbolism, which is typically cast off on the ethereal stage. Its assignment is to offer slides in the nourishment supply cable by nursing the items finished the whole source chain (farm, computers or abattoir, distributor, shop) and give those tools to clientele, supply chain companies, and administration activities to study food past and excellence. The TE-FOOD goals are to upsurge customer faith and make contact, get better supply chain information to recover working efficiency, obey spread rubrics, defend their makes from forging, and perform earlier creation memories.

TE-Food system includes dissimilar fields:

Empathy Gears: It comprises 1D/2D barcodes/RFID ear labels, safety closures, and tag stickers. Traceability tackles: It contains a B2B traceability management moveable app, web app, dominant system, outside interfaces, and journalism tools. Trade and customer gears comprise B2C new harvest past vision moveable app, and web app, trade side nourishment antiquity numerical signage gears. Nationwide cattle organization solutions: It contains cattle management and implementation schemes. Farm organization gears: These gears are founded upon the category-specific (Inoculation, nourishing, manures, vegetable defence crops, etc). Food care gears: These gears comprise a Scam organization scheme, Food disorder device gear, and a Meat excellence graphic examination scheme. To classify the following bodily substances (crops, sites, etc), the scheme gears dissimilar documentation resources: malleable closures with QR ciphers, malleable credentials labels with RFID, and paper-based marker labels with QR ciphers).

For traceability, it delivers dissimilar customer requests: A moveable app used by B2B and clients to image documentation resources and appeal/arrive data, a Web App for the client who fixes not use the moveable app to admission the creation history, IoT API for nourishment businesses that allow to syndicate data conventional from the devices and Exposed Border for supply chain businesses who custom software now to lever invention's information's-FOOD suggestions binary execution representations, remote or formal.

In an Isolated application, a scheme is recycled to suggest their doings though in an Official application, establishments, or community government, the scheme is rummage-sale to suggest a collection of businesses (physically or manufacturing group related). TE-FOOD originates with the filled set of gears and requests wanted for the entire supply chain to tool nourishment traceability by endwise working discernibility and procedure switch.

TE-FOOD existence absorbed on nourishment trackability delivers sole answers in the agrarian industry.

It is lone the trackability answer that proposals dissimilar facilities B2B (Business-to-Business), B2C (Business-to-Consumer), and B2A (Business-to-Authorities), helping businesses, customers, and establishments.

It shapes customer faith as they are talented to path the source of the nourishment creation counting all dispensation the creation experienced.

Due to good tracking ability and sensors, the dirty nourishment creation can be isolated at the initial phase before it spreads to the shop, plummeting numerous foodborne diseases.
Controlling forms have an actual view of the nourishment marketplace that assists to recover food care regulatory nursing and implementation.

One of the curb TE-FOOD is that TFD symbolic that innings on the ethereal net have little deal/second (15 TPS) which is comparatively slow. Likewise, TE-FOOD has to express a straight and unintended rivalry from dissimilar contestant’s businesses like AMbrosus, WABI, MOD, and WTC. Also, TE-FOOD consumes big statistics of customers in Hungary and Vietnam, it is stressed to become a contact in the global marketplace.

### *3.4. Numerical application of FF SST method on regret philosophy*

The array of DDM in Pakistan is dedicated to applying investment founded on large statistics. To understand suitable, protected, and real cross-border remittances, the Array of DDM in Pakistan means choosing the best DDM skill, and supplier. A decision group connecting four DMs is shaped to select a suitable supplier from four before-screened suppliers ($PS_1, PS_2, PS_3$ and $PS_4$). The hierarchical evaluative criteria scheme to measures the presence of the blockchain skill providers, which comprises four chief criteria ($GBU_1$: Technical close $GBU_2$: Produce and amenity, $GBU_3$: Economic issue, and $GBU_4$: Safety jeopardy). To source passable flexibility inside the assessment of the standards of the four criteria of each optional manufacturing, rulers are allowable to exploit FFNs.

The Figure 4 present block chain and write given below.

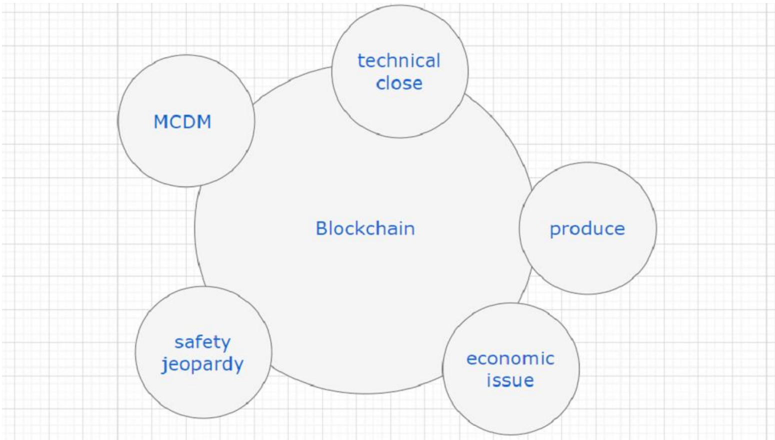


**Figure 4.** Blockchain of hierarchical evaluative.

The assessment comes round of the four pros are wholly chronicled confidential the captivating after four cross units.

**Step 1:** Construct the group FF evaluation matrix in Tables 2 and 3.

**Table 2.** FF expert matrix.

| | $GBU_1$ | $GBU_2$ | $GBU_3$ | $GBU_4$ |
|---|---|---|---|---|
| $PS_1$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.15,\\0.17\end{bmatrix}$ | $\begin{bmatrix}0.24,\\0.28\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.31\end{bmatrix}$ |
| $PS_2$ | $\begin{bmatrix}0.24,\\0.28\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.24,\\0.28\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ |
| $PS_3$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.5,\\0.9\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.105,\\0.109\end{bmatrix}$ |
| $PS_4$ | $\begin{bmatrix}0.5,\\0.9\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.44,\\0.55\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ |

FF evaluation matrix in Table 3.

**Table 3.** FF expert matrix.

| | $GBU_1$ | $GBU_2$ | $GBU_3$ | $GBU_4$ |
|---|---|---|---|---|
| $PS_1$ | $\begin{bmatrix}0.001,\\0.003\end{bmatrix}$ | $\begin{bmatrix}0.02,\\0.03\end{bmatrix}$ | $\begin{bmatrix}0.0024,\\0.0028\end{bmatrix}$ | $\begin{bmatrix}0.3,\\0.5\end{bmatrix}$ |
| $PS_2$ | $\begin{bmatrix}0.5,\\0.8\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.3,\\0.5\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ |
| $PS_3$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.3,\\0.5\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.2,\\0.7\end{bmatrix}$ |
| $PS_4$ | $\begin{bmatrix}0.3,\\0.5\end{bmatrix}$ | $\begin{bmatrix}0.5,\\0.8\end{bmatrix}$ | $\begin{bmatrix}0.05,\\0.08\end{bmatrix}$ | $\begin{bmatrix}0.01,\\0.03\end{bmatrix}$ |

**Step 2:** Define the FFWA operator and $\xi = (0.23, 0.24, 0.25, 0.28)$.

FFWA operator in Table 4.

**Table 4.** FFWA operator.

| | $GBU_1$ | $GBU_2$ | $GBU_3$ | $GBU_4$ |
|---|---|---|---|---|
| $PS_1$ | $\begin{bmatrix} 0.3600, \\ 0.1644 \end{bmatrix}$ | $\begin{bmatrix} 0.0016, \\ 0.2969 \end{bmatrix}$ | $\begin{bmatrix} 0.0001, \\ 0.1931 \end{bmatrix}$ | $\begin{bmatrix} 0.3194, \\ 0.6512 \end{bmatrix}$ |
| $PS_2$ | $\begin{bmatrix} 0.9399, \\ 0.6983 \end{bmatrix}$ | $\begin{bmatrix} 0.0056, \\ 0.3755 \end{bmatrix}$ | $\begin{bmatrix} 0.3359, \\ 0.6238 \end{bmatrix}$ | $\begin{bmatrix} 0.0056, \\ 0.3755 \end{bmatrix}$ |
| $PS_3$ | $\begin{bmatrix} 0.0061, \\ 0.3605 \end{bmatrix}$ | $\begin{bmatrix} 0.3664, \\ 0.8190 \end{bmatrix}$ | $\begin{bmatrix} 0.0061, \\ 0.3605 \end{bmatrix}$ | $\begin{bmatrix} 0.0778, \\ 0.5255 \end{bmatrix}$ |
| $PS_4$ | $\begin{bmatrix} 0.4105, \\ 0.7996 \end{bmatrix}$ | $\begin{bmatrix} 0.9645, \\ 0.5306 \end{bmatrix}$ | $\begin{bmatrix} 0.0046, \\ 0.4170 \end{bmatrix}$ | $\begin{bmatrix} 0.0025, \\ 0.2115 \end{bmatrix}$ |

**Step 3:** Make the criteria concerning the correlation coefficient matrix.
Correlation coefficient matrix in Table 5.

**Table 5.** Correlation coefficient matrix.

| Criteria | $CD_1$ | $CD_2$ | $CD_3$ | $CD_4$ |
|---|---|---|---|---|
| $CD_1$ | –0.1 | –0.1 | –0.1 | –0.1 |
| $CD_2$ | –0.86 | –0.86 | –0.86 | –0.86 |
| $CD_3$ | –0.96 | –0.96 | –0.96 | –0.96 |
| $CD_4$ | –0.34 | –0.34 | –0.34 | –0.34 |

**Step 4:** Compute the criteria standard assessment. The standard assessment of each criterion $\sigma_j$ $(j = 1, 2, \cdots, n)$ can be computed by $\sigma_1 = 1.0037, \sigma_2 = 1.3435, \sigma_3 = 0.9862, \sigma_4 = 1.3681.$

**Step 5:** Regulate the quantity of data contained in each criterion.
The quantity of data of each criterion $\sigma_j$ is defined by the following formula:

$$\sigma_1 = 8.7336, \sigma_2 = 11.6904, \sigma_3 = 8.5814, \sigma_4 = 11.9045.$$

**Step 6:** Compute the absolute weights of criteria, dissimilar quantity of data between criteria and the weights of criteria are denoted by $w_1 = 0.2134, w_2 = 0.2857, w_3 = 0.2097, w_4 = 0.2909.$

**Step 7:** Derive the utility matrix of disaster alternatives.
Utility matrix of disaster alternatives in Table 6.

**Table 6.** Utility matrix.

| $CD_1$ | $CD_2$ | $CD_3$ | $CD_4$ |
|---|---|---|---|
| 2.4 | -0.1123 | 0.2101 | 2.24 |
| 3.5 | 0.1234 | 0.098 | 2.45 |
| 1.4 | 0.4567 | 0.0034 | 2.21 |
| 1.8 | 0.3033 | 1.7 | 4.34 |

**Step 8:** The vectors of ideal points are given in

$$v_1 = 0.2234, v_2 = 0.0123, v_3 = 0.0187, v_4 = 0.4534.$$

**Step 9:** Acquire the regret matrix of disaster choices regret matrix of disaster choices in Table 7.

**Table 7.** Regret matrix of disaster choices.

| $CD_1$ | $CD_2$ | $CD_3$ | $CD_4$ |
|---|---|---|---|
| 2.9 | 0.1001 | 0.2012 | 2.28 |
| 3.8 | 0.1201 | 0.001 | 2.49 |
| 1.2 | 0.4012 | 0.0029 | 2.34 |
| 2.8 | 0.3035 | 1.9 | 4.88 |

**Step 10:** Compute the total utility matrix of disaster choices.
Total utility matrix in Table 8.

**Table 8.** Total utility matrix.

| $C_1$ | $C_2$ | $C_3$ | $C_4$ |
|---|---|---|---|
| 0.11 | 0.2345 | 0.2 | 2.4567 |
| 0.13 | 0.6756 | 0.009 | 0.1865 |
| 0.6 | 0.1127 | 0.008 | 11.23 |
| 2.806 | 0.4577 | 1.008 | 0.6534 |

**Step 11:** Acquire the vector of ordinary result:

$$A_1 = 0.0123, A_2 = 0.1267, A_3 = 0.4567, A_4 = 0.5678.$$

**Step 12:** Create the positive and the negative distance matrices from the ordinary result.
Positive distance in Table 9.

**Table 9.** Positive distance.

| $CD_1$ | $CD_2$ | $CD_3$ | $CD_4$ |
|---|---|---|---|
| 0.0091 | 0.2111 | 0.3412 | 0.316 |
| 0.0013 | 0.6012 | 0.0129 | 0.1114 |
| 0.0125 | 0.1012 | 0.0001 | 0.1103 |
| 0.0712 | 0.4265 | 0.0018 | 0.6006 |

Negative distance in Table 10.

**Table 10.** Negative distance.

| $CD_1$ | $CD_2$ | $CD_3$ | $CD_4$ |
|---|---|---|---|
| 0.1034 | 0.2005 | 0.1232 | 0.3156 |
| 0.5678 | 0.6125 | 0.0769 | 0.1664 |
| 0.0912 | 0.1109 | 0.0098 | 0.1773 |
| 0.8789 | 0.4123 | 1.0098 | 0.8706 |

**Step 13:** Compute the emergency choices of the appraisal scores $AS_1 = 0.0567, AS_2 = 0.0456, AS_3 = 0.2345, AS_4 = 0.6789.$

*3.5. Sensitivity analysis*

In this subsection, a sensitivity analysis is supported available to discover the effect of criteria weights on the ranking of disaster choices. In the sensitivity analysis, four cases with a dissimilar regular of criteria weights are measured and exposed in Table 11.

Note that Case 1 designates the innovative criteria weights intended by the DDM technique though additional cases signify dissimilar likely conditions. The ranking consequences of four disaster choices concerning the deliberated cases are described in Figure 2.

It container be realized from Figure 2 that $A_4$ continuously ranks first although the modification of criteria weights in all cases. Thus, the proposed technique is comparatively vigorous to criteria weights. Though, the ranking instructions of additional disaster choices extricate importantly with deference to diverse criteria weights.

For example, $A_3$ is the second most significant disaster alternate in Case 3. In Case 2, $A_2$ is at the third situation. Meanwhile, the precedence command of $A_1$ is revolved into the fourth with the collective position of Case 1. The major dissimilarity between the ranking instructions discloses that criteria weights production an energetic character in assessing and ranking disaster choices. Influential correct weights of decision criteria are useful for discovery out the greatest strategy for a DDM problem.

The four cases of the criteria weights are exposed in Table 11, written below

**Table 11.** Different cases.

| Criteria | Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|
| $C_1$ | 0.0609 | 0.1087 | 0.1706 | 0.5078 |
| $C_2$ | 0.1102 | 0.1156 | 0.1923 | 0.6589 |
| $C_3$ | 0.1212 | 0.1711 | 0.2234 | 0.4959 |
| $C_4$ | 0.1098 | 0.1009 | 0.1319 | 0.5465 |

*3.6. Benchmark analysis and validation*

In this subsection, we define the Benchmark analysis and validation. The Table 12 present Benchmark analysis and validation.

**Table 12.** Benchmark analysis and validation.

| Performance | 1 | 2 | 3 | Results | Final Results |
|---|---|---|---|---|---|
| Marketing | 0.0609 | 0.1081 | 0.1706 | $R_3 > R_2 > R_1$ | $R_3$ |
| Candidates | 0.1102 | 0.1156 | 0.1923 | $R_3 > R_2 > R_1$ | $R_3$ |
| Car price | 0.1212 | 0.1711 | 0.2223 | $R_3 > R_2 > R_1$ | $R_3$ |
| Oil price | 0.1098 | 0.1009 | 0.1319 | $R_3 > R_2 > R_1$ | $R_3$ |

The results are innovative and critical thinking based. Marketing contains three values, third is best. Candidates are three values, third is best, third value of car price is the best, third value of oil price is best, all third values are the best.

## 4. Comparison of technique with existing method

To demonstrate feasibility of the optional plan, its comparison with another plan (inferior) based upon IFSs [1] and Fermatean fuzzy weighted geometric (FFWG) statistics [22] is shown with cases. Other plans are some specific cases of our method plan that's originated on FFN to the similar descriptive situation.

*4.1. IFN with existing technique*

**Step 1:** Intuitionistic fuzzy (IF) decision matrix is Table 13 in given below:

**Table 13.** IF decision matrix.

| | $GBU_1$ | $GBU_2$ | $GBU_3$ | $GBU_4$ |
|---|---|---|---|---|
| $PS_1$ | $\begin{bmatrix}0.1,\\0.3\end{bmatrix}$ | $\begin{bmatrix}0.12,\\0.14\end{bmatrix}$ | $\begin{bmatrix}0.9,\\0.11\end{bmatrix}$ | $\begin{bmatrix}0.1,\\0.3\end{bmatrix}$ |
| $PS_2$ | $\begin{bmatrix}0.12,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.4,\\0.6\end{bmatrix}$ | $\begin{bmatrix}0.31,\\0.33\end{bmatrix}$ | $\begin{bmatrix}[0.112,\\0.313\end{bmatrix}$ |
| $PS_3$ | $\begin{bmatrix}0.34,\\0.36\end{bmatrix}$ | $\begin{bmatrix}0.12,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.4,\\0.6\end{bmatrix}$ | $\begin{bmatrix}0.554,\\0.556\end{bmatrix}$ |
| $PS_4$ | $\begin{bmatrix}0.3004,\\0.3006\end{bmatrix}$ | $\begin{bmatrix}0.34,\\0.36\end{bmatrix}$ | $\begin{bmatrix}0.12,\\0.13\end{bmatrix}$ | $\begin{bmatrix}0.4,\\0.6\end{bmatrix}$ |

**Step 2:** Describe the intuitionistic fuzzy weighted average (IFWA) operator and $(0.1, 0.2, 0.3, 0.4)$. Now applying given formula in Table 14.

**Table 14.** IFWA operator.

| IFWA operator Table 14 | |
|---|---|
| $PS_1$ | $[0.1024, 0.3145]$ |
| $PS_2$ | $[0.0134, 0.2156]$ |
| $PS_3$ | $[0.0991, 0.3353]$ |
| $PS_4$ | $[0.0201, 0.3043]$ |

**Step 3:** The score function is

$\eta_1 = 0.3121, \eta_2 = 0.1198, \eta_3 = 0.1871, \eta_4 = 0.0121.$

**Step 4:** Given the ranking $\eta_1 > \eta_3 > \eta_2 > \eta_4$ and the $\eta_1$ is the best.

The IFWA operator of score function is defined in Figure 5 and written below.

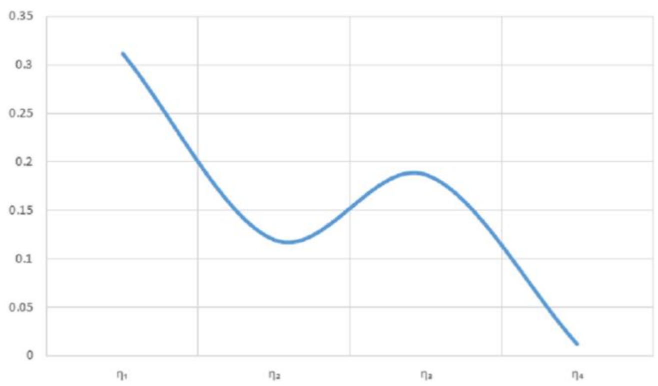


**Figure 5.** Score function of IFWA operator.

*4.2. FF number with existing technique*

**Step 1:** The FF decision matrix is given in Table 15.

**Table 15.** FF decision matrix.

| | $GBU_1$ | $GBU_2$ | $GBU_3$ | $GBU_4$ |
|---|---|---|---|---|
| $PS_1$ | $\begin{bmatrix}0.1,\\0.3\end{bmatrix}$ | $\begin{bmatrix}0.12,\\0.14\end{bmatrix}$ | $\begin{bmatrix}0.9,\\0.11\end{bmatrix}$ | $\begin{bmatrix}0.1,\\0.3\end{bmatrix}$ |
| $PS_2$ | $\begin{bmatrix}0.9,\\0.11\end{bmatrix}$ | $\begin{bmatrix}0.1,\\0.3\end{bmatrix}$ | $\begin{bmatrix}0.31,\\0.33\end{bmatrix}$ | $\begin{bmatrix}[0.112,\\0.313\end{bmatrix}$ |
| $PS_3$ | $\begin{bmatrix}0.32,\\0.34\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.12\end{bmatrix}$ | $\begin{bmatrix}0.1,\\0.4\end{bmatrix}$ | $\begin{bmatrix}0.553,\\0.554\end{bmatrix}$ |
| $PS_4$ | $\begin{bmatrix}0.3002,\\0.3004\end{bmatrix}$ | $\begin{bmatrix}0.32,\\0.34\end{bmatrix}$ | $\begin{bmatrix}0.11,\\0.12\end{bmatrix}$ | $\begin{bmatrix}0.2,\\0.4\end{bmatrix}$ |

**Step 2:** The Fermatean fuzzy weighted geometric (FFWG) operator and $(0.1, 0.2, 0.3, 0.4)$. Applying given formula in Table 16:

**Table 16.** FFWG operator.

| FFWG operator Table 16 | |
|---|---|
| $PS_1$ | $[0.3145, 0.5231]$ |
| $PS_2$ | $[0.1111, 0.1132]$ |
| $PS_3$ | $[0.9353, 0.8935]$ |
| $PS_4$ | $[0.3231, 0.3343]$ |

**Step 3:** The score function is $\eta_1 = 0.6414, \eta_2 = 0.1705, \eta_3 = 0.5866, \eta_4 = 0.6181.$

**Step 4:** Find the ranking $\eta_1 > \eta_3 > \eta_4 > \eta_2$ and $\eta_1$ is the best.

The score function of FFWG operator is defined in Figure 6 and written below.

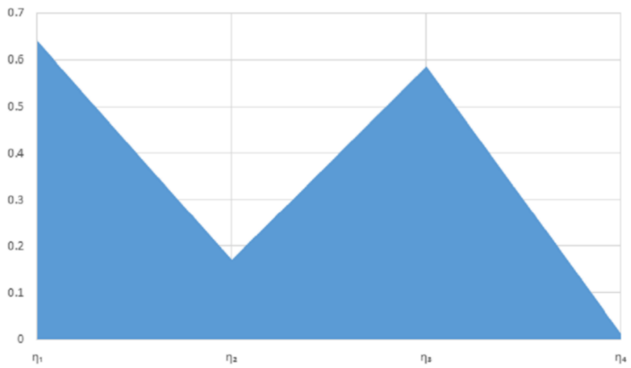


**Figure 6.** Score function of FFWG operator.

When there are interrelationships amongst any manifold criteria: The diverse approaches can grip this state. The diverse approaches define Table 17 and MCDM technique in given Table 18.

**Table 17.** Diverse approaches.

| Methods | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Ding et al. [1] | 0.0253 | 0.2901 | 0.3008 | 0.0621 |
| Batool et al. [2] | 0.0909 | 0.4056 | 0.3087 | 0.4085 |
| Rong et al. [5] | 0.1537 | 0.1881 | –0.8601 | –0.1916 |
| Liu et al. [10] | –0.5243 | 0.3041 | 0.3007 | 0.9721 |

**Table 18.** MCDM technique.

| Methods | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Zhan et al. [11] | 0.8203 | 0.6031 | 0.1625 | 0.0387 |
| Ding et al. [12] | –0.6248 | –0.0299 | 0.3081 | 0.1995 |
| Ding et al. [14] | 0.0267 | 0.0369 | 0.3088 | 0.0801 |

Different existing techniques in Table 19.

**Table 19.** Existing techniques.

| Methods | Score function | Ranking | Final ranking |
|---|---|---|---|
| MCDM [15] | $\begin{Bmatrix} \eta_1 = 0.2014, \\ \eta_2 = 0.8755, \\ \eta_3 = 0.5811, \\ \eta_4 = 0.6711 \end{Bmatrix}$ | $\begin{Bmatrix} \eta_2 > \\ \eta_4 > \\ \eta_3 > \\ \eta_1 \end{Bmatrix}$ | $\begin{Bmatrix} \eta_2 > \\ \eta_4 > \\ \eta_3 > \\ \eta_1 \end{Bmatrix}$ |
| 2-THWDM [18] | $\begin{Bmatrix} \eta_1 = 0.2014, \\ \eta_2 = 0.8755, \\ \eta_3 = 0.5811, \\ \eta_4 = 0.6711 \end{Bmatrix}$ | $\begin{Bmatrix} \eta_2 > \\ \eta_4 > \\ \eta_3 > \\ \eta_1 \end{Bmatrix}$ | $\begin{Bmatrix} \eta_2 > \\ \eta_4 > \\ \eta_3 > \\ \eta_1 \end{Bmatrix}$ |
| TOPSIS method [11] | $\begin{Bmatrix} \eta_1 = 0.0213, \\ \eta_2 = 0.1745, \\ \eta_3 = 0.0545, \\ \eta_4 = 0.0893 \end{Bmatrix}$ | $\begin{Bmatrix} \eta_2 > \\ \eta_4 > \\ \eta_3 > \\ \eta_1 \end{Bmatrix}$ | $\begin{Bmatrix} \eta_2 > \\ \eta_4 > \\ \eta_3 > \\ \eta_1 \end{Bmatrix}$ |

## 5. Conclusions

In this study, an innovative technique is proposed founded on a combined compunction system DDAS technique to contract with DDM complications through the FF data. In exact, the FFs are used to define decision creators' indeterminate valuation data on disaster choices. The regret philosophy and DDAS technique are combined to position disaster substitutes and control the ideal reaction to an emergency happening. A comprehensive CRITIC technique is presented to calculate appropriate criteria weights from the original decision data. Finally, an actual DDM instance of COVID-19 is provided to validate the efficiency and feasibility of our future technique.

In comparison with the available systems, the regret philosophy DDAS technique existence suggested in this paper is advantageous for the reasons: (1) it contains the additional capacity to define the imprecision and indecision of decision data by consuming the FFs; (2) it is intelligent to avoid hominoid involvement and inferior data assortment in criteria weight addition with the stretched CRITIC technique; (3) improved illustration of the inner behaviors of decision makers and variety sensible decisions below disaster states by uniting regret philosophy and DDAS technique.

Primarily, the projected technique is an individual agreement with the linguistic terminologies prearranged by decision-makers. In numerous real states, different kinds of decision data could be complicated as of varied structures of criteria. Thus, the future DDM method can be lengthy to grip varied data in the future. Following this, the planned technique is limited to an insignificant collection of specialists for assessing emergency choices. Therefore, the knowledge curb of a small skilled side may reason biased position results of alternative answers.

In the future, it is auspicious to put frontward a radical process for DDM in the huge assembly setting. The individual one item is assumed in this broadside to validate the suggested DDM method. In the future, it would be upgraded to relate the proposed technique to contract through other difficulties to confirm its feasibility and competence.

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## Conflict of interest

The authors declare no conflict of interest.

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