An Analysis of Bipolar Trapezoidal Neutrosophic Sets (BTNSs) for Examining the Income-Increasing and Poverty-Reduction Effects of Ecological Compensation in the Huai River Basin of Anhui Province: A Comprehensive Study

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Abstract: This study proposes the decision-making approach for evaluation of ecological compensation in the Huai river basin of Anhui province. We used the neutrosophic sets to deal with the uncertainty information. In both the trapezoidal and bipolar neutrosophic environments, decision makers supply all the information needed to make decisions in complex multicriteria decision-making problems. This work suggests a novel, efficient method to handle these situations. We used two methods to evaluate the criteria and alternatives such as LMAW and MARCOS. We used the LMAW method to compute the criteria weights and the MARCOS method to rank the alternatives. Nine criteria and eleven alternatives are evaluated in this study. The sensitivity analysis is conducted to show the stability of the results. The outcomes show the rank of the alternative is stable.

Keywords: Bipolar Trapezoidal Neutrosophic Sets (BTNSs); Ecological Compensation; Huai River Basin of Anhui Province; Uncertainty. MARCOS Method; LMAW Method.

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1. Introduction and Literature Review

Two-valued (Boolean) logic is the foundation for the membership value (truth value) of the classical set element. This usually doesn't offer a bit of possible information to catch the questionable data in the real world. Based on the extension of binary logic, a type of multivalue logic where the actual value might be any real integer between 0 and 1, inclusive, Zadeh [1] proposed the membership value of a classical set element in 1965. A fuzzy set (FS) is a collection of pairs that include every element in the classical set and its true value in relation to the membership function. To manage education and relationships in schools, Hoskova-Mayerova and Maturo [2] have attempted to make sure that fuzzy sets can be utilized. The writers of Nguyen et al. [3], Peng, and Garg [4] talked about several kinds of similarity measures, including multiparametric and exponential fuzzy units, and noted that similarity measures can be used for issues like pattern recognition and decision making. Chakravarty [5] has developed an axiomatic approach to measuring multidimensional poverty using fuzzy sets. In fuzzy soft set theory, Zimmermann proposed triangular and trapezoidal fuzzy numbers.

According to him, trapezoidal membership functions are frequently employed for the purposes of ease of data collecting and computational efficiency. Despite its validity in expressing ambiguous evaluation data, the fuzzy set is unable to handle several complicated real-world problems. Given the current situation, it is impossible to avoid the bipolar sense of the attribute's appraisal. Lee [6] created a bipolar-valued fuzzy set (BFS) by classifying a set element with both positive and negative fuzzy information. Dutta and Doley [7] have demonstrated that the composition of bipolar-valued fuzzy sets can be used to make a scientific diagnosis in an efficient manner.

To handle a commercial enterprise person's concern that fall under the category of multi characteristic group decision making in the context of cubic bipolar fuzzy facts, Riaz and Tehrim [8] provided the averaging aggregation operators. The idea of intuitionistic fuzzy sets with only truth and falsity membership values was first presented by Atanassov[9]. Smarandache [10] discovered in 1998 that the intuitionistic fuzzy sets' membership values may be separated into three categories: truth, indeterminacy, and falsehood. It results in Smarandache's neutrosophic set (NS) shape. It is another significant turning point after the sense of a murky environment with problems associated with ambiguity. By functionalizing the Smarandache's neutrosophic set for certain situations,

Wang et al. [11] developed the concept of a single-valued neutrosophic set. It is commonly recognized that the single-valued neutrosophic set is the most practical way to implement the concept of this paradigm to get rid of the challenges brought on by the values in the neutrosophic set's construction. Ye [12] investigated the trapezoidal sense of the neutrosophic set element's membership value. He was inspired by this to lay the groundwork for a trapezoidal neutrosophic set (TNS). To help an investment business invest their money in the most efficient manner, Pramanik and Mallick [13]developed the TODIM (an acronym in Portuguese for interactive and a couple of attribute choice making) approach, which is fully based on the trapezoidal neutrosophic environment.

The bipolar trapezoidal neutrosophic set, which consists of both bipolar and trapezoidal neutrosophic variables, is the reason behind this study [14]. This set offers a broad overview of several of the neutrosophic set's generalized forms. Furthermore, to integrate bipolar trapezoidal neutrosophic information in uncertain conditions, the research introduces a few aggregating operations. The theory of bipolar trapezoidal neutrosophic aggregation operators is developed and enhanced by these operators' unique ability to realize the synthesis of bipolar trapezoidal neutrosophic information. Furthermore, the suggested (Dombi) aggregation operators facilitate the establishment of many criteria decision making in the bipolar trapezoidal neutrosophic context since they are useful instruments for decision-making.

Accurately implementing the evaluation of ecological compensation process is extremely difficult due to the unavoidable presence of imprecise data, human judgment ambiguity, and uncertainty among different parameters. The evaluation of the ecological compensation process has long been seen as a multi-criteria decision-making (MCDM) issue[15], [16]. It is evident that the selection criteria for alternatives have shifted from quantitative to qualitative, which has led to a change in the methodologies available for evaluation of ecological compensation. Traditional MCDM techniques make it simple to select alternative based on quantitative factors. They offer a useful framework for handling the evaluation of ecological compensation issues when the objectives of the decision-makers are at odds.

Other techniques that facilitate decision-making in the event of imprecise and ambiguous information have begun to be employed because of the move to the use of qualitative factors in evaluation of ecological compensation[17], [18]. The application of neutrosophic set theory is the basis of these techniques. Because some real-world scenarios are not well defined and it might be challenging to specify the set's limits, the idea of neutrosophic sets' application is more akin to human thought.

This is especially true when choosing alternatives based on qualitative standards, as in the case of evaluation of ecological compensation. Different MCDM techniques, whether in the classic, neutrosophic, or rough form, should be used in the evaluation of ecological compensation process to develop a partnership with the alternative who best meets the established business objectives. Since there are many applications for the MCDM technique in evaluation of ecological compensation.

2. Bipolar trapezoidal neutrosophic set (BTNS)

This section shows the definitions of BTNS [14].

Definition 1

We can define the BTNS such as:

$B = \{((\alpha^+, \beta^+, \gamma^+), (\delta^-, \varepsilon^-, \theta^-))\}$

$$B = \left\{ \begin{pmatrix} \left(\begin{pmatrix} a_B^+(x), \\ b_B^+(x), \\ c_B^+(x), \\ d_B^+(x) \end{pmatrix}, \begin{pmatrix} e_B^+(x), \\ f_B^+(x), \\ g_B^+(x), \\ h_B^+(x) \end{pmatrix}, \begin{pmatrix} l_B^+(x), \\ m_B^+(x), \\ n_B^+(x), \\ p_B^+(x) \end{pmatrix} \right), \\ \left(\begin{pmatrix} a_B^-(x), \\ b_B^-(x), \\ c_B^-(x), \\ d_B^-(x) \end{pmatrix}, \begin{pmatrix} e_B^-(x), \\ f_B^-(x), \\ g_B^-(x), \\ h_B^-(x) \end{pmatrix}, \begin{pmatrix} l_B^-(x), \\ m_B^-(x), \\ n_B^-(x), \\ p_B^-(x) \end{pmatrix} \right) \end{pmatrix} \right\} \quad (1)$$

Example

BTNS can be defined as examples such as:

$$B=\left\{\begin{matrix}\left(\left(\begin{pmatrix}0.2,\\0.3,\\0.4,\\0.7\end{pmatrix},\begin{pmatrix}0.4,\\0.4,\\0.5,\\1\end{pmatrix},\begin{pmatrix}0.2,\\0.2,\\0.2,\\0.2\end{pmatrix}\right)\right),\\ \left(\begin{pmatrix}-0.5,\\-0.4,\\-0.3,\\0\end{pmatrix},\begin{pmatrix}0,\\0,\\0,\\0\end{pmatrix},\begin{pmatrix}-1,\\-0.6,\\-0.2,\\-0.1\end{pmatrix}\right)\end{matrix}\right\} \tag{2}$$

Definition 2

This definition can define the operations of bipolar transposal neutrosophic numbers such as:

$$B_1=\left\{\left(\begin{matrix}\left(\left(\begin{pmatrix}a_{B_1}^{+}(x),\\b_{B_1}^{+}(x),\\c_{B_1}^{+}(x),\\d_{B_1}^{+}(x)\end{pmatrix},\begin{pmatrix}e_{B_1}^{+}(x),\\f_{B_1}^{+}(x),\\g_{B_1}^{+}(x),\\h_{B_1}^{+}(x)\end{pmatrix},\begin{pmatrix}l_{B_1}^{+}(x),\\m_{B_1}^{+}(x),\\n_{B_1}^{+}(x),\\p_{B_1}^{+}(x)\end{pmatrix}\right)\right),\\ \left(\left(\begin{pmatrix}a_{B_1}^{-}(x),\\b_{B_1}^{-}(x),\\c_{B_1}^{-}(x),\\d_{B_1}^{-}(x)\end{pmatrix},\begin{pmatrix}e_{B_1}^{-}(x),\\f_{B_1}^{-}(x),\\g_{B_1}^{-}(x),\\h_{B_1}^{-}(x)\end{pmatrix},\begin{pmatrix}l_{B_1}^{-}(x),\\m_{B_1}^{-}(x),\\n_{B_1}^{-}(x),\\p_{B_1}^{-}(x)\end{pmatrix}\right)\right)\end{matrix}\right)\right\}$$

$$B_2 = \left\{ \left(\left(\begin{pmatrix} a_{B_2}^{+}(x), \\ b_{B_2}^{+}(x), \\ c_{B_2}^{+}(x), \\ d_{B_{12}}^{+}(x) \end{pmatrix}, \begin{pmatrix} e_{B_2}^{+}(x), \\ f_{B_2}^{+}(x), \\ g_{B_2}^{+}(x), \\ h_{B_2}^{+}(x) \end{pmatrix}, \begin{pmatrix} l_{B_2}^{+}(x), \\ m_{B_2}^{+}(x), \\ n_{B_2}^{+}(x), \\ p_{B_2}^{+}(x) \end{pmatrix} \right), \left(\begin{pmatrix} a_{B_2}^{-}(x), \\ b_{B_2}^{-}(x), \\ c_{B_2}^{-}(x), \\ d_{B_2}^{-}(x) \end{pmatrix}, \begin{pmatrix} e_{B_2}^{-}(x), \\ f_{B_2}^{-}(x), \\ g_{B_2}^{-}(x), \\ h_{B_2}^{-}(x) \end{pmatrix}, \begin{pmatrix} l_{B_2}^{-}(x), \\ m_{B_2}^{-}(x), \\ n_{B_2}^{-}(x), \\ p_{B_2}^{-}(x) \end{pmatrix} \right) \right) \right\}$$

$$B_1 \sqsubseteq B_2 \; if \; \left\{ \begin{array}{c} \begin{pmatrix} a_{B_1}^{+}(x) \le a_{B_2}^{+}(x), b_{B_1}^{+}(x) \le b_{B_2}^{+}(x), \\ c_{B_1}^{+}(x) \le c_{B_2}^{+}(x), d_{B_1}^{+}(x) \le d_{B_2}^{+}(x) \end{pmatrix}, \\ \begin{pmatrix} e_{B_1}^{+}(x) \ge e_{B_2}^{+}(x), f_{B_1}^{+}(x) \ge f_{B_2}^{+}(x), \\ g_{B_1}^{+}(x) \ge g_{B_2}^{+}(x), h_{B_1}^{+}(x) \ge h_{B_2}^{+}(x) \end{pmatrix}, \\ \begin{pmatrix} l_{B_1}^{+}(x) \ge l_{B_2}^{+}(x), m_{B_1}^{+}(x) \ge m_{B_2}^{+}(x), \\ n_{B_1}^{+}(x) \ge n_{B_2}^{+}(x), p_{B_1}^{+}(x) \ge p_{B_2}^{+}(x) \end{pmatrix}, \\ \begin{pmatrix} a_{B_1}^{-}(x) \ge a_{B_2}^{-}(x), b_{B_1}^{-}(x) \ge b_{B_2}^{-}(x), \\ c_{B_1}^{-}(x) \ge c_{B_2}^{-}(x), d_{B_1}^{-}(x) \ge d_{B_2}^{-}(x) \end{pmatrix}, \\ \begin{pmatrix} e_{B_1}^{-}(x) \le e_{B_2}^{-}(x), f_{B_1}^{-}(x) \le f_{B_2}^{-}(x), \\ g_{B_1}^{-}(x) \le g_{B_2}^{-}(x), h_{B_1}^{-}(x) \le h_{B_2}^{-}(x) \end{pmatrix}, \\ l_{B_1}^{-}(x) \le l_{B_2}^{-}(x), m_{B_1}^{-}(x) \le m_{B_2}^{-}(x), \\ n_{B_1}^{-}(x) \le n_{B_2}^{-}(x), p_{B_1}^{-}(x) \le p_{B_2}^{-}(x) \end{array} \right\} \tag{3}$$

$$B_1 \cap B_2 \; if \; \left\{ \begin{array}{c} \begin{pmatrix} min\{a_{B_1}^{+}(x), a_{B_2}^{+}(x)\}, \min\{b_{B_1}^{+}(x), b_{B_2}^{+}(x)\}, \\ \min\{c_{B_1}^{+}(x), c_{B_2}^{+}(x)\}, \min\{d_{B_1}^{+}(x), d_{B_2}^{+}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \max\{e_{B_1}^{+}(x), e_{B_2}^{+}(x)\}, \max\{f_{B_1}^{+}(x), f_{B_2}^{+}(x)\}, \\ \max\{g_{B_1}^{+}(x), g_{B_2}^{+}(x)\}, \max\{h_{B_1}^{+}(x) \ge h_{B_2}^{+}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \max\{l_{B_1}^{+}(x), l_{B_2}^{+}(x)\}, \max\{m_{B_1}^{+}(x), m_{B_2}^{+}(x)\}, \\ \max\{n_{B_1}^{+}(x), n_{B_2}^{+}(x)\}, \max\{p_{B_1}^{+}(x), p_{B_2}^{+}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \max\{a_{B_1}^{-}(x), a_{B_2}^{-}(x)\}, \max\{b_{B_1}^{-}(x), b_{B_2}^{-}(x)\}, \\ \max\{c_{B_1}^{-}(x), c_{B_2}^{-}(x)\}, \max\{d_{B_1}^{-}(x), d_{B_2}^{-}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \min\{e_{B_1}^{-}(x), e_{B_2}^{-}(x)\}, \min\{f_{B_1}^{-}(x), f_{B_2}^{-}(x)\}, \\ \min\{g_{B_1}^{-}(x), g_{B_2}^{-}(x)\}, \min\{h_{B_1}^{-}(x), h_{B_2}^{-}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \min\{l_{B_1}^{-}(x), l_{B_2}^{-}(x)\}, \min\{m_{B_1}^{-}(x), m_{B_2}^{-}(x)\}, \\ \min\{n_{B_1}^{-}(x), n_{B_2}^{-}(x)\}, \min\{p_{B_1}^{-}(x), p_{B_2}^{-}(x)\} \end{pmatrix} \end{array} \right\} \tag{4}$$

$$B_1 \cup B_2\ if \left\{ \begin{array}{l} \begin{pmatrix} max\{a^+_{B_1}(x), a^+_{B_2}(x)\}, max\{b^+_{B_1}(x), b^+_{B_2}(x)\}, \\ max\{c^+_{B_1}(x), c^+_{B_2}(x)\}, max\{d^+_{B_1}(x), d^+_{B_2}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \min\{e^+_{B_1}(x), e^+_{B_2}(x)\}, \min\{f^+_{B_1}(x), f^+_{B_2}(x)\}, \\ \min\{g^+_{B_1}(x), g^+_{B_2}(x)\}, \min\{h^+_{B_1}(x) \geq h^+_{B_2}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \min\{l^+_{B_1}(x), l^+_{B_2}(x)\}, \min\{m^+_{B_1}(x), m^+_{B_2}(x)\}, \\ \min\{n^+_{B_1}(x), n^+_{B_2}(x)\}, \min\{p^+_{B_1}(x), p^+_{B_2}(x)\} \end{pmatrix}, \\ \begin{pmatrix} \min\{a^-_{B_1}(x), a^-_{B_2}(x)\}, \min\{b^-_{B_1}(x), b^-_{B_2}(x)\}, \\ \min\{c^-_{B_1}(x), c^-_{B_2}(x)\}, \min\{d^-_{B_1}(x), d^-_{B_2}(x)\} \end{pmatrix}, \\ \begin{pmatrix} max\{e^-_{B_1}(x), e^-_{B_2}(x)\}, max\{f^-_{B_1}(x), f^-_{B_2}(x)\}, \\ max\{g^-_{B_1}(x), g^-_{B_2}(x)\}, max\{h^-_{B_1}(x), h^-_{B_2}(x)\} \end{pmatrix}, \\ \begin{pmatrix} max\{l^-_{B_1}(x), l^-_{B_2}(x)\}, max\{m^-_{B_1}(x), m^-_{B_2}(x)\}, \\ max\{n^-_{B_1}(x), n^-_{B_2}(x)\}, max\{p^-_{B_1}(x), p^-_{B_2}(x)\} \end{pmatrix} \end{array} \right\} \quad (5)$$

3. MCDM Approach

This section shows the steps of the proposed approach under the BTNS to compute the criteria weights and rank the alternatives.

3.1 Logarithm Methodology of Additive Weights (LMAW)[19]

1. Evaluate the criteria by a set of experts and decision makers.

2. Prioritize the criteria

The ranking of the criteria is created using the experts and decision makers. They are adding the highest value and lowest value to the criteria.

3. Define the absolute anti-ideal point.

This anti-ideal point is defined by the minimum value from the priority vector A_j.

4. Compute the relation between the criteria

The relation between elements of the criteria is computed such as:

$$n_j = \frac{B_j}{A_j} \quad (6)$$

5. Compute the weight coefficient such as:

$$w_j = \frac{\log(n_j)}{\log\left(\prod_{j=1}^{n} n_j\right)} \quad (7)$$

6. Rank the criteria

3.2 The MARCOS Method

This section shows the steps of the MARCOS method under the BTNS to rank alternatives.

1. Build the decision matrix.

The decision matrix is built with the ideal AI and anti-ideal solution AAI

$$AAI = \min x_{ij} for\ positive\ criteria\ and \max x_{ij} for\ negative\ criteria \quad (8)$$

$$AAI = \max x_{ij} for\ positive\ criteria\ and \min x_{ij} for\ negative\ criteria \quad (9)$$

2. Normalize the decision matrix

$$q_{ij} = \frac{x_{ai}}{x_{ij}}\ for\ negative\ criteria \quad (10)$$

$$q_{ij} = \frac{x_{ij}}{x_{ai}}\ for\ positive\ criteria \quad (11)$$

3. Compute the weighted matrix

$$u_{ij} = q_{ij} w_j \quad (12)$$

4. Compute the utility degree

$$K_i^- = \frac{S_i}{S_{aai}} \quad (13)$$

$$K_i^+ = \frac{S_i}{S_{ai}} \quad (14)$$

$$S_i = \sum_{i=1}^{n} u_{ij} \quad (15)$$

5. Compute the utility function

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1-f(K_i^+)}{f(K_i^+)} + \frac{1-f(K_i^-)}{f(K_i^-)}} \quad (16)$$

$$f(K_i^+) = \frac{K_i^-}{K_i^+ + K_i^-} \quad (17)$$

$$f(K_i^-) = \frac{K_i^+}{K_i^+ + K_i^-} \quad (18)$$

6. Ran alternatives.

4. Application

The eco-compensation policy in the Huaihe River Basin of Anhui Province has significantly contributed to income growth and poverty reduction. By promoting ecological restoration and sustainable development, the policy incentivizes local residents to engage in eco-friendly practices such as afforestation, wetland conservation, and pollution control. These initiatives not only improve environmental quality but also create job opportunities and increase household income, particularly for rural and impoverished communities. The compensation funds provide financial support for farmers and fishermen transitioning to sustainable livelihoods, reducing their economic vulnerability. Overall, the eco-compensation mechanism effectively combines environmental protection with poverty alleviation, fostering a harmonious relationship between ecological preservation and socioeconomic development in the region. This section proposes the decision-making approach for evaluation of ecological compensation in the Huai river basin of Anhui province. This section shows the application of the proposed approach to compute the criteria weighs and rank the alternatives. This study is evaluated the criteria and alternatives by the three experts and decision makers. Three experts are gathered with nine criteria and eleven alternatives as : Climate Resilience, Sustainable Land Use, Biodiversity Conservation, Water Quality Improvement, Evaluation System, Stakeholder Participation, Economic Impact, Water Conservation, Compensation Mechanism Efficiency. The alternatives are: Watershed Protection, Pollution Control, Ecological Redline Policy Enforcement, Carbon Credit Trading, Sustainable Fisheries, Green Finance, Community-Based River Management, Cross-Province Water Quality, Public Awareness, Payment for Ecosystem Services, Eco-Friendly Agricultural Subsidies

LMAW Results

Let experts evaluate the criteria by using the BTNNs. Then they are evaluated by the criteria to rank them by their opinions. Then we defined the absolute anti-ideal point. Then we compute the relation between the criteria using Eq. (6). Then we compute the weights of criteria using Eq. (7) as shown in Fig 1.

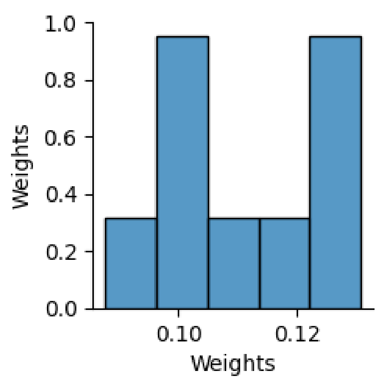

Fig 1. The weights of criteria.

The MARCOS Results

We built the decision matrix using the BTNNs between the criteria and alternative as shown in tables 1-3. Then we normalize the decision matrix using Eq. (10) as shown in table 4. Then we obtained weighted matrix using Eq. (12) as shown in table 5. Then we compute the utility degree using Eqs. (13,14, and 15). Then we compute the utility function using Eqs. (16,17, and 18). Then we rank the alternatives as shown in Fig 2.

Table 1. The first BTNN matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9
A1	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}
A2	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}
A3	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}
A4	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}
A5	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}
A6	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}
A7	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}
A8	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}
A9	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}
A10	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}
A11	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}

Table 2. The second BTNN matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9
A1	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}
A2	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}
A3	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}
A4	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-

	0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	0.6,0,0),(-1,-1,-0.5,-0.3))}	0.8,-0.8),(-0.2,-0.1,0,0))}	0.8,-0.8),(-0.2,-0.1,0,0))}	0.6,0,0),(-1,-1,-0.5,-0.3))}	0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	0.8,-0.8),(-0.2,-0.1,0,0))}	0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	0.1,-0.1),(-1,-1,-0.4,-0.4))}
A_5	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}
A_6	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}
A_7	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}
A_8	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}
A_9	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}
A_{10}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}
A_{11}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}

Table 3. The third BTNN matrix

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
A_1	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}
A_2	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}
A_3	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}
A_4	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}
A_5	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}
A_6	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}
A_7	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-

	0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	0.6,0,0),(-1,-1,-0.5,-0.3))}	0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	0.1,-0.1,0),(-0.5,-0.5,0,0))}	0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	0.1,-0.1,0),(-0.5,-0.5,0,0))}	0.1),(-1,-1,-0.4,-0.4))}
A8	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.5,0.6,1),(0.3,0.3,0.5,0.5),(0,0.2,0.2,0.7)),((-0.8,-0.2,-0.2,-0.1),(-1,-0.1,-0.1,0),(-0.5,-0.5,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}
A9	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.4,0.5,0.5,0.6),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-0.9,-0.9),(-0.2,-0.2,-0.1,-0.1),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}
A10	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.3,0.5,0.6,0.7),(0.2,0.3,0.8,0.8),(0.1,0.4,0.4,0.4)),((-0.5,-0.5,-0.1,-0.1),(-0.9,-0.1,-0.1,-0.1),(-0.9,-0.9,-0.2,-0.1))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}
A11	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.2,0.5,0.5,0.9),(0.5,0.5,1,1),(0.1,0.1,0.1,0.1)),((-0.3,-0.3,-0.1,-0.1),(-0.5,-0.2,-0.2,0),(-1,-1,-0.4,-0.4))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.3,0.5,0.9),(0,0.2,0.4,0.6),(1,1,1,1)),((-0.7,-0.5,-0.3,-0.1),(-1,-1,-0.8,-0.8),(-0.2,-0.1,0,0))}	{((0.2,0.3,0.4,0.7),(0.4,0.4,0.5,1),(0.2,0.2,0.2,0.2)),((-0.5,-0.4,-0.3,0),(0,0,0,0),(-1,-0.6,-0.2,-0.1))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}	{((0.1,0.2,0.2,0.3),(0.8,0.8,1,1),(0,0,0.6,1)),((-1,-1,-1,-0.2),(-0.6,-0.6,0,0),(-1,-1,-0.5,-0.3))}

Table 4. The normalization matrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
A_1	0.833333333	0.966495	0.916667	1	0.583333	0.757576	0.824176	0.916667	0.818627
A_2	0.861111111	0.773196	0.694444	0.722222	1	1	0.824176	1	0.911765
A_3	0.972222222	0.881443	1	0.694444	0.796296	0.94697	0.980769	0.583333	0.617647
A_4	0.85	0.938144	0.759259	0.650463	0.717593	0.590909	0.980769	0.694444	0.897059
A_5	0.911111111	1	0.842593	0.650463	0.701389	0.70202	0.840659	0.657407	0.627451
A_6	1	0.804124	0.898148	0.657407	0.643519	0.868687	0.901099	0.694444	0.642157
A_7	0.991666667	0.969072	0.805556	0.694444	0.759259	0.79798	0.912088	0.583333	0.95098
A_8	0.841666667	0.920103	0.912037	0.62037	0.833333	0.891414	0.848901	0.715278	0.867647
A_9	0.772222223	0.724227	0.666667	0.694444	0.928241	0.893939	0.771978	0.643519	0.688725
A_{10}	0.833333334	0.780928	0.752315	0.884259	0.775463	0.901515	0.901099	0.789352	0.936275
A_{11}	0.711111111	0.938144	0.643519	0.900463	0.701389	0.765152	1	0.944444	1

Table 5. The weighted matrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
A_1	0.084642639	0.115376	0.113413	0.130666	0.051135	0.076948	0.083713	0.113413	0.090162
A_2	0.087464061	0.092301	0.085919	0.09437	0.087659	0.101571	0.083713	0.123724	0.100419
A_3	0.098749746	0.105223	0.123724	0.090741	0.069803	0.096185	0.099618	0.072172	0.068026
A_4	0.086335492	0.111992	0.093938	0.084994	0.062904	0.060019	0.099618	0.085919	0.0988
A_5	0.092542619	0.119376	0.104249	0.084994	0.061483	0.071305	0.085387	0.081337	0.069106
A_6	0.101571167	0.095993	0.111122	0.085901	0.05641	0.088234	0.091526	0.085919	0.070725
A_7	0.100724741	0.115684	0.099666	0.090741	0.066556	0.081052	0.092642	0.072172	0.104739
A_8	0.085489066	0.109838	0.112841	0.081062	0.073049	0.090542	0.086224	0.088497	0.09556
A_9	0.078435513	0.086455	0.082482	0.090741	0.081369	0.090798	0.078411	0.079618	0.075854
A_{10}	0.084642639	0.093224	0.093079	0.115543	0.067977	0.091568	0.091526	0.097662	0.103119
A_{11}	0.072228386	0.111992	0.079618	0.11766	0.061483	0.077717	0.101571	0.11685	0.110137

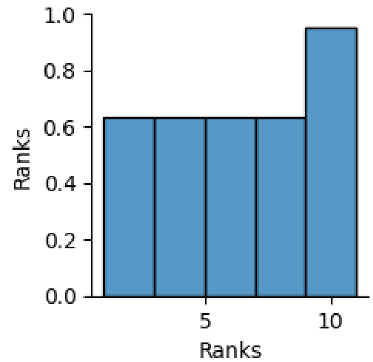

Fig 2. The rank of the alternatives.

Sensitivity analysis

Sensitivity analysis is covered in this area to examine how different criterion weights affect the outcome. The necessary sensitivity analysis findings are shown in Fig 3 and Fig. 4,5. We take into consideration the following scenarios for this purpose:

Situation I When evaluating alternatives, we consider the LMAW -based technique for determining the objective weight of criterion, which is = 1.0 in in this instance. Each option's overall assessment degree is calculated using this model. Alternative 2 is prioritized in the best and alternative 9 is ranked as the worst.

Situation 2. We increased the criteria weights by 14% and other criteria have the same weights. Then we applied the MARCOS method to rank the alternatives. We show the alternative 2 is the best and alternative 9 is the worst.

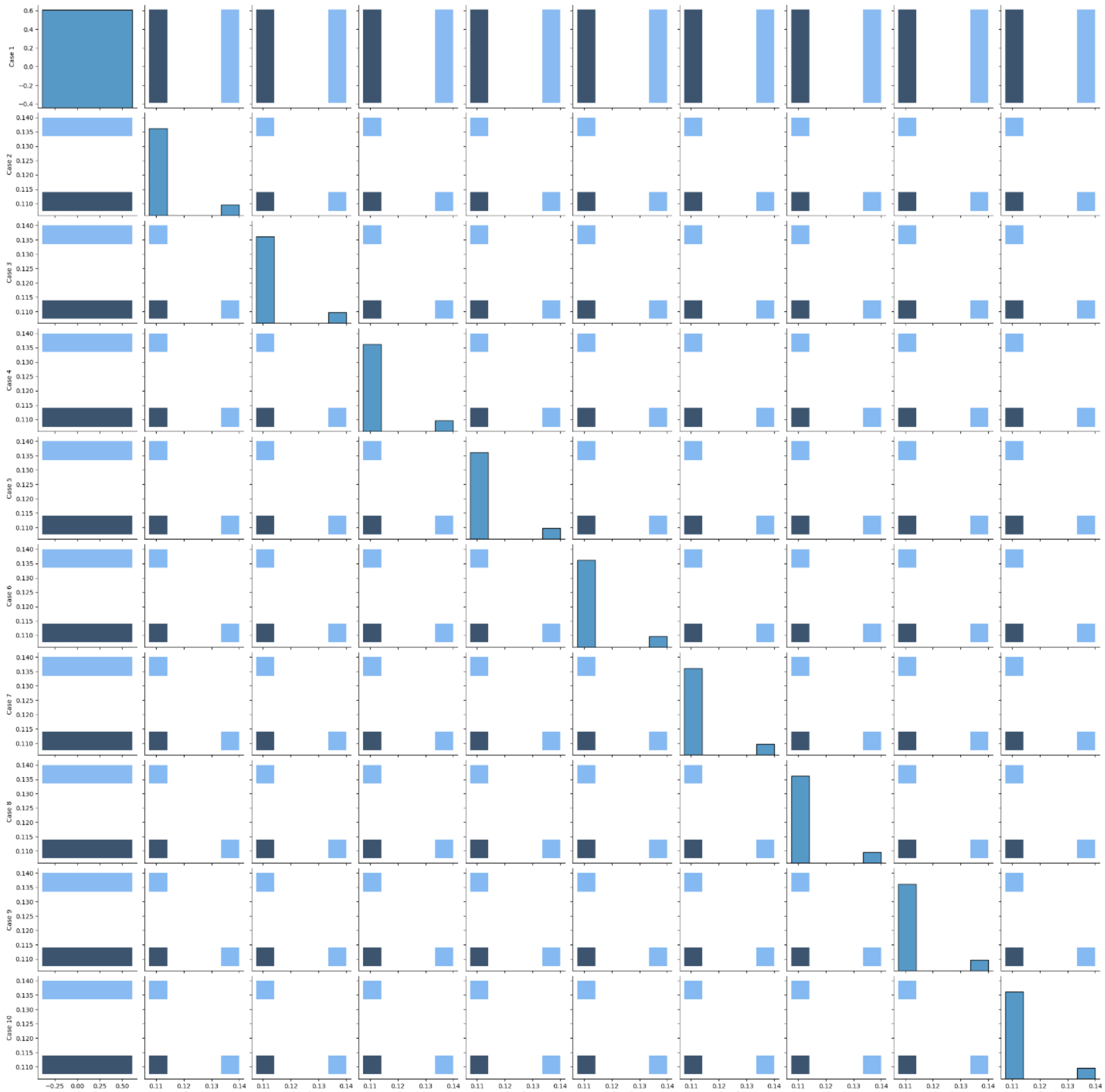

Fig 3. The criteria weights with different cases.

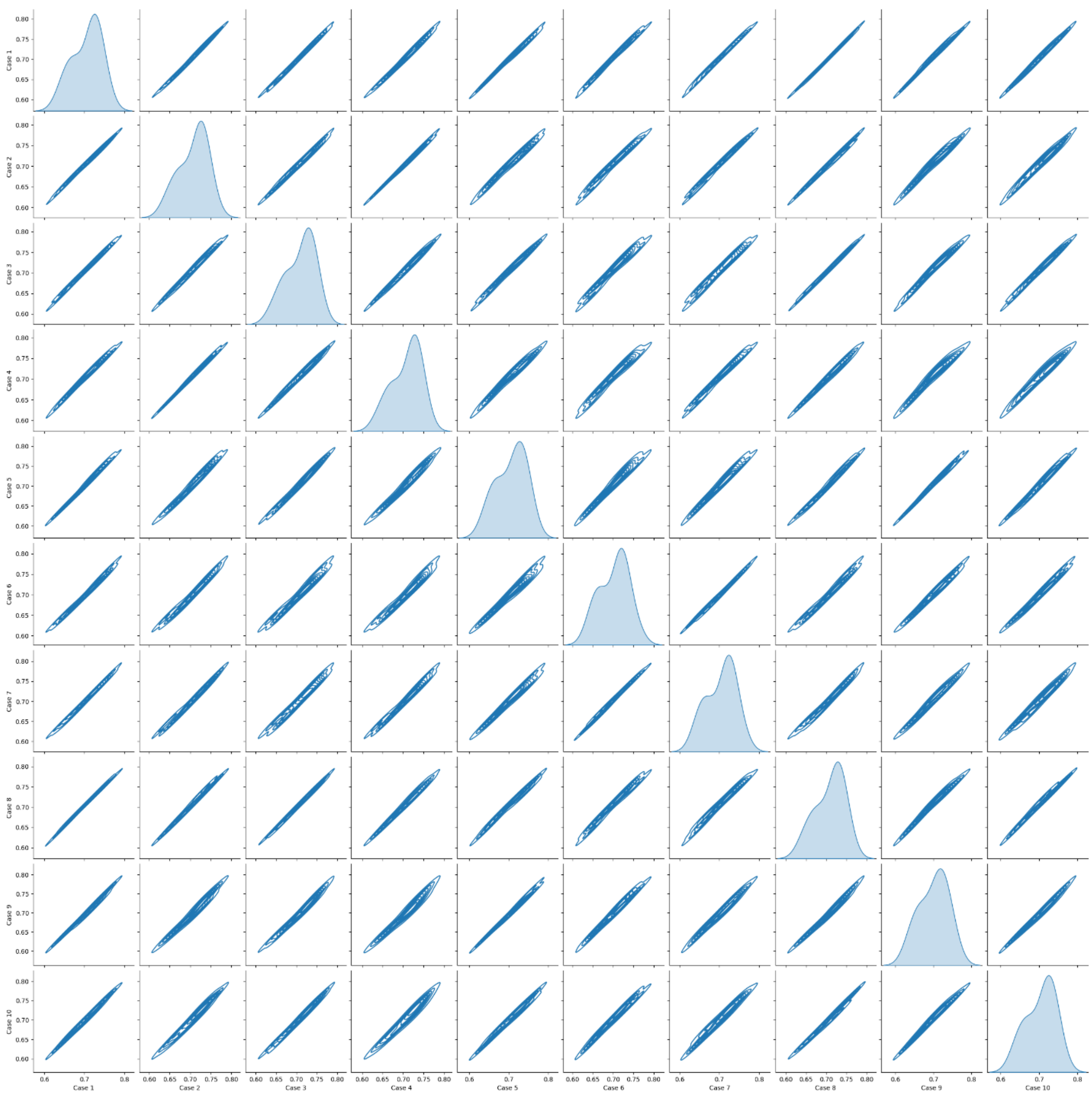

Fig 4. The results of the MARCOS method.

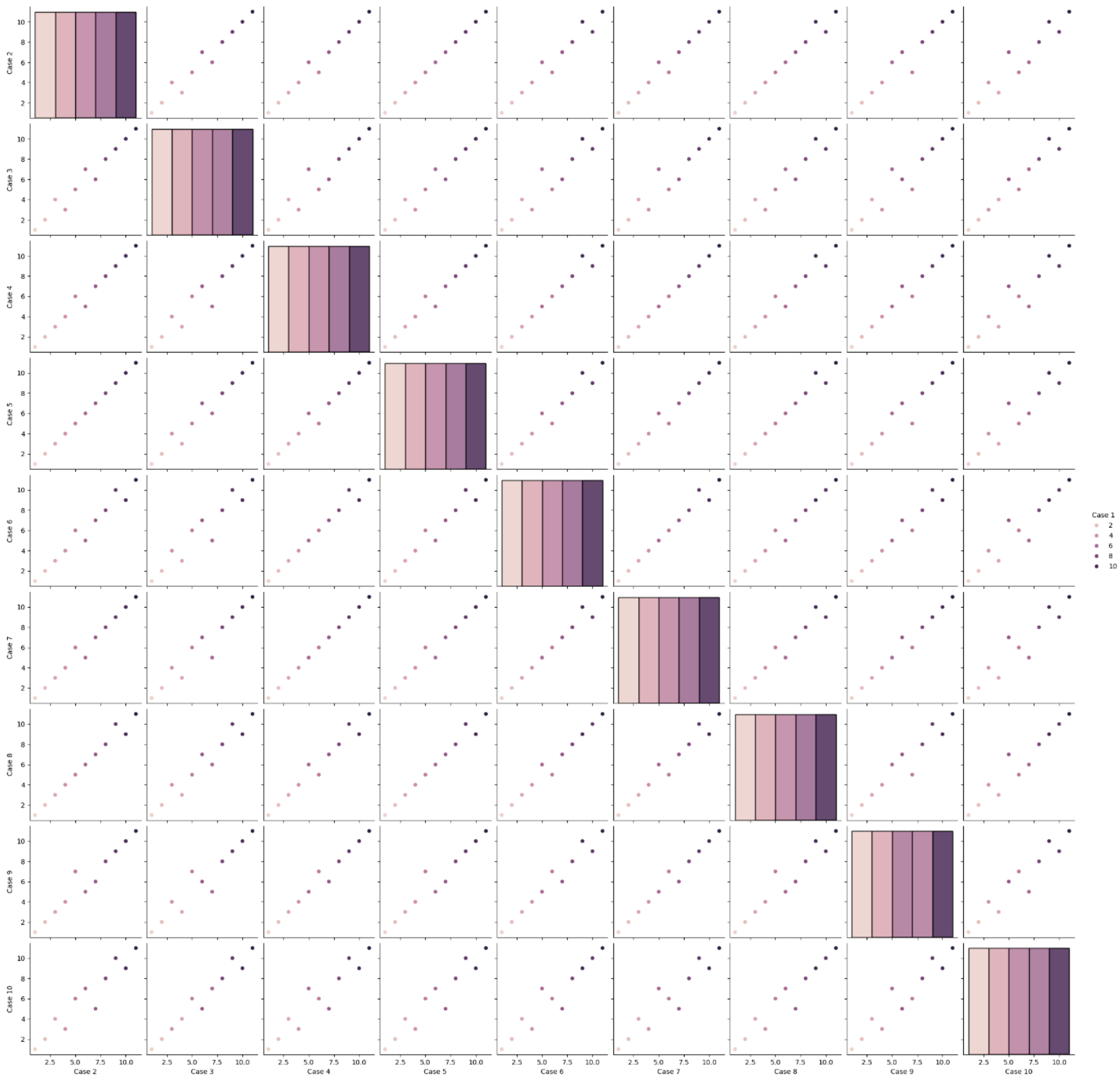

Fig 5. The rank of alternatives with different cases.

5. Conclusions

When deciding on several criteria, the neutrosophic sets and their information aggregation operators have a crucial rule. The generalized form of the neutrosophic set, the bipolar trapezoidal neutrosophic set, and the information aggregation operators under the bipolar trapezoidal neutrosophic were all covered in this study. Furthermore, we suggested two techniques to address various scenarios in the bipolar trapezoidal neutrosophic environment during MCDM operations. The benefits of these comparisons were examined when the outcomes of these algorithms were contrasted with corresponding experimental cases. The steps of the suggested algorithms were. The LMAW method is used under the neutrosophic set to compute the criteria weights. The MARCOS method is used to rank the alternatives. The results of sensitivity analysis show alternative 2 is the best and alternative 9 is the worst.

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