Enhanced CoCoSo Framework for Computer Network Security Evaluation Through Utilizing the Type-2 Neutrosophic Multi-Attribute Group Decision-Making

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Abstract: Computer network security (CNS) evaluation is a comprehensive analysis and assessment of a network system's security to identify potential vulnerabilities and threats, ensuring the system complies with relevant security standards. The evaluation includes the effectiveness of technical measures such as firewalls, intrusion detection, access control, and encryption, to ensure the confidentiality, integrity, and availability of data, ultimately enhancing overall security defenses. The evaluation of CNS is a multi-attribute group decision-making (MAGDM) problem. Recently, both the CoCoSo method and the information entropy approach have been applied to solve MAGDM challenges. Type-2 Neutrosophic Sets (T2NSs) are utilized to represent uncertain data during the network security evaluation process. In this study, the CoCoSo method is adapted for MAGDM with T2NSs. Furthermore, the type-2 Neutrosophic Number with CoCoSo (T2NN-CoCoSo) approach based on T2NN is developed for MAGDM. Finally, a numerical example is provided to demonstrate the application of the T2NN-CoCoSo approach in CNS evaluation. The key contributions of this study include: (1) the development of a MAGDM method using the T2NN-CoCoSo approach with T2NSs, and (2) the proposal of a novel MAGDM approach for CNS evaluation using the T2NN-CoCoSo method.

Keywords: Multiple-attribute group decision-making (MAGDM); T2NSs; CoCoSo approach; information entropy; Computer network security evaluation

1. Introduction

Computer network security is a widely discussed issue. While computers possess certain inherent functionalities, their full potential can only be realized through network connectivity, which relies on internet technology. Every computer can connect to the internet via protocols, but this also means that various security risks associated with the internet constantly pose a threat to computers. As a result, relevant personnel have established a layered evaluation and protection system for CNS. By analyzing the shortcomings of the existing system and providing improvement measures, this has positive implications for future work. Zhan [1] proposed an adaptive BP neural network algorithm optimized by the artificial fish swarm algorithm to evaluate CNS. The study aimed to address the challenges posed by the nonlinearity and complexity of modern network security indicators. The results of simulation tests demonstrated the algorithm's effectiveness in assessing network security. Long and Jiang [2] focused on the development of a CNS evaluation system based on BP neural networks. The study highlighted the open nature of network information transmission and the resulting threats, such as security vulnerabilities and viruses. The authors emphasized the importance of applying BP neural networks to create a reliable security evaluation framework, which helps reduce network security risks. Ma [3] introduced the Fuzzy Analytic Hierarchy Process (FAHP) to evaluate network security risks. The study designed specific steps for applying FAHP to assess the types and characteristics of network security hazards, showing that FAHP could provide valuable insights for network security personnel. Du [4] explored the application of neural networks in CNS evaluation. The study discussed the concepts of CNS and neural networks, and analyzed the principles, system construction, and model design for network security evaluation. The research aimed to improve the accuracy of network security assessments through the use of neural networks. Lu [5] examined the use of BP neural networks and particle swarm optimization algorithms to address common issues in traditional network security evaluations. The study emphasized the utility of these methods in constructing a more secure network framework, particularly for evaluating network safety. Zhang [6] analyzed the potential threats to network security and the value of neural networks in addressing these threats. The paper discussed the advantages and limitations of neural networks when applied to CNS. Luo [7] conducted a detailed study on the application of neural networks in CNS evaluation. By reviewing related literature, the author provided an in-depth analysis of specific strategies for applying neural networks to evaluate network security, aiming to promote the development of computer networks in China. Zhang [8] focused on the practical value of neural networks in assessing CNS. The study analyzed the role of neural networks in addressing security issues arising from virus intrusions and system vulnerabilities. Zhu [9] focused on the construction and application of a layered evaluation and protection system for CNS. This study analyzed the current state of network security, identified issues, and proposed strategies to improve the effectiveness of the layered protection system. Yan [10] discussed the implementation of the GABP neural network algorithm in CNS evaluation. The paper highlighted the importance of adopting more operationally feasible evaluation methods for complex network environments and suggested that the GABP neural network algorithm has significant potential in this regard. Xu [11] analyzed the role of neural networks in CNS evaluation. The author emphasized the importance of applying neural networks to assess network security in the context of continuous network development, aiming to provide useful references for professionals in the field. Meng [12] proposed the use of neural networks for evaluating CNS due to the complex and nonlinear nature of the problem. The study constructed a network security evaluation system based on 14 indicators and demonstrated how neural networks could provide a more objective and comprehensive assessment of network security. Finally, Zhuang [13] combined the AHP with the fuzzy comprehensive evaluation method to evaluate CNS management. The study constructed a security management evaluation system with seven primary indicators and 21 secondary indicators. The results of the fuzzy comprehensive evaluation revealed that training management poses an extremely high risk, suggesting the need for enhanced personnel training.

MAGDM is a process in which multiple decision-makers participate in decision-making based on several attributes or criteria, primarily used to solve complex decision problems[14, 15]. It is widely applied in fields such as management, engineering, and economics, especially in situations where integrating opinions from different parties plays a critical role[16, 17]. In MAGDM, each decision problem typically involves multiple attributes (or criteria), each of which may have different levels of importance or weights. Decision-makers (or experts) evaluate multiple alternatives based on these attributes and then rank the alternatives using certain methods (such as weighted summation, AHP), CoCoSo method [18], etc.) to select the optimal solution. This process requires a comprehensive consideration of the evaluation values and weights of each attribute, while also addressing differences of opinion from various decision-makers [19-21]. A key challenge in MAGDM lies in effectively handling uncertainty and ambiguity, as decision-makers' opinions often contain uncertain information during actual decision-making [22-24]. To address this, tools for managing uncertainty, such as fuzzy set theory, grey system theory, interval numbers and Neutrosophic Sets [25-29], have been introduced into MAGDM in recent years to better express decision-makers' subjective judgments and uncertainties. Moreover, methods like information entropy [30] have been widely used to determine attribute weights. By analyzing the informational relationships between attributes, these methods objectively allocate weights, helping to reduce the influence of subjective human judgment on weight assignment and thus improving the scientific and impartial nature of the decision-making process. In summary, MAGDM provides systematic decision support in complex environments involving multiple criteria and decision-makers, helping decision-makers make the best choices when faced with uncertainty and complexity. The evaluation of CNS falls within the framework of MAGDM. Currently, both the CoCoSo method [18] and entropy-based approach [30] are employed to address various challenges in MAGDM. However, there has been limited application of these methods in combination with T2NSs [31], which are highly effective in representing uncertain and imprecise data, such as that encountered in evaluating virtual reality user experiences. Specifically, the integration of information entropy with the CoCoSo technique[18] in context of T2NSs has not been extensively studied. To address this gap, we propose the T2NN-CoCoSo approach, a novel method to solve MAGDM problems under T2NSs. This approach is designed to handle the complexity and uncertainty inherent in modern decision-making environments, such as CNS evaluation. By incorporating T2NSs, the T2NN-CoCoSo method provides a more flexible and comprehensive framework for representing the uncertain preferences of decision-makers. An illustrative example focusing on the evaluation of virtual reality user experiences is presented to demonstrate the effectiveness and reliability of the T2NN- CoCoSo approach. In addition to this example, a numerical study on CNS evaluation is conducted to validate the practical application of the proposed approach. This study highlights the robustness of the T2NN-CoCoSo technique in addressing real-world MAGDM problems. In this paper, the T2NN -CoCoSo approach is constructed to address MAGDM problems using T2NSs. Furthermore,

The main objectives of this study are as follows:

(1) To develop a MAGDM approach using the T2NN -CoCoSo method under T2NSs;

and (2) To propose a novel MAGDM solution for CNS evaluation utilizing the T2NN-CoCoSo technique. By addressing these objectives, this study contributes to the advancement of decision-making methodologies in complex, uncertain environments like network security.

The structure of this study is organized as follows: Section 2 introduces the T2NSs, providing the background necessary for understanding the subsequent methods. Section 3 describes the development of the T2NN-CoCoSo approach using T2NSs integrated with entropy, detailing the methodological framework. Section 4 presents a numerical example focused on CNS evaluation, accompanied by a comparative analysis to demonstrate the approach's effectiveness. Finally, Section 5 offers concluding remarks, summarizing the key findings and implications of the study.

2. Preliminaries

This section shows some definitions of type-2 neutrosophic set [32,33]as:

Definition 1.

Let X be an initial universe of discourse be a generic element in X. The neutrosophic set can be defined as: $A = (x\!:T_A, I_A, F_A \mid x \in X)$

Definition 2.

We can define the type 2 neutrosophic set (T2NS) as:

$T(x) = \left(T_T(x), T_I(x), T_F(x)\right), I(x) = \left(I_T(x), I_I(x), I_F(x)\right), F(x) = \left(F_T(x), F_I(x), F_F(x)\right)$ and

$0 \leq T_A(x) + I_A(x) + F_A(x) < 3$

Definition 3.

Let $Y_1 = \left\{\left(T_{T_{Y_1}}(x), T_{I_{Y_1}}(x), T_{T_{Y_1}}(x)\right), \left(I_{T_{Y_1}}(x), I_{I_{Y_1}}(x), I_{T_{Y_1}}(x)\right), \left(F_{T_{Y_1}}(x), F_{I_{Y_1}}(x), F_{T_{Y_1}}(x)\right)\right\}$ and

$Y_{12} = \left\{\left(T_{T_{Y_2}}(x), T_{I_{Y_2}}(x), T_{T_{Y_2}}(x)\right), \left(I_{T_{Y_2}}(x), I_{I_{Y_2}}(x), I_{T_{Y_2}}(x)\right), \left(F_{T_{Y_2}}(x), F_{I_{Y_2}}(x), F_{T_{Y_2}}(x)\right)\right\}$ Then

the basic math operations can be defined as:

$$Y_1 \oplus Y_2 = \left\{ \begin{matrix} \left(T_{T_{Y_1}}(x) + T_{T_{Y_2}}(x) - T_{T_{Y_1}}(x)T_{T_{Y_2}}(x), T_{I_{Y_1}}(x) + T_{I_{Y_2}}(x) - T_{I_{Y_1}}(x)T_{I_{Y_2}}(x), \right), \\ T_{T_{Y_1}}(x) + T_{T_{Y_2}}(x) - T_{T_{Y_1}}(x)T_{T_{Y_2}}(x) \\ \left(I_{T_{Y_1}}(x)I_{T_{Y_2}}(x), I_{I_{Y_1}}(x)I_{I_{Y_2}}(x), I_{T_{Y_1}}(x)I_{T_{Y_2}}(x) \right), \\ \left(F_{T_{Y_1}}(x)F_{T_{Y_2}}(x), F_{I_{Y_1}}(x)F_{I_{Y_2}}(x), F_{T_{Y_1}}(x)F_{T_{Y_2}}(x) \right) \end{matrix} \right\} \tag{1}$$

$$Y_1 \otimes Y_2 = \left\{ \begin{matrix} \left(T_{T_{Y_1}}(x)T_{T_{Y_2}}(x), T_{I_{Y_1}}(x)T_{I_{Y_2}}(x), T_{T_{Y_1}}(x)T_{T_{Y_2}}(x) \right), \\ \begin{pmatrix} I_{T_{Y_1}}(x) + I_{T_{Y_2}}(x) - I_{T_{Y_1}}(x)I_{T_{Y_2}}(x), I_{I_{Y_1}}(x) + I_{I_{Y_2}}(x) - I_{I_{Y_1}}(x)I_{I_{Y_2}}(x), \\ I_{T_{Y_2}}(x) + I_{T_{Y_1}}(x) - I_{T_{Y_1}}(x)I_{T_{Y_2}}(x) \end{pmatrix}, \\ \begin{pmatrix} F_{T_{Y_1}}(x) + F_{T_{Y_2}}(x) - F_{T_{Y_1}}(x)F_{T_{Y_2}}(x), F_{I_{Y_1}}(x) + F_{I_{Y_2}}(x) - F_{I_{Y_1}}(x)F_{I_{Y_2}}(x), \\ F_{T_{Y_1}}(x) + F_{T_{Y_2}}(x) - F_{T_{Y_1}}(x)F_{T_{Y_2}}(x) \end{pmatrix} \end{matrix} \right\} \tag{2}$$

Definition 4.

We can compute the score function as:

$$S(Y_1) = \left\{ \frac{1}{12} \begin{pmatrix} 8 + \left(T_{T_{Y_1}}(x) + 2T_{I_{Y_1}}(x) + T_{T_{Y_1}}(x) \right) - \\ \left(I_{T_{Y_1}}(x) + 2I_{I_{Y_1}}(x) + I_{T_{Y_1}}(x) \right) - \\ \left(F_{T_{Y_1}}(x) + 2F_{I_{Y_1}}(x) + F_{T_{Y_1}}(x) \right) \end{pmatrix} \right\} \tag{3}$$

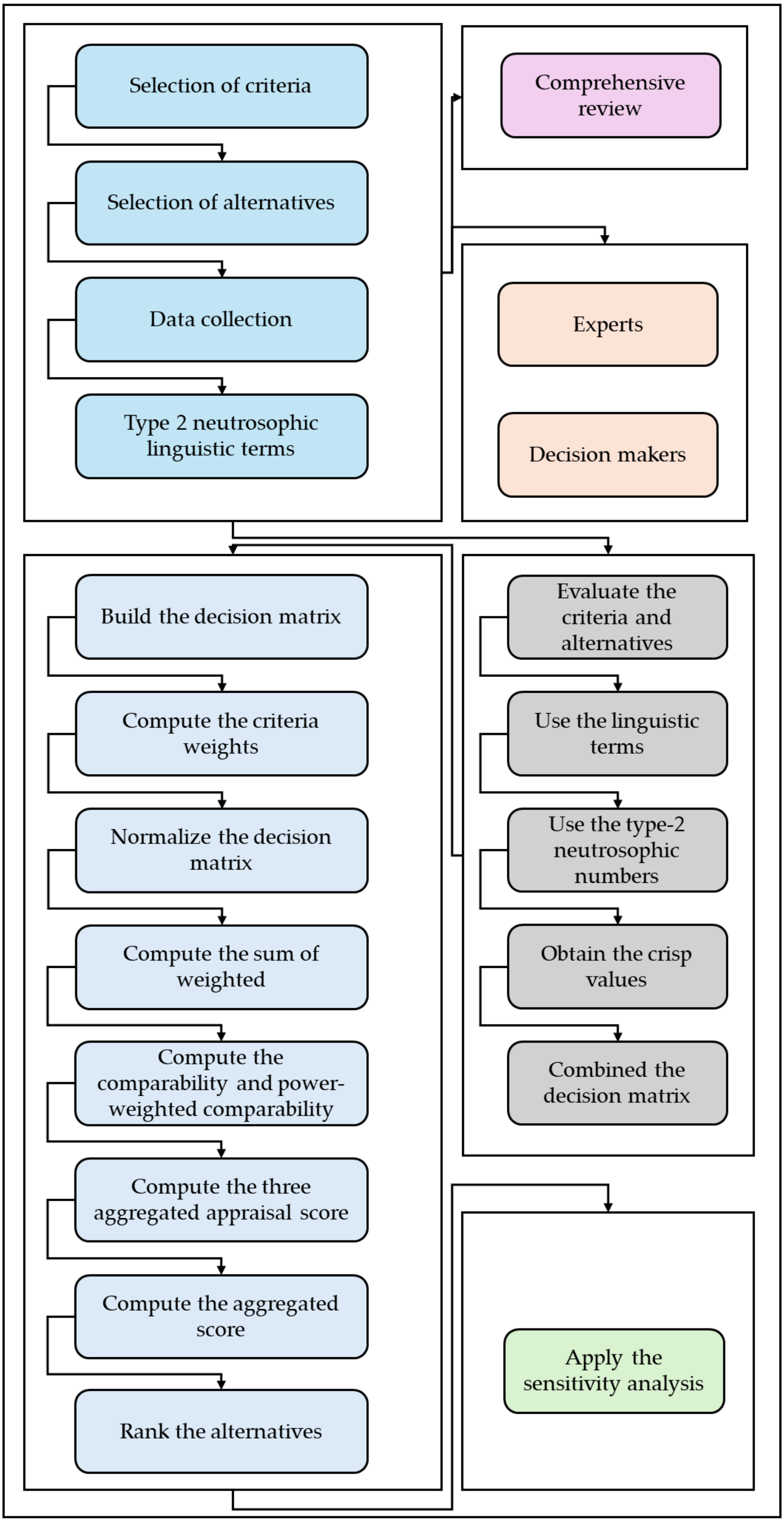
Selection of criteria
Selection of alternatives
Data collection
Type 2 neutrosophic linguistic terms
Comprehensive review
Experts
Decision makers
Build the decision matrix
Compute the criteria weights
Normalize the decision matrix
Compute the sum of weighted
Compute the comparability and power-weighted comparability
Compute the three aggregated appraisal score
Compute the aggregated score
Rank the alternatives
Evaluate the criteria and alternatives
Use the linguistic terms
Use the type-2 neutrosophic numbers
Obtain the crisp values
Combined the decision matrix
Apply the sensitivity analysis

Figure 1. The steps of Type-2 neutrosophic CoCoSo method.

3. Type-2 Neutrosophic Set with CoCoCo

The CoCoSo method used different ideas of different methods such as simple additive weighting weighted aggregated sum product assessment, and multiplicative exponential weighting methods. The CoCoSo method is used to rank alternatives. Figure 1 shows the steps of the CoCoSo method.

Phase 1. Construct the decision matrix.

$$R_1 = \begin{pmatrix} r_{11} & \cdots & r_{1n} \\ \vdots & \ddots & \vdots \\ r_{m1} & \cdots & r_{mn} \end{pmatrix} \tag{4}$$

Phase 2. Normalize the decision matrix

The normalize the decision matrix based on a set of criteria and alternatives.

$$y_{ij} = \frac{r_{ij} - \min\limits_i r_{ij}}{\max\limits_i r_{ij} - \min\limits_i r_{ij}} \text{ for benefit criteria} \tag{5}$$

$$y_{ij} = \frac{\max\limits_i r_{ij} - r_{ij}}{\max\limits_i r_{ij} - \min\limits_i r_{ij}} \text{ for cost criteria} \tag{6}$$

Phase 3. Compute the criteria weights

Phase 4. Compute the sum of weighted comparability and power-weighted comparability sequences for each alternative as:

$$S_i = \sum_{j=1}^{n} (W_j y_{ij}) \tag{6}$$

$$P_i = \sum_{j=1}^{n} (W_j)^{y_{ij}} \tag{7}$$

Phase 5. Compute the three aggregated appraisal score to compute the relative weights of the alternatives.

$$U_{ia} = \frac{P_i + S_i}{\sum_{i=1}^{m}(P_i + S_i)} \tag{8}$$

$$U_{ib} = \frac{S_i}{\min_i P_i} + \frac{P_i}{\min_i P_i} \tag{9}$$

$$U_{ic} = \frac{\theta(S_i) + (1-\theta)P_i}{\theta \max_i S_i + (1-\theta)\max_i P_i} \tag{10}$$

Where $0 \leq \theta \leq 1$

Phase 6. Compute the aggregated score

$$U_i = (U_{ia}\, U_{ib}\, U_{ic})^{1/3} + \frac{1}{3}(U_{ia} + U_{ib} + U_{ic}) \tag{11}$$

Phase 7. Rank the alternatives

4. Numerical example

Computer network security evaluation is a critical process for ensuring the security and stable operation of information systems. Its goal is to identify potential threats, vulnerabilities, and risks within a network through comprehensive analysis and review, and to provide corresponding improvement recommendations. With the rapid advancement of digitization and networking, network security issues are becoming increasingly complex, and the frequency and severity of cyberattacks continue to rise. This makes network security evaluation an indispensable management tool. Firstly, network security evaluation effectively helps organizations identify and analyze security risks. In modern network environments, threats not only come from external hackers but also from internal user errors or malicious actions. Through security evaluation, experts can deeply analyze network structures, data flows, and user behaviors, uncovering potential risk points, which in turn helps organizations build more comprehensive security strategies. Secondly, network security evaluation assists in assessing the effectiveness of existing security measures. Many companies and institutions have deployed various security defense tools, such as firewalls, intrusion detection systems, and data encryption, but whether these measures are truly effective and whether they can counter the latest cyber threats requires verification through security evaluations. By simulating attacks and conducting penetration tests, evaluations can test the performance of these security tools and uncover any deficiencies in their configurations or policies. Moreover, network security evaluation has the function of continuous improvement and optimization. As technology evolves and threats change, network security needs to be constantly adjusted and updated. Regular security evaluations help organizations stay informed about changes in their network environment, identify new security needs, and make targeted adjustments and optimizations to ensure the timeliness and effectiveness of their security defense systems. Lastly, network security evaluation plays a significant role in compliance auditing. Many industries and countries have strict legal and regulatory requirements for network security, such as the PCI-DSS standards in the financial industry or HIPAA compliance in the healthcare field. Through security evaluations, organizations can ensure that their network systems comply with these regulations, avoiding legal risks and penalties due to non-compliance. In conclusion, CNS evaluation is a fundamental method for ensuring network security. It helps organizations gain a comprehensive understanding of their network's security status, enhance overall defense capabilities, and ensure compliance with relevant regulations, thereby effectively addressing the complex and ever-changing landscape of cybersecurity threats. The CNS evaluation is MAGDM. Ten potential computer network systems are evaluated with 14 attributes as shown in Table 1.

Phase 1. Eq. (4) was used to build the decision matrix as displayed in Table A1.

Phase 2. Eq. (5) was used to normalize the decision matrix for all benefit criteria as displayed in Table 2.

Phase 3. Then we obtained the criteria weights as displayed in Figure 2.

Phase 4. Then we used Eqs. (6 and 7) to obtain the sum of weighted comparability and power-weighted comparability sequences as displayed in Tables 3 and 4.

Phase 5. Eqs. (8,9, and 10) was used to obtain the three aggregated appraisal score to compute the relative weights of the alternatives.

Phase 6. Then we compute the aggregated score using Eq. (11).

Phase 7. Then we rank the alternatives as shown in Figure 3.

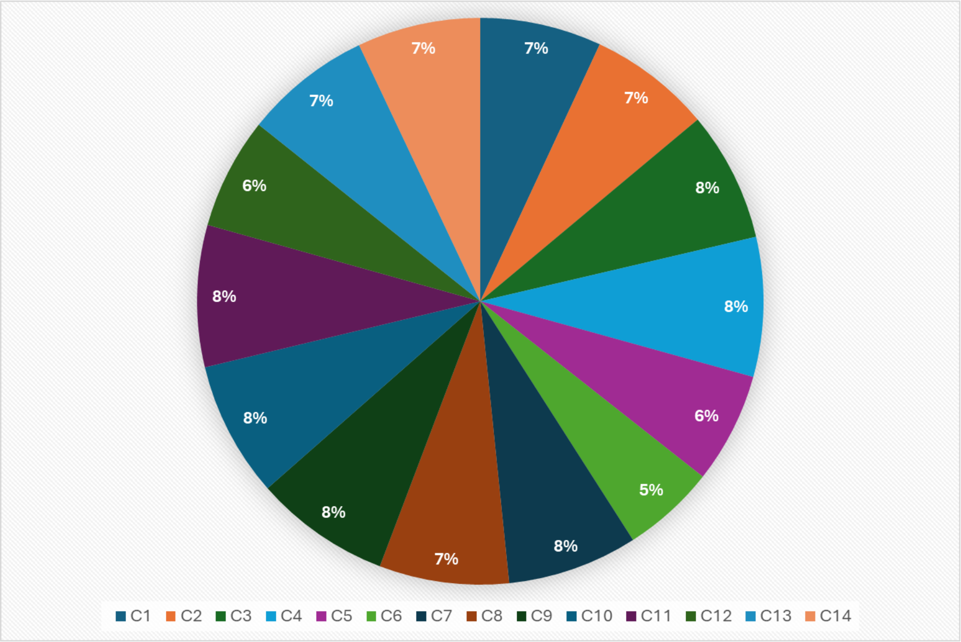

Figure 2. The criteria weights.

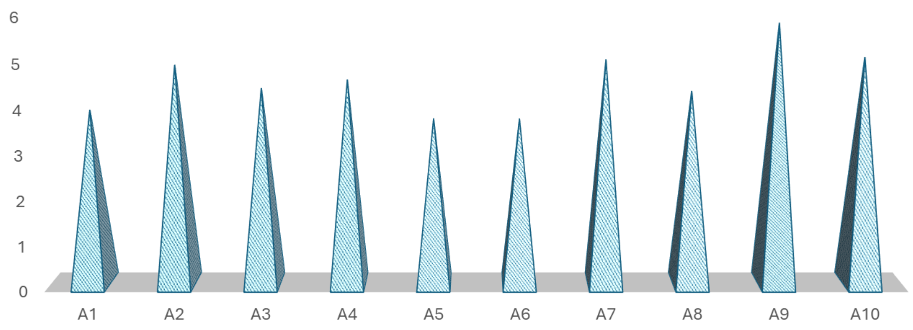

Figure 3. The rank of alternatives.

Table . The 14 criteria of this study.

Symbol	Criteria	Type
C_1	Analyzes potential risks and vulnerabilities	Benefit
C_2	Firewall and Perimeter Security	Benefit
C_3	Includes real-time monitoring and intrusion detection systems	Benefit
C_4	Ensuring that data within the network remains accurate	Benefit
C_5	Ensures the network complies with industry standards	Benefit
C_6	Provides training for users	Benefit
C_7	Controls who can access	Benefit
C_8	Use encryption protocols	Benefit
C_9	Ensures that network resources and data are accessible	Benefit
C_{10}	Verifies of user identities	Benefit
C_{11}	Safe the sensitive information within the network	Benefit
C_{12}	Ensures that network infrastructure has redundancy	Benefit
C_{13}	Regularly scans the network for vulnerabilities	Benefit
C_{14}	Incident Response and Recovery Planning	Benefit

Table 2. The normalized decision matrix.

	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}
C_1	0.742547	0.520325	0.685637	0.99458	1	0.357724	0	0.327913	0.468835	0.485095
C_2	0.963211	0.541806	1	0.444816	0.568562	0.846154	0.67893	0.444816	0	0.963211
C_3	0.976316	0.715789	1	0.563158	0.747368	0.826316	0.142105	0.55	0	0.665789
C_4	1	0.39501	0.802495	0.544699	0.62578	0.600832	0.45738	0.480249	0	1
C_5	0	0.224839	0.24197	1	0.710921	0.503212	0.036403	0.539615	0.862955	0.24197
C_6	0.273063	0.48524	0.341328	0.667897	0.586716	0.647601	1	0.178967	0	0.273063
C_7	0.209677	1	0.778226	0.116935	0.177419	0.197581	0.875	0.568548	0.71371	0
C_8	0.241497	1	0	0.057823	0.377551	0.782313	0.85034	0.557823	0.360544	0.057823
C_9	0.865217	0.913043	0.373913	1	0.604348	0.908696	0	0.082609	0.865217	0.865217
C_{10}	1	0.301818	0.88	0	0.570909	0.872727	0.64	0.349091	0.105455	1
C_{11}	1	0.085443	0.832278	0.174051	0.306962	0.262658	0.221519	0.601266	0	0.528481
C_{12}	1	0.079625	0	0.177986	0.700234	0.388759	0.262295	0.384075	0.079625	0.098361
C_{13}	1	0	0.809237	0.809237	0.497992	0.532129	0.614458	0.614458	0.226908	0.10241
C_{14}	1	0	0.203209	0.540107	0.63369	1	0.171123	0.262032	0.882353	0

Table 3. The Si decision matrix.

	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}
C_1	0.051452	0.036054	0.047509	0.068916	0.069291	0.024787	0	0.022721	0.032486	0.033613
C_2	0.067375	0.037899	0.069949	0.031114	0.03977	0.059187	0.04749	0.031114	0	0.067375
C_3	0.07244	0.053109	0.074197	0.041785	0.055453	0.06131	0.010544	0.040808	0	0.0494
C_4	0.079592	0.03144	0.063872	0.043354	0.049807	0.047821	0.036404	0.038224	0	0.079592

C_5	0	0.014203	0.015286	0.063171	0.04491	0.031789	0.0023	0.034088	0.054514	0.015286
C_6	0.01452	0.025802	0.01815	0.035515	0.031198	0.034435	0.053174	0.009516	0	0.01452
C_7	0.015589	0.074349	0.05786	0.008694	0.013191	0.01469	0.065055	0.042271	0.053063	0
C_8	0.017874	0.074012	0	0.00428	0.027943	0.0579	0.062935	0.041285	0.026684	0.00428
C_9	0.067099	0.070808	0.028998	0.077552	0.046868	0.070471	0	0.006406	0.067099	0.067099
C_{10}	0.077265	0.02332	0.067994	0	0.044112	0.067432	0.04945	0.026973	0.008148	0.077265
C_{11}	0.08089	0.006912	0.067323	0.014079	0.02483	0.021246	0.017919	0.048636	0	0.042749
C_{12}	0.063626	0.005066	0	0.011325	0.044553	0.024735	0.016689	0.024437	0.005066	0.006258
C_{13}	0.072545	0	0.058706	0.058706	0.036127	0.038603	0.044576	0.044576	0.016461	0.007429
C_{14}	0.070387	0	0.014303	0.038016	0.044603	0.070387	0.012045	0.018444	0.062106	0

Table 4. The Pi decision matrix.

	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}
C_1	0.137768	0.24933	0.160371	0.070301	0.069291	0.384842	1	0.416718	0.286068	0.273917
C_2	0.07714	0.236643	0.069949	0.306294	0.220387	0.105319	0.164318	0.306294	1	0.07714
C_3	0.078912	0.155394	0.074197	0.231126	0.143141	0.116569	0.690997	0.239173	1	0.176976
C_4	0.079592	0.367987	0.131206	0.251945	0.205204	0.218579	0.314253	0.296581	1	0.079592
C_5	1	0.537415	0.51258	0.063171	0.140367	0.249119	0.904348	0.22529	0.092236	0.51258
C_6	0.448782	0.240801	0.36732	0.140896	0.178791	0.149541	0.053174	0.591483	1	0.448782
C_7	0.579871	0.074349	0.132311	0.737924	0.630583	0.598392	0.102888	0.228173	0.156465	1
C_8	0.533261	0.074012	1	0.86024	0.374199	0.130448	0.109275	0.234029	0.39114	0.86024
C_9	0.10946	0.096861	0.384419	0.077552	0.213269	0.097944	1	0.8096	0.10946	0.10946
C_{10}	0.077265	0.461715	0.105058	1	0.231815	0.107032	0.194227	0.409078	0.763366	0.077265
C_{11}	0.08089	0.806654	0.123329	0.645533	0.462131	0.516595	0.572899	0.220473	1	0.264755
C_{12}	0.063626	0.803044	1	0.612441	0.1453	0.342692	0.485512	0.347142	0.803044	0.762649
C_{13}	0.072545	1	0.119663	0.119663	0.270764	0.247569	0.199476	0.199476	0.551395	0.76439
C_{14}	0.070387	1	0.583177	0.238519	0.186066	0.070387	0.635008	0.498891	0.096179	1

4.1 Sensitivity Analysis

We change the criteria weight under different values as shown in Table 5 to show different weights. In the first case, we put all cases with the same weight. In the second case, we put the first criterion with 0.1 weight and other have the same weight. Then we applied the CoCoSo method under different weights. Then we rank the alternatives as displayed in Figure 4. We show the alternative 9 is the best in all cases and alternative 6 is the worst in all cases.

Table 5. The different criteria weights.

	Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8	Z_9	Z_{10}	Z_{11}	Z_{12}	Z_{13}	Z_{14}	Z_{15}

C_1	0.071429	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_2	0.071429	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_3	0.071429	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_4	0.071429	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_5	0.071429	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_6	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_7	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_8	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231
C_9	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231	0.069231
C_{10}	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231	0.069231
C_{11}	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231	0.069231
C_{12}	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231	0.069231
C_{13}	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1	0.069231
C_{14}	0.071429	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.069231	0.1

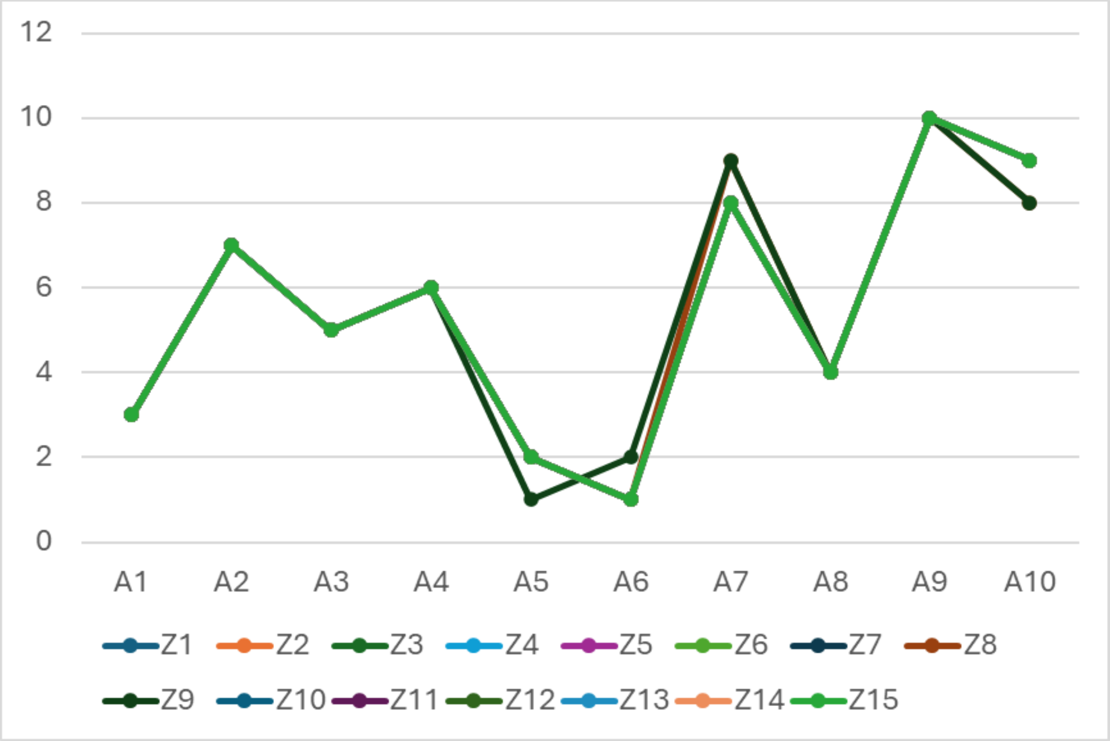

Figure 4. The rank of alternatives under different weights.

5. Conclusion

The significance of CNS evaluation lies in ensuring the security, stability, and reliability of network systems. As cyberattacks become increasingly complex and diverse, network security has become a critical issue in the information society. Through systematic security evaluations, potential vulnerabilities and threats can be comprehensively identified, and the effectiveness of existing security measures can be assessed, providing administrators with recommendations for improvement. Security evaluation also ensures the confidentiality, integrity, and availability of data, preventing information leakage, tampering, or loss. Additionally, it helps network systems comply with national or industry security standards and regulations, reducing the economic losses and reputational damage caused by security incidents, while enhancing overall network defense capabilities and risk management. The evaluation of CNS is a MAGDM problem. Recently, the CoCoSo method has been employed to tackle MAGDM issues effectively. In this context, T2NSs are utilized to represent and manage uncertain data during the process of network security evaluation, providing a more flexible and comprehensive approach to handling uncertainty. In this study, we propose the development of T2NN-CD-CoCoSo approach to introduce an enhanced MAGDM technique under the framework of T2NSs. This approach allows for better decision-making in scenarios where uncertainty plays a significant role. To demonstrate the practicality and effectiveness of the proposed T2NN-CD-CoCoSo approach, a numerical example is provided, focusing on the application of this method to CNS evaluation. This example validates the approach by showing how it can improve decision-making and enhance the overall security assessment process.

References

[1] J. Zhan, Computer network security evaluation based on adaptive bp neural networks,

Modern Electronic Technology, 38 (2015) 85-88.

[2] K. Long, R. Jiang, Research on computer network security evaluation based on neural networks, Wireless Internet Technology, (2016) 26-27.

[3] X. Ma, Research on computer network security evaluation based on fuzzy analytic hierarchy process, Information Communication, (2017) 98-99.

[4] Y. Du, Research on the application of neural networks in computer network security evaluation, Computer Knowledge and Technology, 13 (2017) 40-41.

[5] Y. Lu, Application of neural networks in computer network security evaluation, Communication World, (2018) 78-79.

[6] R. Zhang, Analysis of the application of neural networks in computer network security evaluation, Digital World, (2018) 61.

[7] M. Luo, Research on the application of neural networks in computer network security evaluation, Computer Products & Circulation, (2019) 61.

[8] Z. Zhang, Application of neural networks in computer network security evaluation, Electronic Technology & Software Engineering, (2019) 176.

[9] Y. Zhu, Research on the construction and application of a layered evaluation and protection system for computer network security, Popular Standardization, (2020) 50-51.

[10] C. Yan, Analysis of the implementation of the gabp neural network algorithm in computer network security evaluation, Computer Knowledge and Technology, 17 (2021) 70-71.

[11] J. Xu, Application of neural networks in computer network security evaluation, Network Security Technology & Application, (2022) 9-10.

[12] W. Meng, Research on the application of neural networks in computer network security evaluation, Metallurgy and Materials, 43 (2023) 157-159.

[13] L. Zhuang, Research on computer network security management based on fuzzy comprehensive evaluation method, Industrial Innovation Research, (2024) 87-89.

[14] R. Mohamed, M.M. Ismail, Leveraging an uncertainty methodology to appraise risk factors threatening sustainability of food supply chain, Neutrosophic Systems with Applications, 19 (2024) 30-52.

[15] M. Luo, Z. Sun, L. Wu, Fuzzy inference quintuple implication method based on single valued neutrosophic t-representable t-norm, Neutrosophic Optimization and Intelligent Systems, 3 (2024) 8-22.

[16] M. Saqlain, P. Kumam, W. Kumam, Neutrosophic linguistic valued hypersoft set with application: Medical diagnosis and treatment, Neutrosophic Sets and Systems, 63 (2024) 130-152.

[17] A. Salem, M. Mohamed, F. Smarandache, Im4.0ef: Tele-medical realization via integrating vague t2nss with owcm-ram toward intelligent medical 4.0 evaluator framework, Sustainable Machine Intelligence Journal, 9 (2024) 79-88.

[18] M. Yazdani, P. Zarate, E.K. Zavadskas, Z. Turskis, A combined compromise solution (cocoso) method for multi-criteria decision-making problems., Management Decision, 57 (2018) 2501-2519.

[19] A.K. Das, N. Gupta, C. Granados, R. Das, S. Das, Neutrosophic approach to water quality assessment: A case study of gomati river, the largest river in tripura, india, Neutrosophic Systems with Applications, 22 (2024) 1-12.

[20] V. Christianto, F. Smarandache, The convergence of ikigai and design thinking: Crafting a purposeful framework, Sustainable Machine Intelligence Journal, 7 (2024) (1):1-8.

[21] T.B. Taha, H.E. Khalid, Neutrosophic similarity measure for assessing digital watermarked images, Neutrosophic Sets and Systems, 61 (2023) 53-68.

[22] J. Ye, B.Z. Sun, X.L. Chu, J.M. Zhan, J.X. Cai, Valued outranking relation-based heterogeneous multi-decision multigranulation probabilistic rough set and its use in medical decision-making, Expert Systems with Applications, 228 (2023) 18.

[23] J. Ye, B.Z. Sun, X.L. Chu, J.M. Zhan, Q. Bao, J.X. Cai, A novel diversified attribute group decision-making method over multisource heterogeneous fuzzy decision systems with its application to gout diagnosis, Ieee Transactions on Fuzzy Systems, 31 (2023) 1780-1794.

[24] J. Ye, S.G. Du, R. Yong, Multi-criteria decision-making model using trigonometric aggregation operators of single-valued neutrosophic credibility numbers, Information Sciences, 644 (2023) 17.

[25] F. Smarandache, Foundation of revolutionary topologies: An overview, examples, trend

analysis, research issues, challenges, and future directions, Neutrosophic Systems with Applications, 13 (2024) 45-66.

[26] F. Smarandache, Neutrosophy transcends binary oppositions in mythology and folklore, Neutrosophic Sets and Systems, 65 (2024) 55-79.

[27] F. Smarandache, Foundation of superhyperstructure & neutrosophic superhyperstructure (review paper), Neutrosophic Sets and Systems, 63 (2024) 367-381.

[28] H. Wang, F. Smarandache, Y. Zhang, R. Sunderraman, Single-valued neutrosophic sets, Multispace and Multistructure, 4 (2010) 410-413.

[29] F.A. Smarandache, Unifying field in logics. Neutrosophy: Neutrosophic probability, set and logic, American Research Press, Rehoboth, 1999.

[30] C.E. Shannon, A mathematical theory of communication, Bell System Technical Journal, 27 (1948) 379-423.

[31] H. Wang, F. Smarandache, Y.Q. Zhang, R. Sunderraman, Interval neutrosophic sets and logic: Theory and applications in computing, Hexis: Phoenix, AZ, USA, (2005).

[32] M. Abdel-Basset, M. Saleh, A. Gamal, and F. Smarandache, "An approach of TOPSIS technique for developing supplier selection with group decision making under type-2 neutrosophic number," *Appl. Soft Comput.*, vol. 77, pp. 438–452, 2019..

[33] M. Deveci, N. Erdogan, U. Cali, J. Stekli, and S. Zhong, "Type-2 neutrosophic number based multi-attributive border approximation area comparison (MABAC) approach for offshore wind farm site selection in USA," Eng. Appl. Artif. Intell., vol. 103, p. 104311, 2021.

Appendix

Table A1. The decision matrix.

	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}
C_1	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))
C_2	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))

C_3	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))
C_4	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))
C_5	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))
C_6	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))		((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_7	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))
C_8	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))
C_9	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))
C_{10}	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))
C_{11}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))
C_{12}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))
C_{13}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_{14}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))
	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}
C_1	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))
C_2	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))

C_3	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))
C_4	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))
C_5	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))
C_6	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))		((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_7	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))
C_8	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))
C_9	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))
C_{10}	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))
C_{11}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))
C_{12}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))
C_{13}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_{14}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))
	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}
C_1	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))
C_2	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))

C_3	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_4	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))
C_5	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))
C_6	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_7	((0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_8	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_9	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))
C_{10}	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))
C_{11}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_{12}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))
C_{13}	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))
C_{14}	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45))	((0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15))	((0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))	((0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65))	((0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05))	((0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70))

Received: Aug 14, 2024. Accepted: Nov 2, 2024