Medical diagnostics based on correlation measure of quadripartitioned single valued neutrosophic refined sets

Arokia Pratheesha S V [1] and Mohana K [2]

[1] *Research Scholar, Nirmala College for Women, Coimbatore;*

[2] *Assistant Professor, Nirmala College for Women, Coimbatore*

pratheesha555@gmail.com; riyaraju1116@gmail.com

Abstract: The correlation measure for quadripartitioned single-valued neutrosophic refined sets (QSVNRS) is introduce and few fundamental characteristics are demonstrate in this paper. The correlation of the QSVNRS measure is used to apply medical diagnostics and pattern recognition.

Keywords: *Neutrsophic refined sets; Quadripartitioned single valued neutrosophic refined sets,; Correlation measure ; Medical diagnosis*

1. INTRODUCTION

Lotfi A. Zadeh[13] independently developed fuzzy set theory (FS). Sets with elements that have varying degrees of membership and non-membership are known as intuitionistic fuzzy sets (IFS). Krassimir Atanassov introduced IFS as an extended of Lotfi Zadeh's notion of FS, which in turn expands the conventional theory of a set. Neutosophic Sets (NSs), which are an extended of FS and IFS, were proposed by Smarandache[9]. Wang et al. [11] proposed single valued NS (SVNS), a unique instance of NS. SVNS are currently commonly employed in medical analysis.The truth,a contradiction an unknown and falsity membership function are four quadripartitioned SVNS that Chatterjee[7] evoloved. The idea of intuitionistic fuzzy multisets (IFMs) and fuzzy multisets (FMs) as a generalisation of the idea of neutrosophic refined sets (NRS) is one put up by Deli et al.[5].

The IFMS correlation measure was proposed by Rajarajeswari and Uma [8]. The correlation coefficient between INS was proposed by Broumi and Smarandache [3]. Hanafy and colleagues [6] constructed, examined, and focused on some of the relationship coefficient of NSs' highlights in light of the centroid technique. The Haudroff distance between NSs was recently described by Bromi and Smarandache, along with other similarity measures based on the distance, including the set theoretic method and matching function to determine the degree of similarity between NSs. The correlation coefficient between interval NSs was also proposed that year by Broumi and Smarandache [11]. The framework of this document is as follows: Fundamental definitions of QSVNRS provides in Section 2. The idea of a QSVNRS correlation measure are investigated in Section 3.discusses a technique for using pattern recognition and the QSVNRS correlation measure in medical diagnosis issues in Section 4.

2. PRELIMINARIES

Definition 2.1 [2] A QSVNRS $\mathfrak{P}$ on $\mathfrak{G}$ is in the form of

$\mathfrak{P}$ = { ⟨ σ, $T^i_{\mathfrak{P}}(\sigma)$, $D^i_{\mathfrak{P}}(\sigma)$, $Y^i_{\mathfrak{P}}(\sigma)$, $F^i_{\mathfrak{P}}(\sigma)$ ⟩ : $\sigma \in \mathfrak{G}$ } (i = 1,2….P) where , $T^i_{\mathfrak{P}}(\sigma)$, $D^i_{\mathfrak{P}}(\sigma)$, $Y^i_{\mathfrak{P}}(\sigma)$, $F^i_{\mathfrak{P}}(\sigma)$: $\mathfrak{G} \rightarrow [0,1]$ such that $0 \leq T^i_{\mathfrak{P}}(\sigma)+ D^i_{\mathfrak{P}}(\sigma)+ Y^i_{\mathfrak{P}}(\sigma)+ F^i_{\mathfrak{P}}(\sigma) \leq 4$ (i = 1,2….P) .Here $T^i_{\mathfrak{P}}(\sigma)$, $D^i_{\mathfrak{P}}(\sigma)$, $Y^i_{\mathfrak{P}}(\sigma)$, $F^i_{\mathfrak{P}}(\sigma)$ is the truth, a contradiction, an unknown and a falsity membership sequences of the element $\sigma \in \mathfrak{G}$ respectively. P is often referred to as QSVNRS ($\mathfrak{P}$) dimension.

Definition 2.2 [2] The complement of a QSVNRS $\mathfrak{P}$ on $\mathfrak{R}$ is denoted by $\mathfrak{P}^{\tilde{c}}$

$$\mathfrak{P}^{\tilde{c}} = \{ \langle \sigma, F^i_{\mathfrak{P}}(\sigma), Y^i_{\mathfrak{P}}(\sigma), D^i_{\mathfrak{P}}(\sigma), T^i_{\mathfrak{P}}(\sigma) \rangle : \sigma \in \mathfrak{G} \}$$

That is , $F^i_{\mathfrak{P}}(\sigma) = T^i_{\mathfrak{P}}(\sigma)$, $Y^i_{\mathfrak{P}}(\sigma) = D^i_{\mathfrak{P}}(\sigma)$, $D^i_{\mathfrak{P}}(\sigma) = Y^i_{\mathfrak{P}}(\sigma)$ and $T^i_{\mathfrak{P}}(\sigma) = F^i_{\mathfrak{P}}(\sigma)$ for all $\sigma \in \mathfrak{G}$ and (i = 1,2….P).

Definition 2.3 [4] A NRS ℵ and ℷ on $\mathfrak{R}$ = { σ_1 , σ_2,………, σ_n} of the form

ℵ = { ⟨ σ_k, $T^i_{\mathfrak{P}}(\sigma_k)$, $D^i_{\mathfrak{P}}(\sigma_k)$, $F^i_{\mathfrak{P}}(\sigma_k)$ ⟩ : $\sigma_k \in \mathfrak{R}$ } and

ℷ = { ⟨ σ_k, $T^i_{ℷ}(\sigma_k)$, $D^i_{ℷ}(\sigma_k)$, $F^i_{ℷ}(\sigma_k)$ ⟩ : $\sigma_k \in \mathfrak{R}$}

Then the correlation between ℵ and ℷ

$$\rho_{NRS}(ℵ, ℷ) = \frac{C_{NRS}((ℵ,ℷ)}{\sqrt{C_{NRS}(ℵ,ℵ) \cdot C_{NRS}(ℷ,ℷ)}} \quad \text{where}$$

$$C_{NRS}((ℵ,ℷ) = \frac{1}{\eta}\sum_{\mathrm{i}=1}^{\mathrm{P}}\sum_{k=1}^{n}\{T^i_{ℵ}(\sigma_k)\, T^i_{ℷ}(\sigma_k) + D^i_{ℵ}(\sigma_k) D^i_{ℷ}(\sigma_k) + F^i_{ℵ}(\sigma_k) F^i_{ℷ}(\sigma_k)\}$$

$$C_{NRS}(ℵ,ℵ) = \frac{1}{\eta}\sum_{\mathrm{i}=1}^{\mathrm{p}}\sum_{k=1}^{n}\{T^i_{ℵ}(\sigma_k) T^i_{ℵ}(\sigma_k) + D^i_{ℵ}(\sigma_k) D^i_{ℵ}(\sigma_k) + F^i_{ℵ}(\sigma_k) F^i_{ℵ}(\sigma_k)\}$$

And

$$C_{NRS}(ℷ,ℷ) = \frac{1}{\eta}\sum_{\mathrm{i}=1}^{\mathrm{p}}\sum_{k=1}^{n}\{T^i_{ℷ}(\sigma_k)\, T^i_{ℷ}(\sigma_k) + D^i_{ℷ}(\sigma_k) D^i_{ℷ}(\sigma_k) + F^i_{ℷ}(\sigma_k) F^i_{ℷ}(\sigma_k)\}$$

3. Correlation Measure of Quadripartitioned Single Valued Neutrosophic Refined Sets

Definition 3.1. A QSVNRS $\mathfrak{Y}$ and $\mathfrak{H}$ on $\mathfrak{R}$ = { $\mathfrak{d}_1$, $\mathfrak{d}_2$,………, $\mathfrak{d}_n$} of the form

$\mathfrak{Y}$ = { ⟨ $\mathfrak{d}_k$, $T^i_{\mathfrak{Y}}(\mathfrak{d}_k)$, $D^i_{\mathfrak{Y}}(\mathfrak{d}_k)$, $Y^i_{\mathfrak{Y}}(\mathfrak{d}_k)$, $F^i_{\mathfrak{Y}}(\mathfrak{d}_k)$ ⟩ : $\mathfrak{d}_k \in \mathfrak{R}$ } and $\mathfrak{H}$ = { ⟨ $\mathfrak{d}_k$, $T^i_{\mathfrak{H}}(\mathfrak{d}_k)$, $D^i_{\mathfrak{H}}(\mathfrak{d}_k)$, $Y^i_{\mathfrak{H}}(\mathfrak{d}_k)$, $F^i_{\mathfrak{H}}(\mathfrak{d}_k)$ ⟩ : $\mathfrak{d}_k \in \mathfrak{R}$}

Then the correlation between $\mathfrak{Y}$ and $\mathfrak{H}$

$$\rho_{QSVNRS}(\mathfrak{Y},\mathfrak{H}) = \frac{C_{QSVNRS}(\mathfrak{Y},\mathfrak{H})}{\sqrt{C_{QSVNRS}(\mathfrak{Y},\mathfrak{Y}) \cdot C_{QSVNRS}(\mathfrak{H},\mathfrak{H})}}$$

Where

$$C_{QSVNRS}(\mathfrak{Y},\mathfrak{H}) = \frac{1}{\eta}\sum_{i=1}^{p}\sum_{k=1}^{n}\{T_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)\, T_{\mathfrak{H}}^{i}(\mathfrak{d}_k)) + D_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)D_{\mathfrak{H}}^{i}(\mathfrak{d}_k) + Y_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)Y_{\mathfrak{H}}^{i}(\mathfrak{d}_k) + F_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)F_{\mathfrak{H}}^{i}(\mathfrak{d}_k)\}$$

$$C_{QSVNRS}(\mathfrak{Y},\mathfrak{Y}) = \frac{1}{\eta}\sum_{i=1}^{p}\sum_{k=1}^{n}\{T_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)T_{\mathfrak{Y}}^{i}(\mathfrak{d}_k) + D_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)\, D_{\mathfrak{Y}}^{i}(\mathfrak{d}_k) + Y_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)Y_{\mathfrak{Y}}^{i}(\mathfrak{d}_k) + F_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)\, F_{\mathfrak{Y}}^{i}(\mathfrak{d}_k)\}$$

And

$$C_{QSVNRS}(\mathfrak{H},\mathfrak{H} = \frac{1}{\eta}\sum_{i=1}^{p}\sum_{k=1}^{n}\{T_{\mathfrak{H}}^{i}(\mathfrak{d}_k)T_{\mathfrak{H}}^{i}(\mathfrak{d}_k) + D_{\mathfrak{H}}^{i}(\mathfrak{d}_k)D_{\mathfrak{H}}^{i}(\mathfrak{d}_k) + Y_{\mathfrak{H}}^{i}(\mathfrak{d}_k)Y_{\mathfrak{H}}^{i}(\mathfrak{d}_k) + F_{\mathfrak{H}}^{i}(\mathfrak{d}_k)F_{\mathfrak{H}}^{i}(\mathfrak{d}_k)\}$$

Proposition 3.2. The correlation measure $\rho_{QSVNRS}(\varsigma,\varrho)$ for two QSVNRS ς and ϱ in $\mathfrak{N}$ should satisfy the following properties

a) $0_{QSVNRS} \leq \rho_{QSVNRS}(\varsigma,\varrho) \leq 1_{QSVNRS}$
b) $\rho_{QSVNRS}(\varsigma,\varrho) = 1_{QSVNRS}$ iff $\varsigma = \varrho$
c) $\rho_{QSVNRS}(\varsigma,\varrho) = \rho_{QSVNRS}(\varrho,\varsigma)$

Proof:

a) $0_{QSVNRS} \leq \rho_{QSVNRS}(\varsigma,\varrho) \leq 1_{QSVNRS}$

Since the truth, contradiction, unknown and falsity are the membership sequences of QSVNRS lies between $0_{QSVNRS}$and 1_{QSVNRS} , $\rho_{QSVNRS}(\varsigma,\varrho)$ also lies between 0_{QSVNRS} and1_{QSVNRS}.

b) $\rho_{QSVNRS}(\varsigma,\varrho)= 1_{QSVNRS}$ iff $\varsigma = \varrho$

If the two QSVNRS ς and ϱ be equal (i.e $\varsigma = \varrho$). Therefore

$T_{\varsigma}^{i}(\mathfrak{d}_k) = T_{\varrho}^{i}(\mathfrak{d}_k)$, $D_{\varsigma}^{i}(\mathfrak{d}_k) = D_{\varrho}^{i}(\mathfrak{d}_k)$, $Y_{\varsigma}^{i}(\mathfrak{d}_k) = Y_{\varrho}^{i}(\mathfrak{d}_k)$ and $F_{\varsigma}^{i}(\mathfrak{d}_k) = F_{\varrho}^{i}(\mathfrak{d}_k)$

Then

$C_{QSVNRS}(\varsigma,\varsigma) = C_{QSVNRS}(\varrho,\varrho)$

$$= \frac{1}{\eta}\sum_{i=1}^{p}\sum_{k=1}^{n}\{T_{\varsigma}^{i}(\mathfrak{d}_k)\, T_{\varsigma}^{i}(\mathfrak{d}_k) + D_{\varsigma}^{i}(\mathfrak{d}_k)D_{\varsigma}^{i}(\mathfrak{d}_k) + Y_{\varsigma}^{i}(\mathfrak{d}_k)Y_{\varsigma}^{i}(\mathfrak{d}_k) + F_{\varsigma}^{i}(\mathfrak{d}_k)F_{\varsigma}^{i}(\mathfrak{d}_k)\}$$

and

$$C_{QSVNRS}(\varsigma,\varrho) = \frac{1}{\eta}\sum_{\mathrm{i}=1}^{\mathrm{P}}\sum_{k=1}^{n}\{T_{\varsigma}^{i}(\mathfrak{d}_k)\, T_{\varrho}^{i}(\mathfrak{d}_k) + D_{\varsigma}^{i}(\mathfrak{d}_k)D_{\varrho}^{i}(\mathfrak{d}_k) + Y_{\varsigma}^{i}(\mathfrak{d}_k)Y_{\varrho}^{i}(\mathfrak{d}_k) + F_{\varsigma}^{i}(\mathfrak{d}_k)F_{\varrho}^{i}(\mathfrak{d}_k)\}$$

$$= \frac{1}{\eta}\sum_{\mathrm{i}=1}^{\mathrm{p}}\sum_{k=1}^{n}\{T_{\varsigma}^{i}(\mathfrak{d}_k)\, T_{\varsigma}^{i}(\mathfrak{d}_k) + D_{\varsigma}^{i}(\mathfrak{d}_k)D_{\varsigma}^{i}(\mathfrak{d}_k) + Y_{\varsigma}^{i}(\mathfrak{d}_k)Y_{\varsigma}^{i}(\mathfrak{d}_k) + F_{\varsigma}^{i}(\mathfrak{d}_k)F_{\varsigma}^{i}(\mathfrak{d}_k)\}$$

$$= C_{QSVNRS}(\varrho,\varrho)$$

Hence

$$\rho_{QSVNRS}(\varsigma,\varrho) = \frac{C_{QSVNRS}(\varsigma,\varrho)}{\sqrt{C_{QSVNRS}(\varsigma,\varsigma)\,.\,C_{QSVNRS}(\varrho,\varrho)}} = \frac{C_{QSVNRS}(\varsigma,\varsigma)}{\sqrt{C_{QSVNRS}(\varsigma,\varsigma)\,.\,C_{QSVNRS}(\varsigma,\varsigma)}} = 1_{QSVNRS}$$

Now $\rho_{QSVNRS}(\varsigma,\varrho) = 1_{QSVNRS}$

The unit measure is possible only if

$$\frac{C_{QSVNRS}(\varsigma,\varrho)}{\sqrt{C_{QSVNRS}(\varsigma,\varsigma)\,.\,C_{QSVNRS}(\varrho,\varrho)}} = 1_{QSVNRS}$$

Then refers $T_{\varsigma}^{i}(\mathfrak{d}_k) = T_{\varrho}^{i}(\mathfrak{d}_k)$, $D_{\varsigma}^{i}(\mathfrak{d}_k) = D_{\varrho}^{i}(\mathfrak{d}_k)$, $Y_{\varsigma}^{i}(\mathfrak{d}_k) = Y_{\varrho}^{i}(\mathfrak{d}_k)$ and $F_{\varsigma}^{i}(\mathfrak{d}_k) = F_{\varrho}^{i}(\mathfrak{d}_k)$

for every i,k values. Therefore $\varsigma = \varrho$

It is clear that $\frac{C_{QSVNRS}(\varsigma,\varrho)}{\sqrt{C_{QSVNRS}(\varsigma,\varsigma)\,.\,C_{QSVNRS}(\varrho,\varrho)}} = \frac{C_{QSVNRS}(\varrho,\varsigma)}{\sqrt{C_{QSVNRS}(\varsigma,\varsigma)\,.\,C_{QSVNRS}(\varrho,\varrho)}}$

$$= \rho_{QSVNRS}(\varrho,\varsigma)$$

$$C_{QSVNRS}(\varsigma,\varrho) = \frac{1}{\eta}\sum_{\mathrm{i}=1}^{\mathrm{P}}\sum_{k=1}^{n}\{T_{\varsigma}^{i}(\mathfrak{d}_k)\, T_{\varrho}^{i}(\mathfrak{d}_k) + D_{\varsigma}^{i}(\mathfrak{d}_k)D_{\varrho}^{i}(\mathfrak{d}_k) + Y_{\varsigma}^{i}(\mathfrak{d}_k)Y_{\varrho}^{i}(\mathfrak{d}_k) + F_{\varsigma}^{i}(\mathfrak{d}_k)F_{\varrho}^{i}(\mathfrak{d}_k)\}$$

$$= \frac{1}{\eta}\sum_{\mathrm{i}=1}^{\mathrm{P}}\sum_{k=1}^{n}\{T_{\varrho}^{i}(\mathfrak{d}_k)T_{\varsigma}^{i}(\mathfrak{d}_k) + D_{\varrho}^{i}(\mathfrak{d}_k)\, D_{\varsigma}^{i}(\mathfrak{d}_k) + Y_{\varrho}^{i}(\mathfrak{d}_k)Y_{\varsigma}^{i}(\mathfrak{d}_k) + F_{\varrho}^{i}(\mathfrak{d}_k)F_{\varsigma}^{i}(\mathfrak{d}_k)\}$$

$$= C_{QSVNRS}(\varrho,\varsigma)$$

4. Application of Medical Diagnosis using QSVNRS – Correlation Measure

Due to the enormous challenging the large number of data made accessible to clinicians by contemporary medical technologies and the uncertainty involved in medical diagnosis, the practice of grouping multiple sets of symptoms under a single disease term becomes difficult. Symptoms can be described in a variety of practical contexts using four elements: truth membership, a contradiction, an unknown and falsity membership functions. The precise clinical finding is given by proposed relationship measure among patients and side effects and side effects and sicknesses. The fact that it takes into account membership in multiple truths, contradictions, unknowns, and falsities makes this proposed method unique. It is possible for one-time inspections to lead to incorrect diagnoses. Consequently, the most accurate diagnosis is provided by this multiple inspection, which involves taking samples from the same patient at various intervals.

4.1. Example

This example shows how the proposed correlation measure can be applied to a medical diagnosis issue.

Let $\mathcal{H}$ = {Temperature, Dry Cough, Pharyngalgia, Dizziness, and Rhinorrhea} is a set of symptoms, and $\mathcal{R}$ = {Typhoid, Malaria, Dengue, and Viral Fever} is a set of diseases. Our approach involves observing the patient three times per day at different spans, which thus makes every patient have a different truth, contradiction, unknown, and falsity membership function.

Table 1. QSVNRS models of the patients' symptoms.

$\mathcal{W}$	Temperature	Dry cough	Pharyngalgia	Dizziness	Rhinorrhea
$\wp_1$	(0.5,0.2,0.4,0.5) (0.4,0.5,0.7,0.2) (0.3,0.6,0.2,06)	(0.6,0.5,0.5,0.3) (0.5,0.2,0.4,0.3) (0.4,0.5,0.3,0.6)	(0.4,0.6,0.1,0.6) (0.3,0.7,0.5,0.1) (0.2,0.7,0.1,0.4)	(0.6,0.4,0.5,0.4) (0.6,0.5,0.4,0.8) (0.4,0.2,0.6,0.4)	(0.6,0.3,0.5,0.2) (0.3,0.4,0.2,0.6) (0.2,0.5,0.4,0.2)
$\wp_2$	(0.7,0.4,0.6,0.3) (0.6,0.4,0.3,0.1) (0.5,0.3,0.6,0.2)	(0.5,0.3,0.6,0.2) (0.3,0.3,0.1,0.2) (0.1,0.2,0.4,0.3)	(0.5,0.2,0.1,0.2) (0.2,0.4,0.3,0.1) (0.2,0.3,0.1,0.4)	(0.5,0.2,0.1,0.3) (0.3,0.4,0.7,0.1) (0.3,0.5,0.2,0.1)	(0.3,0.2,0.5,0.6) (0.2,0.3,0.1,0.6) (0.1,0.3,0.4,0.3)
$\wp_3$	(0.7,0.2,0.1,0.4) (0.6,0.4,0.3,0.1) (0.5,0.3,0.1,0.3)	(0.4,0.2,0.1,0.6) (0.2,0.3,0.2,0.1) (0.2,0.5,0.1,0.3)	(0.2,0.4,0.5,0.3) (0.1,0.4,0.6,0.3) (0.2,0.3,0.4,0.6)	(0.5,0.3,0.6,0.2) (0.4,0.2,0.1,0.5) (0.1,0.2,0.2,0.5)	(0.5,0.3,0.2,0.4) (0.2,0.4,0.4,0.3) (0.1,0.3,0.2,0.5)

Let the samples be collected throughout the day at three distinct times (07:00, 15:00, and 23:00)

Table 2. Disease symptoms that have been modelled as QSVNRS

$\mathcal{X}$	*Typhoid*	*Malaria*	*Dengue*	*Viral Fever*
Temperature	(0.3,0.4,0.5,0.2)	(0.3,0.5,0.4,0.2)	(0.5,0.3,0.2,0.4)	(0.2,0.6,0.8,0.1)
Dry Cough	(0.5,0.3,0.7,0.1)	(0.7,0.3,0.2,0.1)	(0.2,0.3,0.5,0.1)	(0.3,0.5,0.1,0.2)
Pharyngalgia	(0.4,0.1,0.2,0.3)	(0.5,0.4,0.3,0.2)	(0.5,0.4,0.4,0.3)	(0.3,0.5,0.1,0.2)
Dizziness	(0.5,0.7,0.1,0.2)	(0.3,0.2,0.5,0.1)	(0.2,0.5,0.4,0.1)	(0.1,0.4,0.6,0.2)
Rhinorrhea	(0.6,0.3,0.2,0.4)	(0.3,0.2,0.5,0.1)	(0.1,0.2,0.3,0.5)	(0.1,0.3,0.2,0.4)

The correlation measure from Table 3 with the highest value indicates the correct medical diagnosis. Patient $\wp_1$ suffers from Malaria, whereas Patients $\wp_2$ and $\wp_3$ suffers from Dengue.

Table 3. The Correlation Measure between QSVNRS $\mathcal{W}$ and $\mathcal{X}$

	Typhoid	*Malaria*	*Dengue*	*Viral Fever*
$\wp_1$	0.801	**0.844**	0.827	0.811
$\wp_2$	0.828	0.808	**0.865**	0.830
$\wp_3$	0.721	0.760	**0.824**	0.716

4.2. Pattern Recognition of QSVNRS – Correlation Measure

Example 4.2.1. Let $\mathfrak{R}$ = $\{\varpi_1, \varpi_2, \varpi_3, \ldots.. \varpi_n\}$ with ϖ = $\{\varpi_1, \varpi, \varpi_3, \varpi_4, \varpi_5\}$ and $\mathfrak{Y}$= $\{\varpi_2, \varpi_5, \varpi_7, \varpi_8, \varpi_9\}$ are the QSVNRS defined by

Pattern I = {⟨ ϖ_1,(0.3,0.4,0.1,0.5),(0.5,0.2,0.4,0.3) ⟩,⟨ ϖ_2,(0.4,0.4,0.3,0.2),(0.2,0.1,0.6,0.3) ⟩, ⟨ ϖ,(0.5,0.2,0.3,0.1),(0.5,0.4,0.1,0.2) ⟩,⟨ ϖ_4,(0.6,0.3,0.5,0.4),(0.4,0.3,0.5,0.1) ⟩, ⟨ ϖ_5,(0.2,0.6,0.4,0.2),(0.2,0.1,0.3,0.4) ⟩}

Pattern II = {⟨ ϖ,(0.4,0.5,0.3,0.2),(0.2,0.3,0.5,0.4) ⟩,⟨ ϖ_5,(0.6,0.2,0.4,0.3),(0.5,0.1,0.3,0.2) ⟩, ⟨ ϖ,(0.6,0.4,0.3,0.2),(0.3,0.4,0.2,0.1) ⟩,⟨ ϖ_8,(0.7,0.5,0.3,0.2),(0.2,0.4,0.3,0.6) ⟩, ⟨ ϖ_9,(0.5,0.2,0.1,0.3),(0.4,0.5,0.2,0.3) ⟩}

Then the testing QSVNRS **Pattern III** be $\{\varpi_6, \varpi_7, \varpi_8, \varpi_9, \varpi_{10}\}$ such that
{⟨ ϖ_6,(0.5,0.3,0.1,0.2),(0.6,0.2,0.6,0.1) ⟩,⟨ ϖ_7,(0.8,0.1,0.2,0.3),(0.7,0.2,0.1,0.2) ⟩, ⟨ ϖ_8,(0.5,0.6,0.1,0.2),(0.2,0.7,0.1,0.3) ⟩,⟨ ϖ_9,(0.2,0.7,0.4,0.1),(0.1,0.6,0.2,0.1) ⟩, ⟨ ϖ_{10},(0.3.0.4,0.5,0.1),(0.2,0.6,0.1,0.3) ⟩}

Pattern (I, III) = 0.769, Pattern (II, III) = **0.857**

Hence the testing Pattern **III** falls under the **Pattern II** type.

5. Conclusion

The correlation measure of QSVNRS was defined and few fundamental characteristics were demonstrated in this work and we demonstrated that a correlation measure of QSVNRS can be applied in the context of medical diagnostics and pattern recognition.

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