

Application of vague sets of Identification of Disease

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Abstract:

Vague set and its properties are more advanced record of the traditional fuzzy sets, which is frequently used in a variety of applications to deal with uncertainty and fuzzy situations. The degree of neutrality, which is typically taken into account in medical diagnosis, is one of the crucial and essential components that is not taken into account in vague sets (VSS). We proposed new similarity measure in this research that may contrast picture Fuzzy Sets (PFSs). The proposed similarity measure on PFSs have been used to attempt medical diagnosis in this research. It has been discovered that similarity measures enable the introduction of weights for all symptoms, allowing the patient to be diagnosed directly

Keywords:

Vague set, Medical diagnosis, Similarity Measures.

1. Introduction

Zadeh [14] was the first to establish the idea of a fuzzy set. The fuzzy set can express the state between “belong to” and “not belong to” by assigning a membership degree between 0 and 1 to items with respect to a set. As a result, fuzzy sets can be used to explain a large number of uncertainties that aren't adequately represented by classical sets. Since its inception, fuzzy set hypothesis has been employed in various applications, counting automatic control, pattern recognition, and decision-making. The hypothesis of fuzzy sets has been found to be unsatisfactory in many actual circumstances. As a result, numerous higher theories have arisen over time, such as vague sets (VSS), Pythagorean fuzzy sets, q-rung

fuzzy sets given by Lin (2020) and so on. vague sets by Gowh and buhereis a higher hypothesis that is a notion of fuzzy sets that ask specialists to provide non-membership opinions on set elements. As a result, vague set (VSS) are frequently employed in pattern recognition applications suggested by W.L.Gahu, D.J. Buehrer[13] vague sets. The tools that are frequently employed in those application challenges are similarity and distance measures. These two ideas are complimentary in the sense that by subtracting one from a unit, one can be derived from the other. Similarity measure can be used to solve issues in a range of contexts, like decision making, machine learning, and pattern detection suggested by Wei (2017, 2018). Despite the fact that (VSS) are superior to FSs at conveying cloudy and unclear data, they shortage a crucial notion, namely degree of neutrality, which is relevant in a variety of circumstances such includes human voting, medical diagnosis, and personal selection, to name a few examples. When it comes to general election, a person has four choices: poll in favor, poll against, abstain from polling, or refuse to poll. In medical diagnostics, symptoms such as fever and headache may have little influence on disorders such as chest pain and stomach pain.

The objective of this paper is further contribution, the study of medical diagnosis of the type using the suggested similarity measures on Vague sets (VSS), this piece of work illustrates how to go about medical decision-making. First noted in medical diagnostics is the idea of distance measures on Vague sets (VSS), to resolve uncertainty. In order to properly complete medical decision-making, this article offers a critical algorithm. This paper's main contribution is the creation of a distance-based medical decision-making system for Vague sets (VSS). The ability of (VSS) to adequately deal with inaccuracy, ambiguity and ambiguity while incorporating the idea of neutrality to some extent is the main justification for the choice. It helps medical professionals diagnose patients more effectively by giving them assistance.

Axiomatically defined vague sets (VSS). The application of changing outcomes in medical diagnosis is the last.

This paper's key contribution is:

1. New similarity measures have been proposed that can be used to compare VSSs.
2. We will also show its properties in order to confirm that the recommended measures are present.
3. To show medical diagnosis, some numerical examples are provided.

2. Preliminaries:

We give here a review of some definitions and results which are in Gau.w.L and BuhereD.j [3] ,Nageswararao.B, Ramakrishana.N and Eswarlal.T[6],[7] ,[8],[9].

Definition [11] 2.1: Let X be a non-empty set. A fuzzy set A drawn from X is defined as $A=\{x,\mu_A(x): x \in X\}$, where $\mu_A(x):X \rightarrow [0, 1]$ is the membership function of the fuzzy set A

The membership degrees are calculated using membership functions with

$\mu_A(X)$ where X is considered as the subject.

Definition [13] 2.2: The Hamming distance between the fuzzy sets can be defined by

$$d(A, B) = \sum_{i=1}^n |\mu_A(x_i) - \mu_B(x_i)|, \text{ where } x_i \in X$$

Definition [13] 2.3: The Euclidean distance between the fuzzy sets can be defined by

$$d(A, B) = \sum_{i=1}^n (\sqrt{[\mu_A(x_i) - \mu_B(x_i)]^2}), \text{ where } x_i \in X$$

In this section we give here a review of some definitions and results which are in Gau.w.LandBuhere.D.j[8]Nageswararao.B,Ramakrishana.NandEswarlal.T[3],[4] ,[5],[6].

Definition [1]2.1: Let X be a non-empty set. A fuzzy set A drawn from X is defined as $A=\{x, m_A(x): x \in X\}$, where $m_A(x):X \rightarrow [0, 1]$ is the membership function of the fuzzy set A .

Definition[8] 2.2: A vague set A in the universe of discourse X is a pair $A=(m_A, n_A)$ where $m_A :X \rightarrow [0, 1]$, $n_A: X \rightarrow [0,1]$ such that $m_A(x)+n_A(x) \leq 1$ for all x in X. Here m_A is called the membership function and n_A is called non-membership function and also called truth function and false function respectively.

Definition 2.3 [4] The vague set A of a set X with $t_A(x)=0$ and $f_A(x)=1$, for all $x \in X$ is called the zero vague set of X. It is denoted by $\bar{0}=(0,1)$.

Definition 2.4 [5] The vague set A of a set X with $t_A(x)=1$ and $f_A(x)=0$, for $x \in$, for all $x \in X$ is called the unit vague set of X. It is denoted by $\bar{1}=(1,0)$.

3. Application of Vague sets in Medical Diagnosis:

Let $P = \{Raju, Rajini, Rani, Roy, Rajesh\}$ represent the set of five patients, and the vague value of the patients suffered by their symptoms and initially identified by the doctor in the hospital. Therefore the set of all symptoms of $S = \{\text{temperature, fever, foot Pain, headache, hand pain}\}$

Table 3.1 The Vague values of patients and symptoms:

	Temperature	Fever	Foot pain	Headache	Hand pain
Raju	(0.1, 0.2)	(0.4, 0.1)	(0.0, 0.2)	(0.3, 0.1)	(0.1, 0.2)
Rajni	(0.1, 0.2)	(0.2, 0.1)	(0.6, 0.1)	(0.3, 0.2)	(0.2, 0.5)
Rani	(0.9, 0.1)	(0.2, 0.5)	(0.5, 0.4)	(0.1, 0.5)	(0.2, 0.4)
Roy	(0.5, 0.3)	(0.1, 0.3)	(0.2, 0.8)	(0.4, 0.2)	(0.5, 0.2)
Rajesh	(0.4, 0.2)	(0.3, 0.4)	(0.3, 0.1)	(0.5, 0.1)	(0.2, 0.1)

Table 3.2 The vague values of symptoms of patients and Diagnosis:

Let D represent the diagnosis, where $D = \{\text{Diabetes, Anxiety, Lupus, Depression, Yeast infection}\}$. Here we calculate the distance between patient and diseases using proposed similarity measure. The patient is likely to have the disease if there is a close proximity between the patient and the disease.

The vague values of symptoms of patients and Diagnosis:

	Diabetes	Anxiety	Lupus	Depression	Yeast infection
temperature	(0.4, 0.3)	(0.3, 0.1)	(0.2, 0.2)	(0.2, 0.1)	(0.4, 0.2)
Fever	(0.5, 0.2)	(0.3, 0.1)	(0.5, 0.1)	(0.3, 0.0)	(0.2, 0.3)
Foot pain	(0.8, 0.1)	(0.2, 0.3)	(0.8, 0.2)	(0.1, 0.2)	(0.2, 0.1)
Headache	(0.4, 0.3)	(0.1, 0.2)	(0.2, 0.3)	(0.3, 0.2)	(0.1, 0.2)
Hand pain	(0.5, 0.2)	(0.1, 0.3)	(0.2, 0.4)	(0.2, 0.2)	(0.1, 0.2)

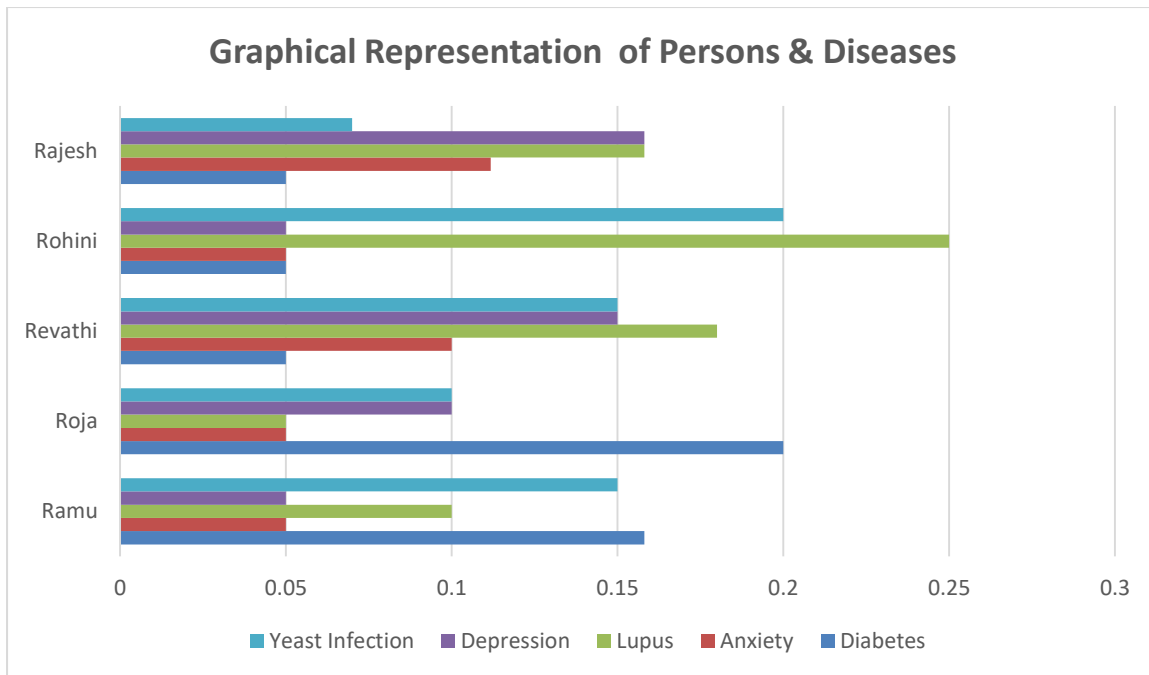
Table: 3.3: The Distance between patient and Diseases:

The distance between patient and diseases using proposed similarity measure

The distance between the symptoms of glaucoma and the set of glaucoma disease values of the present having the patients which is identified by doctors in a laboratory is

$$d(A,B) = \left[\frac{1}{2n} (t_A(x_i) - t_B(x_i))^2 + (f_A(x_i) - f_B(x_i))^2 \right]^{1/2}$$

Diseases	Diabetes	Anxiety	Lupus	Depression	Yeast infection
Ramu	0.1581	0.05	0.1	0.05	0.15
Roja	0.2	0.05	0.05	0.1	0.1
Revathi	0.05	0.1	0.18	0.15	0.15
Rohini	0.05	0.05	0.25	0.05	0.2
Rajesh	0.05	0.1118	0.1581	0.1581	0.07



Conclusion: 3.4

From the above table the following points observed in my research

From the last table we have concluded that the following

1. Rajesh is affected with diabetes
2. Rohini is affected with depression ,anxiety and diabetes
3. Revathi is affected with diabetes
4. Roja is affected with Lupus and anxiety
5. Ramu is affected with depression and anxiety

Conclusion: 3.5

Using the suggested similarity measures on Vague sets (VSS), this piece of work illustrates how to go about medical decision-making. First noted in medical diagnostics is the idea of distance measures on Vague sets (VSS), to resolve uncertainty. In order to properly complete medical decision-making, this article offers a critical algorithm. This paper's main contribution is the creation of a distance-based medical decision-making system for Vague sets (VSS). The ability of (VSS) to adequately deal with inaccuracy, ambiguity and ambiguity while incorporating the idea of neutrality to some extent is the main justification for the choice. It helps medical professionals diagnose patients more effectively by giving them assistance.

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