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HAIRFALL PROBLEM: AN INTUITIONISTIC FUZZY APPROACH TO REMEDIAL MEASURES

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Abstract. Hair problems may be caused due to a combination of biological, emotional and psychological factors related to hairfall. This may differ from one person to another. In this paper, we propose an Intuitionistic Fuzzy method to analyze the hairfall causes of youth below 30 and define its remedial measures.

Key words

Intuitionistic Fuzzy Sets(IFSs), Distance Measures, Hairfall problem.

1. Introduction

In 1983 K.T. Attanassov introduced the concept of Intuitionistic Fuzzy Sets, which is an extension of L.Zadeh's Fuzzy Sets. IFS theory is very useful tool in handling vague information. It has been successfully applied in various fields such as decision making problem, logic programming, medical diagnosis, networking etc. As an application of IFSs in medical diagnosis we have taken the hairfall problem of youth below 30.

Hairfall whether it is in men or in women, is a common biological problem all over the world. Many young boys and girls start losing their hair early in life because of several factors. Effective hair treatment can control and even reverse the hairloss process.In this paper, we analyse the causes of hairfall in youth and define proper remedies by Intuitionistic Fuzzy approach.

Rest of the paper is organised as follows: In section 2, some basic definitions related to IFS are briefly explained. In section 3, we discuss some of the important causes of hairfall and define its remedies using Intuitionistic Fuzzy Distance Measures. Section is the conclusion.

1. Preliminaries

Definition 2.1[1]

Let X be a given set. An Intuitionistic Fuzzy Set A in X is given $A = (x, \mu_A(x), \nu_A(x))|x\varepsilon X$, where $\mu_A, \nu_A : X \to [0,1]$, and $0 \leq \mu_A(x) + \nu_A(x) \leq 1$. $\mu_A(x)$ is the degree of membership of the element x in A and $\nu_A(x)$ is the degree of nonmembership of x in A. For each $x\varepsilon X$, $\pi_A(x) = 1 - \mu_A(x) - \nu_A(x)$ is called the degree of hesitation.

Definition 2.2

A real-valued function $D : IFS(X) \times IFS(X) \to [0,1]$ is called a distance measure on IFS(X), if it satisfies the axiomatic requirements:

1. $0 \leq D(A,B) \leq 1$
2. D(A,B) = 1 if and only if A = B
3. D(A,B) = D(B,A)
4. $D(A,C) \leq D(A,B)$ and $D(A,C) \leq D(B,C)$ if $A \subseteq B \subseteq C$.

Definition 2.3

The Hamming distance between two intuitionistic fuzzy sets $A = (\mu_A(x_i), \nu_A(x_i), \pi_A(x_i))$ and $B=(\mu_B(x_i), \nu_B(x_i), \pi_B(x_i))$, is given by

$$d^1_{IFS}(A,B) = \tfrac{1}{2} \sum_{i=1}^{n} (|\mu_A(x_i) - \mu_B(x_i)| + |\nu_A(x_i) - \nu_B(x_i)| + |\pi_A(x_i) - \pi_B(x_i)|)$$

Definition 2.4

The Normalized Hamming distance between two intuitionistic fuzzy sets $A = (\mu_A(x_i), \nu_A(x_i), \pi_A(x_i))$ and $B=(\mu_B(x_i), \nu_B(x_i), \pi_B(x_i))$, is given by

$$l^1_{IFS}(A,B) = \tfrac{1}{2n} \sum_{i=1}^{n} (|\mu_A(x_i) - \mu_B(x_i)| + |\nu_A(x_i) - \nu_B(x_i)| + |\pi_A(x_i) - \pi_B(x_i)|)$$

Definition 2.5

Let $A = (\mu_A(x_i), \nu_A(x_i), \pi_A(x_i))$ and $B = (\mu_B(x_i), \nu_B(x_i), \pi_B(x_i))$ be two Intuitionistic Fuzzy Sets.Then the tangent inverse distance is defined as

$$T_{IFS}(A,B) = \tfrac{1}{2(n+1)} \sum_{i=1}^{n} [\tan^{-1}[d_i]]$$

where $d_i = |\mu_A(x_i) - \mu_B(x_i)| + |\nu_A(x_i) - \nu_B(x_i)| + |\pi_A(x_i) - \pi_B(x_i)|$

3. Illustration

Here we consider the hairfall problem of youth below 30. Let C={Dandruff, Stress, Vitamin Deficiency, Hormonal Problems} be the set of main causes of hairfall. Also, let

R={Creams and Medications, Medicine Supplements, Proper Diet, Stress relief measures } be the set of remedies. For each cause we define the membership degree and membership degree as the chances of hairfall due to each cause and chances of hairfall not being affected with each cause respectively. It is given in Table 1.

The membershipdegree and nonmembership degree of each solution is given by the

TABLE 1

Causes	(μ, ν, π)
Dandruff	(.2, .3, .5)
Stress	(.3, .58, .12)
Vitamin Deficiency	(.4, .2, .4)
Hormonal Problems	(.59, .3, .21)

probability of hairfall getting cured and not cured by each solution. It is given in table 2. Tangent inverse distance between causes and remedies are presented in Table 3.

TABLE 2

Remedies	(μ, ν, π)
Creams and Medications	(.25, .35, .4)
Medicine Supplements	(.48, .22, .3)
Proper Diet	(.35, .25, .4)
Stress Relief Measures	(.25, .4, .35)

TABLE 3. symptom Vs Diseases

	$Creamsand\ Medications$	$Medicine\ Supplements$	$Proper\ Diet$	$StressRelief\ Measures$	
$Dandruf$	**0.0493**	0.1276	0.0728	0.0728	
$Stress$	0.1276	0.1560	0.1428	**0.1077**	
$VitaminDeficiency$	0.0728	0.0493	**0.0249**	0.9512	
$HormonalProblems$	0.1509	**0.0541**	0.1118	0.1492	

Note: The shortest distance of each cause with remedies yields proper solution to hairfall problem.

4. Conclusion

In this paper we focused on the hairfall problem of youth below 30. We analyzed its causes and defined proper remedies by Intuitionistic Fuzzy Distance Measure. We can use any IF distance measures in literature. In this paper we have applied our own Distance measure for IFSs.

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