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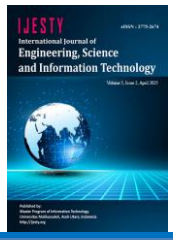

Web-based Rabies Disease Diagnosis Expert System with Forward Chaining and Dempster Shafer Methods

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Abstract

Rabies is a hazardous zoonotic disease that poses a significant threat to both animals and humans, as it can result in death. The disease is caused by a single-stranded RNA virus commonly found in infected animals' saliva, which can be transmitted to humans through bites. Although many people keep animals as pets, many lack adequate knowledge about the potential risks of rabies transmission. In Indonesia, most cases of rabies transmission to humans are caused by bites from infected dogs, followed by bites from monkeys and cats. The absence of an effective treatment for Rabies makes prevention and early diagnosis extremely important. One approach that could help manage the disease is creating an expert system for rabies diagnosis. The Rabies Disease Expert System is developed based on a needs analysis conducted through interviews with veterinarians to understand the classification of symptoms and the diagnostic process for Rabies. It's important to note that while the system is a valuable tool, it does have limitations and should not replace the role of a veterinarian. The system employs two critical methodologies: the Forward Chaining and Dempster-Shafer algorithms. These algorithms allow the system to trace the progression of symptoms and calculate the probability of a rabies infection. The system is an interactive platform where users—such as animal owners or medical professionals—can input observed symptoms in either animals or humans. Based on these inputs, the system provides a probable diagnosis. For example, the expert system might determine that a dog is in the 'Excitation Stage' of Rabies with a 54% confidence level. The integration of Forward Chaining and Dempster-Shafer methods ensures that the system continuously refines its diagnostic accuracy, aiming for a confidence level close to 100%. This expert system offers a promising tool to aid in the early detection and management of Rabies, potentially reducing the risk of widespread transmission.

Keywords: *Rabies, Expert System, Forward Chaining, Dempster Shafer, Diagnosis.*

1. Introduction

One of the loyal pets that can help the community is a dog. People who like or choose animals must pay attention to the health of their animals because people's pets may be Rabies Transmitting Animals (HPR) [1]. Rabies infections in both animals and humans that have shown clinical signs and symptoms of Rabies in the brain (Encephalomyelitis) end in death [2]. There is only one surviving patient in the world. Limited information about Rabies, especially in humans and Rabies Transmitting Animals (HPR), which are also pets of some people, is a problem and makes it difficult for people to predict the disease they are suffering from [3]. To determine whether or not a human or Animal categorized as a rabies-infected animal has Rabies requires the help of an expert, such as an animal expert or veterinarian [4]. In specific communities or regions, the cost of consulting an expert or veterinarian is not cheap, and the lack of public knowledge about the dangers of Rabies has led to a lack of public concern, resulting in delays in treatment as the disease becomes more severe and complicated to cure and even infectious [5].

There is currently no effective cure for rabies [6]. However, Rabies can be prevented by early recognition of rabies-infectious animal bites and early management of bite cases [7]. For the public to be able to conduct early recognition of Rabies Transmitting Animals, one form of artificial intelligence that helps human activities today is an expert system. By implementing an expert system, a program will model the ability to solve problems like an expert (expert) to obtain cost and time efficiency, considering the cost of treatment is relatively high [8]. Many methods can be used to design an expert system, including the forward chaining search method. The search process with the Forward Chaining method departs from left to right, namely from the premise to the conclusion. This method is often called data-driven, meaning the search is controlled by the data provided [9]. The Dempster-Shafer method was used to determine the percentage of rabies disease probability. Dempster-Shafer theory is a proof based on belief function and plausible reasoning that combines separate pieces of information (evidence) to calculate the likelihood of an event [10].

2. Literature Review

2.1. Rabies

Rabies is a dangerous and deadly disease caused by an RNA virus of the genus Lyssavirus. The disease is transmitted by biting infected animals, such as dogs, cats, and monkeys, and exhibiting aggressive behaviour. When the rabies virus reaches the brain (Encephalomyelitis) and shows clinical symptoms, it almost always ends in death - with only one recorded case of survival worldwide. Structurally, the rabies virus measures 180nm x 75nm and has five main proteins, namely Polymerase (L), Glycoprotein (G), Matrix (M), Phosphoprotein (P), and Nucleoprotein (N) [11].

The rabies virus can infect warm-blooded animals and even humans and can cause damage to the central nervous system. Dogs, cats, monkeys, and even cows are warm-blooded animals that can contract and transmit Rabies [12]. Rabies transmission occurs through the bite of a rabies-carrying animal to other warm-blooded animals, including humans. The rabies virus enters the body through bite wounds and open wounds exposed to saliva containing rabies virus. In addition, rabies virus can also be transmitted through the licks of HPR on mucous membranes; even inactivated rabies vaccines that cause rabies infection have also been reported. The virus that enters the body will replicate in the muscle or connective tissue. Then, the rabies virus will spread in the patient's body through the nervous system and salivary glands and then to the central nervous system [13].

The mechanism of rabies disease will start from virus inoculation and replication in peripheral tissues, then spread along the peripheral nerves, then to the spinal cord and brain, and can cause encephalomyelitis. After centrifugal spread in the central nervous system, the virus moves through the nerve pathways to various organs (salivary glands, skin, liver, muscles, tongue, etc.) without viremia. Then, the incubation period will vary from 5 days to several years, generally 20-30 days. This incubation variation is influenced by several factors, such as the bite's location, the wound's depth, and the amount of virus [14].

2.2. Expert System

An Expert System is a system that seeks to adopt human knowledge into computers so that computers can solve problems as experts do [15]. A sound expert system is designed to solve a particular issue by mimicking the work of experts. With this expert system, even ordinary people can solve quite complicated problems that can only be solved with the help of experts. This specialist system will also help experts' activities as experienced assistants. Expert systems are applied to support problem-solving activities. These problem-solving activities include decision-making, knowledge guiding, design, planning, forecasting, organizing, controlling, diagnosing, formulating, explaining, advising, and training [16].

Expert systems have specific characteristics that distinguish them from other systems. Expert systems focus on particular areas of expertise and can provide reasoning for uncertain data using specific rules. This system is designed to be developed in stages, provide output through advice/recommendations, be equipped with reliable information facilities, and be operated on various types of computers. All these characteristics are the main guidelines for developing expert systems [17]. Figure 1 illustrates the basic concept of an expert system's knowledge base. Users submit facts or information to the specialist system and receive expert advice or answers. The inside of an expert system consists of 2 main components: the knowledge base and the inference engine that concludes.

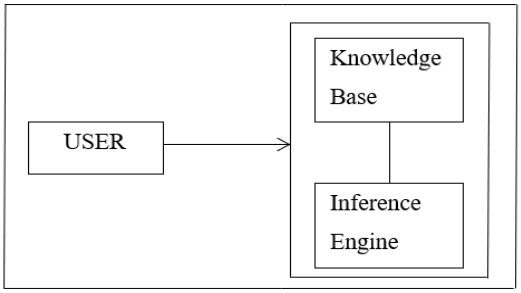

Fig 1. Basic Concepts of Expert System

The components of an expert system are divided into two primary environments: the consultation environment and the development environment. The Consultation Environment focuses on the interaction between the user and the system through the user interface, where the user can input specific facts that are then processed by the inference engine and produce recommended actions, with the support of explanation facilities and a whiteboard (workplace) as a work area. Meanwhile, the Development Environment contains the knowledge base (facts and rules) developed through the knowledge acquisition process, where the knowledge engineer's role is to collect and process knowledge from experts equipped with explanatory facilities to ensure the system can be adequately understood [18].

2.3. Dempster Shafer Method

In the mid-1960s, Arthur P Dempster developed a theory of probability. The resulting theory is an approach value to explain an uncertainty value from an expert [19]. About ten years later, Dempster's theory was updated by Glenn Shafer as a mathematical evidence

theory, which became known as Dempster Shafer's theory. Uncertainty occurs due to the limited information available. The existence of preferences in the Dempster-Shafer method is an advantage of the Dempster-Shafer method in overcoming uncertainty problems [20].
The Dempster-Shafer method reasoning system can be used as a solution to uncertainty due to changes in knowledge that hinder the determination of conclusions in expert systems because the Dempster-Shafer method works without affecting the reduction or addition of new facts, so it is suitable and safe for the work of an expert. The Dempster-Shafer Theory is generally written in an interval, namely [Belief, Plausibility] [21]. The explanation is as follows:

1. Belief (Bel) measures the strength of evidence in supporting a set of propositions. If it is 0, it indicates no proof; if it is 1, it indicates certainty where the value of belief (Bel) is (0 - 0.9).
2. Plausibility (Pl) is denoted as:

Pl (s) = 1 – Bel (-s) ……..(1)

Plausibility also has a value of 0 to 1. If sure -s, then it can be said that Bel = (¬s) = 0.
In the Dempster-Shafer theorem, we recognize the existence of a frame of discernment, denoted by $\theta\theta$. This frame is the universe of discussing a set of hypotheses [22]. The goal is to associate a measure of confidence in the elements of $\theta\theta$. Not all evidence directly supports each aspect. For this reason, a probability density function (m) is necessary. The value of m not only defines the elements of $\theta\theta$ but also all its subsets. So if $\theta\theta$ contains n elements, then the subset of $\theta\theta$ is 2n. The sum of all m in the subgroup of $\theta\theta$ is equal to i. If there is no information to select a hypothesis, then the value M{$\theta\theta$}=1.0. If it is known that X is a subset of $\theta\theta$, with m1 as its density function, and Y is also a subset of $\theta\theta$ with m2 density, then a combination function of m1 and m2 can be formed as m3 with the following formula, namely:

$$m_3(Z)=\frac{\sum X\cap=zm_1(x).m_2(y)}{1-K} \quad \text{……(2)}$$

$$K=\sum X\cap Y=\ \theta m_1(x).m_2(Y) \quad \text{.....(3)}$$

Description:
m1 (X) is the mass function of evidence X
m2 (Y) is the mass function of evidence Y
m3 (Z) is the mass function of evidence Z
K is the number of conflict evidence.

3. Research Method

3.1. Data Analysis

The data collection analysis in this study uses primary data collection, namely data obtained through interviews and direct observations from Rabies experts, namely Drh Zefri Helmi and Drh Titiek Usfah Laily. The data collection analysis in this study is as follows:

1. Rabies Disease in Rabies Transmitted Animals and Humans.
2. Symptoms of Disease in Rabies Transmitted Animals and Humans.
3. Disease Prevention.
4. Disease Management Methods.

3.2. Literature study and data collection

Before starting the research, interviews were conducted with Rabies experts Drh Zefri Helmi and Drh Titiek Usfah Laily and literature studies on the Forward Chining and Dempster Shafer methods and other supporting theories. After obtaining these references, then create a Rabies disease expert system by applying the Forward Chining and Dempster Shafer methods to determine the percentage of probability of contracting rabies disease.

3.3. Designing The Program

The author designs the program in such a way that the system to be built can carry out the process of diagnosing the term decision support system using the Forward Chining and Dempster Shafer methods. The first step of this stage is to design the flow of system performance using UML (Unified Modeling Language) and flowcharts that will explain the processes in the system in detail. The material for this research is in the form of reference books on related material, especially artificial intelligence and web-based system design, which will later become the data source for the system being built. In addition, this research's materials include functional and non-functional needs, such as the need for hardware and software.
In designing this system, several computer hardware that can be physically seen and felt are used, consisting of: Acer Aspire laptop with specifications of 4GB DDR3 RAM and 500GB HDD, and equipped with supporting devices such as keyboard, mouse, and printer. Then, the design of this system also uses software (software) for data processing, consisting of Windows 10 Operating System, Microsoft Word 2010, Microsoft Visio 2010, App Server, Notepad++, and Google Browser as supporting devices in system creation and development.

3.4. System Diagram

The system starts by asking the user questions about the symptoms that must be answered with 'yes' or 'no.' If the user answers 'no', the system will display other questions; if the user answers 'yes,' the system will display the related symptoms. Next, the system will classify the type of disease using the Dempster-Shafer method to calculate the percentage, then display the diagnosis results along with the percentage value, and end by displaying the disease profile and treatment solution. The following is a flow chart of this research:

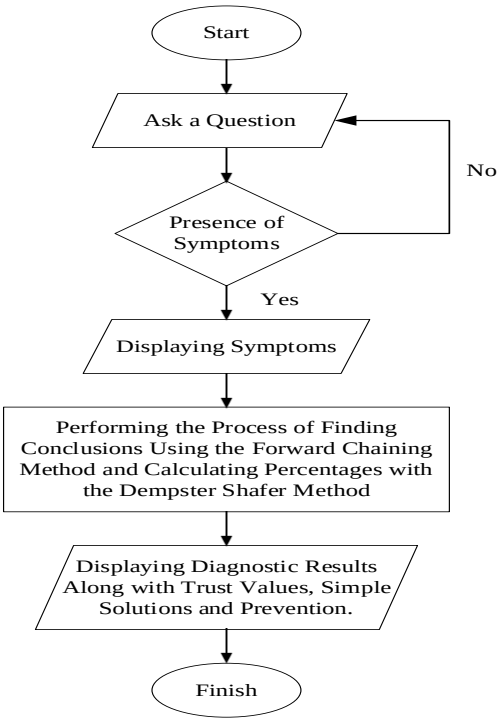

Fig 2. Flow Chart System

4. Result And Discussions

4.1. System Analysis

The system to be built utilizes an expert system with the Forward Chaining and Dempster Shafer methods to conclude diseases suffered by pets and humans along with the solution. The expert system will be built like an expert in getting conclusions from existing problems (symptoms) with the expertise of a Veterinarian expert. The expert system to be built is web-based and uses PHP programming language and MySQL Database. Before this expert system is run, some data is used as a knowledge base: symptom data, disease data, and the relationship between symptoms and diseases. All knowledge bases are used to provide a diagnostic conclusion of plant rabies disease.

4.2. Search with Forward Chaining and Dempster Shafer Methods

In one case, a dog appeared unwell and changed temperament or emotional state. The dog started barking differently than usual and avoided interacting with the people who usually cared for it as if it didn't recognize them. When someone tried to approach the dog, it was startled. As the behavioural changes became more pronounced, the dog hallucinated as if trying to catch something invisible, such as a fly that did not exist. Furthermore, the dog began to eat objects that were not its food, such as wood or plastic, and it looked like it wanted to bite something. Over time, the dog seemed to move lazily lazily, as if paralyzed. Based on this information, the first step is to create Forward Chaining rules for each disease as follows:

1. Rule 1

IF an Animal has a change in temperament or emotional state

AND the Animal avoids or appears not to recognize the owner.

AND Animal is easily startled.

THEN Paranormal Stage Canine Rabies Disease

2. Rule 2

IF Animal is Humanizing (example: Like swatting flies, but there are no flies).

AND Animal Bites or chews something that is not its food

AND Animal Tends to want to bite

THEN Dog Rabies Disease Excitation Stage

3. Rule 3

IF Animal Experiences Full Body Paralysis

THEN Canine Rabies Disease Paralysis Stage

4. Dempster Shafer Method Calculation

It is assumed that the symptoms taken are those of a user inputted into the expert system. The following are the symptoms that have been selected and the disease codes associated with the selected symptoms. The disease is symbolized by P, followed by the sequence of the disease.

1. Selected symptom 1: The Animal has a change in temperament, supporting disease A
2. Selected symptom 2: Animal avoids or appears not to recognize owner, favouring disease A.
3. Selected symptom 3: Animal Startles easily in favour of disease A
4. Selected symptom 4: Animal Hallucinates (e.g., Like swatting at a fly, but there is no fly). In favour of disease B
5. Selected symptom 5: Animal bites or chews what it does not eat. Support disease B
6. Selected symptom 6: The Animal Tends to want to bite. In favour of disease B
7. Selected symptom 7: The animal has complete body paralysis in favour of disease C

Then, determine the initial density (m):

No	Symptoms	Diagnosis	*Belief*	*Plausibility*
1	Animals Experiencing temperamental or emotional changes	A	0.2	0.8
2	Animal avoids or looks like it does not recognize the owner	A	0.2	0.8
3	Animals are easily startled	A	0.3	0.7
4	Humanized Animals (e.g., swatting flies, but there are no flies)	B	0.6	0.4
5	Animals Bite or chew on things that are not their food	B	0.5	0.5
6	Animals tend to want to bite	B	0.4	0.6
7	Animals experiencing complete body paralysis	C	0.8	0.2

Define the new density:

Symptoms 1 x Symptoms 2 (A x B)	A (0.2)		θ (0.8)	
A (0.2)	A	0.04	A	0.16
θ (0.8)	A	0.16	θ	0.64

The new density is then m(3):

a. M3 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By1)+ (Ax1*By2) +(Ax2*Bx1)$

$\sum X \cap) = (0.2*0.2)+ (0.2*0.8) +(0.8*0.8)$

$\sum X \cap) = (0.04+0.16+0.16) = 0.36$

K(Θ)= 0

Maka M3(A) :

M3 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M3 (A) $= \frac{0.36}{1-0}$

M3=0.36 =36%

b. M3 (θ) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax2*By2)$

$\sum X \cap) = (0.8*0.8)$

$\sum X \cap) = 0.64$

K(Θ)=0

Maka M3(θ) :

M3 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M3 (A) $= \frac{0.64}{1-0}$

M3=0.64 =64%

New dentition M3 x Symptom 03:

M3 x Symptoms 3	A(0.3)		θ (0.7)	
M3 (A) 0.36	A	0.108	A	0.252
M3 (θ)0.64	A	0.192	θ	0.448

Then, the new density is m(4):

a. M4 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By1)+(Ax1*By2) +(Ax2*Bx1)$

$\sum X \cap) =(0.36*0.3)+(0.36*0.7)+(0.64*0.3)$

$\sum X \cap) = (0.108+0.192+0.252) = 0.552$

K(Θ)= 0

Maka M4(A) :

M4 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M4 (A) $= \frac{0.552}{1-0}$

M4 (A) =0.552 =5.52%

b. M4 (θ) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax2*By2)$

$\sum X \cap) = (0.64*0.7)$

$\sum X \cap) = 0.448$

K(Θ)= 0

Maka M4(θ) :

M4 (θ) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M4 (θ) $= \frac{0.448}{1-0}$

M4 (θ) =0.448 =44.8%

Then, the new density is m(5):

a. M5 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By2)$

$\sum X \cap) = (0.553*0.4)$

$\sum X \cap) = (0.2208)$

K(Θ)= (Ax1*Bx1)= (0.552*0.6)=0.3312

Maka M5(A) :

M5 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M5 (A) $= \frac{0.2208}{1-0.3312}$

M5=0.3301 =33.01%

b. M5 $(B) = \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax2*By1)$

$\sum X \cap) = (0.448*0.6)$

$\sum X \cap) = 0.2688$

K(Θ)= (Ax1*Bx1)= (0.552*0.6)=0.3312

Maka M5 (B) :

M5 (B)= $\frac{0.2688}{1-0.3312}$

M5 (B) =0.4109=41.09%

c. M5$(\theta) = = \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By1)$

$\sum X \cap) = (0.448*0.4)$

$\sum X \cap) = 0.1792$

K(Θ)= (Ax1*Bx1)= (0.552*0.6)=0.3312

Maka M5 (θ) :

M6 (θ)= $\frac{0.1792}{1-0.3312}$

M5 (θ)= 0.2679=26.79%

New dentition M5 x Symptom 05:

M5 x Symptoms 4		B(0.5)		θ (0.5)
M5(A) 0.3301	Θ	0.1651	A	0.1651
M5(B) 0.4109	B	0.201	B	0.201
M5(θ) 0.2679	B	0.134	θ	0.134

The new density is then m(6):

a. M6 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By2)$

$\sum X \cap) = (0.3301*0.5)$

$\sum X \cap) = (0.1651)$

K(Θ)= (Ax1*Bx1)= (0.3301*0.5)= 0.1651

Maka M6 (A) :

M6 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M6 (A) $= \frac{0.1651}{1-0.1651}$

M6 =0.1977=19.77%

b. M6 $(B) = \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax2*By1)+(Ax2*By2)+(Ax3*Bx1)$

$\sum X \cap) =(0.4109*0.5)+(0.4109*0.5)+ (0.2679*0.5)$

$\sum X \cap) = 0.201+0.201+0.134 = 0.6418$

K(Θ)= (Ax1*Bx1)= (0.3301*0.5)= 0.1651

Maka M6 (B) :

M6 (B)= $\frac{0.6418}{1-0.1651}$

M6 (B) =0.6418=64.18%

c. M6$(\theta) = = \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By1)$

$\sum X \cap) = (0.3301*0.5)$

$\sum X \cap) = 0.134$

K(Θ)=(Ax1*Bx1)=(0.3301*0.5)=0.1651

Maka M6 (θ) :

M6 (θ)= $\frac{0.134}{1-0.1651}$

M6 (θ)= 0.1605 = 16.05%

New dentition M6 x Symptom 06:

M5 X Symptoms 4		B (0.4)		θ (0.6)
M5(A) 0.1977	Θ	0.0791	A	0.1186
M5(B) 0.6418	B	0.2567	B	0.3851
M5(θ) 0.1605	B	0.0642	θ	0.0963

Then the new density is m (7):

a. M7 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By2)$

$\sum X \cap) = (0.1977*0.4)$

$\sum X \cap) = (0.1186)$

K(Θ)= (Ax1*Bx1)= (0.1977*0.4)= 0.0791

Maka M7 (A) :

M7 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M7 (A) $= \frac{0.1186}{1-0.0791}$

M7 =0.1288=12.88%

b. M7 $(B) = \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax2*By1)+(Ax2*By2)+(Ax3*Bx1)$

$\sum X \cap) = (0.0791*0.4) + (0.0791*0.6) + (0.1605*0.4)$

$\sum X \cap) = (0.2567+0.3851+0.0642)=0.706$

K(Θ)= (Ax1*Bx1)= (0.1977*0.4)= 0.0791

Maka M7 (B) :

M7 (B)= $\frac{0.706}{1-0.0791}$

M7(B) =0.7666=76.66%

c. M7 $(\theta) == \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By1)$

$\sum X \cap) = (0.1977*0.5)$

$\sum X \cap) = 0.0963$

K(Θ)= (Ax1*Bx1)= (0.1977*0.4)= 0.0791

Maka M7 (θ) :

M7 (θ)= $\frac{0.0963}{1-0.0791}$

M7=0.1045=10.45%

New dentition M7 x Symptom 07:

M7 X Symptoms 07	C(0.8)		θ (0.2)	
M7(A) 0.1288	Θ	0.10304	A	0.02576
M7(B) 0.7666	Θ	0.61328	B	0.15332
M7(θ) 0.1045	C	0.0836	θ	0.0209

The new density is then m(8):

a. M8 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax1*By2)$

$\sum X \cap) = (0.1288*0.2)$

$\sum X \cap) = 0.02576$

K(Θ)= (Ax1*Bx1)+(Ax3*By2)

= (0.1288*0.8)+(0.1045*0.2)

=(0.10304 +0.61328)= 0.71632

Maka M8 (A) :

M8 (A) $= \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

M8 (A) $= \frac{0.02576}{1-0.71632}$

M8=0.09080 =9.08%

b. M8 $(B) = \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap)$=Ax2*By2)

$\sum X \cap) = (0.7666*0.2)$

$\sum X \cap) = (0.1532)$

K(Θ) = (Ax1*Bx1)+(Ax3*By2)

= (0.1288*0.8)+(0.1045*0.2)

=(0.10304 +0.61328)= 0.71632

Maka M8 (B) :

M8 (B)= $\frac{0.1532}{1-0.71632}$

M8=0.5404 =54.04%

c. M8 $(C) == \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax3*By1)$

$\sum X \cap) = (0.1045*0.8)$

$\sum X \cap) = 0.0836$

K(Θ) = (Ax1*Bx1)+(Ax3*By2)

= (0.1288*0.8)+(0.1045*0.2)

= (0.10304 +0.61328)= 0.71632

Maka M7 (θ) :

M8 (C)= $\frac{0.0836}{1-0.7163}$

M8 (C) = 0.2946=29.46%

d. M8 $(\theta) == \frac{\sum X \cap = zm_1(x).m_2(y)}{1-K}$

$\sum X \cap = zm_1(x).m_2(y)$

$\sum X \cap) = (Ax3*By2)$

$\sum X \cap) = (0.1045*0.2)$

$\sum X \cap) = 0.0209$

K(Θ) = (Ax1*Bx1)+(Ax3*By2)

= (0.1288*0.8)+(0.1045*0.2)

= (0.10304 +0.61328)= 0.71632

Maka M8 (θ) :

M8 (θ)= $\frac{0.0209}{1-0.7163}$

M8=0.0736=7.36%

Based on the highest value of the Dempster Shafer search, it can be concluded that the disease suffered is Disease B (Excitation Stage Dog Rabies Disease), with a Trust Value of 54.04%.

5. Conclusion

Based on the symptoms entered by the user, the system used the Forward Chaining search method and percentage calculation with Dempster Shafer, which resulted in a diagnosis of Excitation Stage Dog Rabies with a percentage of 54%. This method shows that the confidence value obtained is nearly 100%. If the Plausability value exceeds the belief, the Dempster-Shafer method provides conclusions from various possible diagnoses or diseases.

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