JOURNAL LA MULTIAPP

VOL. 07, ISSUE 01 (138-158), 2026
DOI: 10.37899/journallamultiapp.v7i1.2920

Comparative Analysis of the Certainty Factor and Dempster-Shafer Methods in the Diagnosis of Acute Respiratory Infection in Childern

Besse Nurul Huda[1], St. Hajrah Mansyur[2], Siska Anraeni[3]

[1]*Informatics Engineering, Faculty of Computer Science, Universitas Muslim Indonesia, Indonesia*
[2]*Department of Information System, Faculty of Computer Science, Universitas Muslim Indonesia, Indonesia*
[3]*Department of Informatics Engineering, Faculty of Computer Science, Universitas Muslim Indonesia, Indonesia*

**Corresponding Author: Besse Nurul Huda*
Email: nurulhda1411@gmail.com

Article Info

Article history:
Received 16 December 2025
Received in revised form 12 January 2026
Accepted 30 January 2026

Keywords:
Expert System
Certainty Factor
Dempster-Shafer
ISPA
Diagnosis

Abstract

Acute Respiratory Infections (ARI) are one of the diseases that often affect children and are a major cause of morbidity and mortality in Indonesia. Accurate early diagnosis is very important to prevent complications, but limited medical personnel and the similarity of ARI symptoms to other diseases are often obstacles. In this context, an artificial intelligence-based expert system can be a solution to support medical decisions. This article presents a comparative analysis of two inference methods commonly used in expert systems, namely Certainty Factor (CF) and Dempster-Shafer (DS). Through a Systematic Literature Review (SLR) approach, this study evaluates the performance of both methods based on accuracy, complexity, flexibility, and ease of implementation. The results of the study show that Certainty Factor excels in simplicity and efficiency, while Dempster-Shafer is more reliable in handling uncertainty and cases with many overlapping symptoms. This article is expected to be a reference for the development of more accurate and efficient medical expert systems in assisting the diagnosis of ARI in children.

Introduction

Acute Respiratory Infections (ARI) remain one of the most common health problems affecting children in Indonesia, contributing significantly to healthcare visits and complications (Lutpiatina et al., 2022; Azrin et al., 2025; Zebua et al., 2023). Children's vulnerability to ARI is heightened due to their developing immune system, making rapid and accurate diagnosis essential. Advancements in information technology have encouraged the use of expert systems as decision-support tools, particularly in situations where medical professionals are limited or patient volume is high (Indriani et al., 2019; Surahman, 2019; Mz & Rosana, 2020; Arnanda et al., 2024).

Expert systems operate by utilizing knowledge-based reasoning to replicate the decision-making processes of experts (Bapu, 2019; Harliana, & Widayani, 2019). In diagnosing ARI, the method used to address uncertainty plays a crucial role in ensuring reliable outcomes. Two widely adopted techniques are the Certainty Factor (CF) and Dempster-Shafer (DS) methods (Mirino et al., 2022; Wulandari et al., 2024; Yulianita et al., 2023; Akbar & Kurniawan, 2026). CF represents expert confidence toward symptoms based on experience, whereas DS

ISSN: 2716-3865 (Print), 2721-1290 (Online)

integrates multiple pieces of evidence to generate stronger belief values toward a hypothesis (Kanggeraldo & Jansen, 2020; Setiyani & Prasetyaningrum, 2021; Anjasani et al., 2020). Comparing these two approaches is essential to identify which offers better performance and diagnostic reliability, as previous studies have reported notable differences in certainty levels produced by each method (Azzahra et al., 2024; Okta et al., 2022). Therefore, this study aims to analyze and evaluate the performance of CF and DS in handling uncertainty within expert systems for diagnosing ARI in children (Kalimatullah et al., 2020; Markus et al., 2023; Rizky et al., 2023; Salamah & Ramadhan, 2023).

Methods

Certainty Factor Method

The Certainty Factor (CF) method is one approach used to represent the degree of certainty regarding a hypothesis based on available evidence. CF values range from 0 to 1, where 0 indicates no certainty and 1 indicates complete certainty that the hypothesis is true (Smarandache, F., & Dezertb, J. (2023; Kelen, Y. P. K. (2025; Tiana et al., 2023; Li & Zhang, 2024; Moras et al., 2023; Dezerta & Dezertb, 2023). In the context of diagnosing acute respiratory infections (ARI) in children, CF is used to combine expert knowledge and user confidence regarding the appearance of certain symptoms. Several key components are used, as follows:

a. Expert CF (CF_rule), which is the expert's confidence value regarding the relationship between a symptom G and disease P.

b. User CF (CF_user), which is the user's or patient's confidence value regarding the appearance of symptom G.

c. Evidence CF (CF_e), which is the contribution of symptom G to disease P obtained from a combination of CF_rule and CF_user.

CF_evidence is calculated using the following formula:

$$CF\_e = CF\_user \times CF\_rule$$

If there is more than one symptom that supports the same disease, the CF_evidence value of each symptom is combined gradually using the following positive CF combination formula:

$$CF\_combination = CF\_old + CF\_new \times (1 - CF\_old)$$

In this equation, CF_old represents the CF value from the previous combination, while CF_new represents the CF_evidence value of the next symptom. This process is carried out iteratively until all symptoms related to the disease are completed.

General Steps for Calculating the Certainty Factor

In general, the steps for calculating the CF in the ISPA expert system can be explained as follows:

a. Determine the symptoms experienced by the patient along with the CF_user value for each symptom.

b. Take the CF_rule value from the knowledge base for each symptom-disease pair.

c. Calculating CF_evidence for each symptom and disease using

$CF\_e = CF\_user \times CF\_rule$.

d. Combining the CF_evidence values for each disease gradually using the combination formula

ISSN: 2716-3865 (Print), 2721-1290 (Online)

CF_combination = CF_old + CF_new × (1 − CF_old).

e. Repeat the combination process until all symptoms associated with the disease have been processed.

f. Determine the final CF value for each disease, then select the disease with the highest CF value as the system's diagnosis result.

Dempster Shafer Method

Frame of Discernment and Power Set

In Dempster-Shafer theory, the set of all possible hypotheses is called the frame of discernment and is denoted by Θ (theta). Suppose there are N mutually exclusive and exhaustive hypotheses, then the frame is defined as:

$\Theta = \{\theta_1, \theta_2, \ldots, \theta\_N\}$

From Θ, a power set is formed that contains all subsets of Θ, including the empty set ∅ and Θ itself:

$P(\Theta) = \{\emptyset, \{\theta_1\}, \{\theta_2\}, \ldots, \Theta\}$

Mass Function (Basic Probability Assignment)

The mass function m is a function that maps each element in the power set to the interval [0,1]. The mass function expresses the degree of belief (mass) given to each hypothesis set (Zhou & Deng, 2022).

$m : P(\Theta) \rightarrow [0,1]$

The mass function m satisfies the following two properties:

1. $m(\emptyset) = 0$

2. $\sum\_\{A \subseteq \Theta\} m(A) = 1$

In its application to expert systems, a symptom with a belief value b that supports a hypothesis group $H \subseteq \Theta$ will be expressed as:

$m(H) = b$

$m(\Theta) = 1 - b$

If there is no evidence at all, all belief mass is placed on ignorance, namely:

$m(\Theta) = 1.0$

Belief and Plausibility Functions

The Belief Function (Bel) expresses the minimum degree of belief in a set $X \subseteq \Theta$. The value Bel(X) is the sum of the masses of all subsets Y that are definitely contained in X:

$Bel(X) = \sum\{Y \subseteq X\} m(Y)$

The Plausibility function (Pls) expresses the maximum degree of possibility for X. The plausibility of X is the sum of the masses of all subsets Y that intersect with X:

$Pls(X) = \sum\{Y \cap X \neq \emptyset\} m(Y)$

The relationship between Belief and Plausibility can also be expressed as:

$Pls(X) = 1 - Bel(X')$

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Dempster Combination Rule

If there are two independent pieces of evidence with mass functions m_1 and m_2 defined in the same frame, then both can be combined using the Dempster combination rule (Shao et al., 2025; Prieto et al., 2025; Wu, 2025; Dezert et al., 2023). The first step is to calculate the degree of conflict K, which is the mass that falls on the empty intersection:

$K = \sum m_1(A) \cdot m_2(B)$, for all $A \cap B = \emptyset$

Next, the combined mass function $m_3 = m_1 \oplus m_2$ for each set $C \neq \emptyset$ is calculated by:

$$m3(Z) = \frac{\Sigma_{X \cap Y=Z}\ m_1\ (X).\ m_2(Y)}{1\ -\ \Sigma_{X \cap Y=\emptyset}\ m1\ (X).\ m2(Y)}$$

Where:

$m_1(X)$ = Weight of belief in evidence X (first symptom of ISPA)

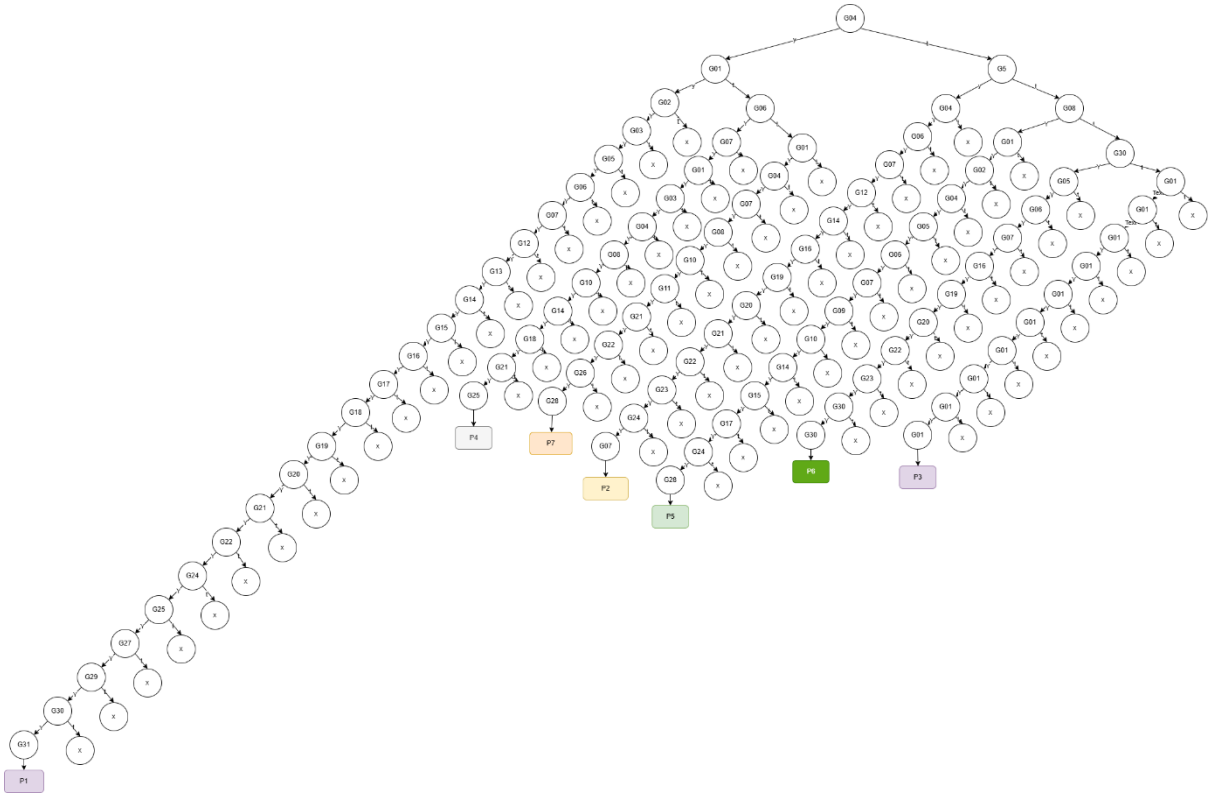
$m_2(Y)$ = Weight of belief in evidence Y (second symptom of ISPA)

$m_3(Z)$ = Combined value of belief from $m_1(X)$ and $m_2(Y)$

Z = ISPA disease, which is the intersection of symptoms X and Y

$\emptyset$ (theta) = Empty intersection, which represents evidence conflict

Decision Tree



ISSN: 2716-3865 (Print), 2721-1290 (Online)

Production Rules

Rule 1: If G1 and G2 and G3 and G4 and G5 and G6 and G7 and G12 and G13 and G14 and G15 and G16 and G18 and G19 and G20 and G21 and G22 and G24 and G25 and G27 and G29 and G30 and G31 then P1

Rule 2: If G4 and G5 and G6 and G7 and G12 and G14 and G16 and G19 and G20 and G21 and G22 and G23 and G24 and G31 then P2

Rule 3: If G1 and G4 and G5 and G6 and G7 and G16 and G19 and G20 and G23 and G31 then P3

Rule 4: If G1 and G3 and G4 and G7 and G8 and G10 and G14 and G18 and G21 and G25 then P4

Rule 5: If G1 and G2 and G4 and G5 and G6 and G7 and G8 and G9 and G10 and G14 and G15 and G17 and G28 then P5

Rule 6: If G5 and G6 and G7 and G16 and G19 and G20 and G22 and G23 and G30 and G31 then P6

Rule 7: If G1 and G4 and G7 and G8 and G10 and G11 and G21 and G22 and G26 and G28 then P7

Table of acute respiratory tract infections

Disease Code	**Name of Disease**
P1	Common cold
P2	Pharyngitis (sore throat)
P3	Laryngitis (inflammation of the vocal cords)
P4	Sinusitis (inflammation of the sinuses)
P5	Pneumonia (inflammation of the lungs)
P6	Tonsillitis (inflammation of the tonsils)
P7	Bronchitis

Decision Table

Code	Symptoms	Type of Disease ISPA							Type of Disease ISPA
		P1	P2	P3	P4	P5	P6	P7	
G1	Cough	✓		✓	✓	✓		✓	
G2	Runny nose	✓				✓			
G3	Sneezing	✓			✓				
G4	Fever	✓	✓	✓	✓	✓		✓	
G5	Sore Throat	✓	✓	✓		✓	✓		
G6	Fatigue and Body Aches	✓	✓	✓		✓	✓		
G7	Loss of Appetite	✓	✓	✓	✓	✓	✓	✓	
G8	Shortness of breath				✓	✓		✓	
G9	Blue lips and nails					✓			
G10	Wheezing				✓	✓		✓	

ISSN: 2716-3865 (Print), 2721-1290 (Online)

G11	Chest or lung pain							✓
G12	Stuffy nose	✓	✓					
G13	Eye pain, watery eyes, and redness	✓						
G14	Headache	✓	✓		✓	✓		
G15	Muscle pain	✓				✓		
G16	Pain when swallowing	✓	✓	✓			✓	
G17	Digestive problems					✓		
G18	Decreased sense of smell	✓			✓			
G19	Hoarse voice	✓	✓	✓			✓	
G20	Itchy throat	✓	✓	✓			✓	
G21	Dizziness/Headache	✓	✓		✓			✓
G22	Feeling weak	✓	✓				✓	✓
G23	Nausea and vomiting		✓	✓			✓	
G24	Cough with Phlegm	✓	✓			✓		
G25	Stuffy/Congested Nose	✓			✓			
G26	Chest Pain/Discomfort							✓
G27	Thick Yellow Mucus from the Nose	✓						
G28	Rapid breathing					✓		✓
G29	Ear pressure	✓						
G30	Bad breath	✓					✓	
G31	Occasional loss of voice	✓	✓	✓			✓	

Results and Discussion

Example of Certainty Factor Calculation for Patient 1

This section presents a complete example of the CF calculation steps for one patient. The symptom data and CF_user values are taken from the patient 1 test data table, while the CF_rule values are obtained from the expert knowledge base. The detailed calculation focuses on disease P1 (common cold).

Patient Symptom Data 1

Table 1. Patient Symptom Data 1

No	Disease Code	Symptoms	CF_user
1	G2	Runny Nose	0.80
2	G3	Sneezing	0.60
3	G4	Fever	0.80
4	G6	Fatigue and Body Aches	0.40
5	G14	Headache	0.60
6	G21	Dizziness/Headache	0.80
7	G22	Feeling Weak	0.40
8	G31	Occasional Loss of Voice	0.40

The table above shows the sequence of symptoms experienced by patient 1 along with the CF_user value for each symptom.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Expert CF Values for Disease P1 (Common Cold)

Table 2. Expert CF Values for Disease P1 (Common Cold)

No	Disease Code	Symptoms	CF_rule (P1)
1	G2	Runny Nose	1.00
2	G3	Sneezing	0.40
3	G4	Fever	0.40
4	G6	Fatigue and Body Aches	0.40
5	G14	Headache	0.80
6	G21	Dizziness/Headache	0.60
7	G22	Feeling Weak	0.60
8	G31	Occasional Loss of Voice	0.40

The table shows the expert CF_rule values for each symptom of disease P1. These values reflect the strength of the relationship between the symptom and the disease according to the experts.

Calculation of CF_evidence and Combination for P1

The calculation begins by calculating the CF_evidence for each symptom, then these values are combined gradually. The following shows the detailed calculation steps for each symptom experienced by patient 1.

The narrative description of each calculation step is as follows.

Step 1. Symptom G2 (Runny nose).

In this step, the patient reports a runny nose symptom with a CF_user value of 0.80. Based on the knowledge base, the CF_rule expert value for this symptom for disease P1 is 1.00.

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

$CF\_e = CF\_user \times CF\_rule = 0.80 \times 1.00 = 0.8000.$

Since this is the first symptom processed, the CF_evidence value is directly used as the initial CF_combination value for P1, namely $CF\_1(P1) = 0.8000$.

Step 2. Symptom G3 (Sneezing).

In this step, the patient reports the symptom of sneezing with a CF_user value of 0.60. Based on the knowledge base, the expert CF_rule value for this symptom for disease P1 is 0.40.

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

$CF\_e = CF\_user \times CF\_rule = 0.60 \times 0.40 = 0.2400.$

Before this symptom was considered, the CF_old value for P1 was 0.8000. The new CF_evidence value is then combined with CF_old using the CF combination formula:

$CF\_combination = CF\_old + CF\_new \times (1 - CF\_old)$

$= 0.8000 + 0.2400 \times (1 - 0.8000)$

$= 0.8480.$

Thus, the CF_combination value after considering this symptom becomes 0.8480.

Step 3. Symptom G4 (Fever).

In this step, the patient reports symptoms of fever with a CF_user value of 0.80. Based on the knowledge base, the expert CF_rule value for this symptom for disease P1 is 0.40.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

CF_e = CF_user × CF_rule = 0.80 × 0.40 = 0.3200.

Before this symptom was considered, the CF_old value for P1 was 0.8480. The new CF_evidence value is then combined with CF_old using the CF combination formula:

CF_combination = CF_old + CF_new × (1 − CF_old)

= 0.8480 + 0.3200 × (1 − 0.8480)

= 0.8966.

Thus, the CF_combination value after considering this symptom becomes 0.8966.

Step 4. Symptom G6 (Fatigue and Body Pain).

In this step, the patient reports symptoms of Fatigue and Body Pain with a CF_user value of 0.40. Based on the knowledge base, the CF_rule expert value for this symptom for disease P1 is 0.40.

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

CF_e = CF_user × CF_rule = 0.40 × 0.40 = 0.1600.

Before this symptom was considered, the CF_old value for P1 was 0.8966. The new CF_evidence value was then combined with CF_old using the CF combination formula:

CF_combination = CF_old + CF_new × (1 − CF_old)

= 0.8966 + 0.1600 × (1 − 0.8966)

= 0.9132.

Thus, the CF_combination value after considering this symptom becomes 0.9132.

Step 5. Symptom G14 (Headache).

In this step, the patient reports a Headache symptom with a CF_user value of 0.60. Based on the knowledge base, the expert CF_rule value for this symptom for disease P1 is 0.80.

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

CF_e = CF_user × CF_rule = 0.60 × 0.80 = 0.4800.

Before this symptom was considered, the CF_old value for P1 was 0.9132. The new CF_evidence value is then combined with CF_old using the CF combination formula:

CF_combination = CF_old + CF_new × (1 − CF_old)

= 0.9132 + 0.4800 × (1 − 0.9132)

= 0.9549.

Thus, the CF_combination value after considering this symptom becomes 0.9549.

Step 6. Symptom G21 (Dizziness/Headache).

In this step, the patient reports the symptom Dizziness/Headache with a CF_user value of 0.80. Based on the knowledge base, the expert CF_rule value for this symptom for disease P1 is 0.60.

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

CF_e = CF_user × CF_rule = 0.80 × 0.60 = 0.4800.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Before this symptom was considered, the CF_old value for P1 was 0.9549. The new CF_evidence value is then combined with CF_old using the CF combination formula:

CF_combination = CF_old + CF_new × (1 − CF_old)

= 0.9549 + 0.4800 × (1 − 0.9549)

= 0.9765.

Thus, the CF_combination value after considering this symptom becomes 0.9765.

Step 7. Symptom G22 (Feeling Weak).

In this step, the patient reports the symptom Feeling Weak with a CF_user value of 0.40. Based on the knowledge base, the expert CF_rule value for this symptom for disease P1 is 0.60.

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

CF_e = CF_user × CF_rule = 0.40 × 0.60 = 0.2400.

Before this symptom was considered, the CF_old value for P1 was 0.9765. The new CF_evidence value is then combined with CF_old using the CF combination formula:

CF_combination = CF_old + CF_new × (1 − CF_old)

= 0.9765 + 0.2400 × (1 − 0.9765)

= 0.9822.

Thus, the CF_combination value after considering this symptom becomes 0.9822.

Step 8. Symptom G31 (Voice Sometimes Disappears).

In this step, the patient reports the symptom Voice Sometimes Disappears with a CF_user value of 0.40. Based on the knowledge base, the expert CF_rule value for this symptom for disease P1 is 0.40.

The CF_evidence value is calculated by multiplying CF_user and CF_rule:

CF_e = CF_user × CF_rule = 0.40 × 0.40 = 0.1600.

Before this symptom was considered, the CF_old value for P1 was 0.9822. The new CF_evidence value is then combined with CF_old using the CF combination formula:

CF_combination = CF_old + CF_new × (1 − CF_old)

= 0.9822 + 0.1600 × (1 − 0.9822)

= 0.9850.

Thus, the CF_combination value after considering this symptom becomes 0.9850.

After all relevant symptoms were entered into the combination process, the final Certainty Factor value for disease P1 in patient 1 was obtained as CF(P1) = 0.9850.

Table 3. The CF_combination Value

No	Kode	Symptoms	CF_user	CF_rule (P1)	CF_e = CF_user×CF_rule	CF_old	CF_kombinasi
1	G2	Runny Nose	0.80	1.00	0.8000	0.0000	0.8000
2	G3	Sneezing	0.60	0.40	0.2400	0.8000	0.8480
3	G4	Fever	0.80	0.40	0.3200	0.8480	0.8966

ISSN: 2716-3865 (Print), 2721-1290 (Online)

4	G6	Fatigue and Body Aches	0.40	0.40	0.1600	0.8966	0.9132
5	G14	Headache	0.60	0.80	0.4800	0.9132	0.9549
6	G21	Dizziness/Headache	0.80	0.60	0.4800	0.9549	0.9765
7	G22	Feeling Weak	0.40	0.60	0.2400	0.9765	0.9822
8	G31	Occasional Loss of Voice	0.40	0.40	0.1600	0.9822	0.9850

Summary of Certainty Factor Values for All Diseases

The same calculation procedure was applied to other diseases (P2 to P7), where each CF_rule value for the disease was used in the CF_evidence calculation and combined using the same formula. A summary of the final CF values for all diseases in patient 1 is presented in the following table.

Table 4. Summary of Certainty Factor Values for All Diseases

Disease Code	Disease Name	CF(P) End
P1	Common cold	0.9850
P2	Pharyngitis (sore throat)	0.8407
P3	Laryngitis (inflammation of the vocal cords)	0.6116
P4	Sinusitis (inflammation of the sinuses)	0.8603
P5	Pneumonia (inflammation of the lungs)	0.8437
P6	Tonsillitis (inflammation of the tonsils)	0.5148
P7	Bronchitis	0.7945

The table shows that one of the diseases has the highest CF value. The disease with the highest CF value is selected as the system's diagnosis result for patient 1 using the Certainty Factor method.

Conclusion of Certainty Factor Calculations for Patients 1–20

The following table summarizes the results of the Certainty Factor calculations for patients 1 to 20. The conclusion is based on the highest CF value for each disease P1 to P7 in each patient.

Table 5. Conclusion of Certainty Factor Calculations for Patients 1–20

No	Patient	Disease Code	Disease Name	CF(P) Value
1	Patient 1	P1	Common cold	0.9850
2	Patient 2	P1	Common cold	0.9529
3	Patient 3	P1	Common cold	0.9944
4	Patient 4	P1	Common cold	0.9006
5	Patient 5	P6	Tonsillitis	0.9737
6	Patient 6	P2	Pharyngitis	0.7313
7	Patient 7	P3	Laryngitis	0.8480
8	Patient 8	P3	Laryngitis	1.0000
9	Patient 9	P3	Laryngitis	1.0000
10	Patient 10	P4	Sinusitis	0.9600
11	Patient 11	P4	Sinusitis	1.0000

ISSN: 2716-3865 (Print), 2721-1290 (Online)

12	Patient 12	P2	Pharyngitis	0.9466
13	Patient 13	P5	Pneumonia	0.8640
14	Patient 14	P5	Pneumonia	0.9562
15	Patient 15	P5	Pneumonia	0.9056
16	Patient 16	P6	Tonsilitis	0.5610
17	Patient 17	P6	Tonsilitis	0.9424
18	Patient 18	P6	Tonsilitis	0.9027
19	Patient 19	P7	Bronchitis	0.8723
20	Patient 20	P4	Sinusitis	1.0000

Example of Dempster-Shafer Calculation for Patient 1

Patient 1 Symptom Data

Table 6. Patient 1 Symptom Data

No.	Disease Code	Symptoms	DS Belief Value	Hypothesis Group (DS)
1	G2	Runny Nose	1	{P1,P5}
2	G3	Sneezing	0,4	{P1,P4}
3	G4	Fever	0,8	{P1,P2,P3,P4,P5,P7}
4	G6	Fatigue and Body Aches	0,6	{P1,P2,P3,P5,P6}
5	G14	Headache	0,8	{P1,P2,P4,P5}
6	G21	Dizziness/Headache	0,6	{P1,P2,P4,P7}
7	G22	Feeling Weak	0,6	{P1,P2,P6,P7}
8	G31	Occasional Loss of Voice	0,8	{P1,P2,P3,P6}

Factor-1: Runny Nose (G2)

The initial mass function for the Runny Nose symptom is:

• m1{P1,P5} = 1

• m1{θ) = 0

Factor-2: Sneezing (G3)

The mass function for this symptom is:

m2{P1,P4} = 0.4

m2{θ) = 0.6

m1		m2			
		{P1,P4}	0,4	{θ}	0,6
{P1,P5}	1	{P1}	0,4	{P1,P5}	0,6
{θ}	0	{P1,P4}	0	θ	0

Mass distribution formula after combination (using Dempster's rule):

Conflict value K = 0

m3{P1} = (0,4) / (1 − 0) = 0,4

m3{P1,P4} = (0) / (1 − 0) = 0

m3{P1,P5} = (0,6) / (1 − 0) = 0,6

ISSN: 2716-3865 (Print), 2721-1290 (Online)

m3{θ) = (0) / (1 − 0) = 0

Factor-3: Fever (G4)

Mass function for this symptom:

m3{{P1,P2,P3,P4,P5,P7} = 0.8

m3{θ) = 0.2

Table of combination matrices of mass functions before and after this factor (copied from the worksheet):

m3		m4			
		{P1,P2,P3,P4,P5,P7}	0,8	{θ}	0,2
m3{P1}	0,4	{P1}	0,32	{P1}	0,08
m3{P1,P4}	0	{P1,P4}	0	{P1,P4}	0
m3{P1,P5}	0,6	{P1,P5}	0,48	{P1,P5}	0,12
M3{θ}	0	{P1,P2,P3,P4,P5,P7}	0	θ	0

Mass distribution formula after combination (using Dempster's rule):

Conflict value K = 0

m5{P1} = (0,32 + 0,08) / (1 − 0) = 0,4

m5{P1,P4} = (0) / (1 − 0) = 0

m5{P1,P5} = (0,48 + 0,12) / (1 − 0) = 0,6

m5{P1,P2,P3,P4,P5,P7} = (0) / (1 − 0) = 0

m5{θ) = (0) / (1 − 0) = 0

Factor-4: Fatigue and Body Pain (G6)

Mass function for this symptom:

• m4{P1,P2,P3,P5,P6} = 0.6

• m4{θ) = 0.4

Combination matrix table of mass functions before and after this factor (copied from the worksheet):

m5		m6			
		{P1,P2,P3,P5,P6}	0,6	{θ}	0,4
m5{P1}	0,4	{P1}	0,24	{P1}	0,16
m5{P1,P4}	0	{P1}	0	{P1,P4}	0
m5{P1,P5}	0,6	{P1,P5}	0,36	{P1,P5}	0,24
m5{P1,P2,P3,P4,P5,P7}	0	{P1,P2,P3,P5}	0	{P1,P2,P3,P4,P5,P7}	0
m5{θ}	0	{P1,P2,P3,P5,P6}	0	θ	0

Mass distribution formula after combination (using Dempster's rule):

Conflict value K = 0

m7{P1} = (0,24 + 0,16) / (1 − 0) = 0,4

ISSN: 2716-3865 (Print), 2721-1290 (Online)

m7{P1,P4} = (0) / (1 − 0) = 0

m7{P1,P5} = (0,36 + 0,24) / (1 − 0) = 0,6

m7{P1,P2,P3,P5} = (0) / (1 − 0) = 0

m7{P1,P2,P3,P4,P5,P7} = (0) / (1 − 0) = 0

m7{P1,P2,P3,P5,P6} = (0) / (1 − 0) = 0

m7{θ) = (0) / (1 − 0) = 0

Factor-5: Headache (G14)

Mass function for this symptom:

m5{P1,P2,P4,P5} = 0.8

m5{θ) = 0.2

Combination matrix table of mass functions before and after this factor (copied from the worksheet):

m7		m8			
		{P1,P2,P4,P5}	0,8	{θ}	0,2
m7{P1}	0,4	{P1}	0,32	{P1}	0,08
m7{P1,P4}	0	{P1,p4}	0	{P1,P4}	0
m7{P1,P5}	0,6	{P1,P5}	0,48	{P1,P5}	0,12
m7{P1,P2,P3,P5}	0	{P1,P2,P5}	0	{P1,P2,P3,P5}	0
m7{P1,P2,P3,P4,P5,P7}	0	{P1,P2,P4,P5}	0	{P1,P2,P3,P4,P5,P7}	0
m7{P1,P2,P3,P5,P6}	0	{P1,P2,P5}	0	{P1,P2,P3,P5,P6}	0
m7{θ}	0	{P1,P2,P4,P5}	0	θ	0

Mass distribution formula after combination (using Dempster's rule):

Conflict value K = 0

m9{P1} = (0,32 + 0,08) / (1 − 0) = 0,4

m9{P1,P4} = (0) / (1 − 0) = 0

m9{P1,P5} = (0,48 + 0,12) / (1 − 0) = 0,6

m9{P1,P2,P5} = (0) / (1 − 0) = 0

m9{P1,P2,P4,P5} = (0) / (1 − 0) = 0

m9{P1,P2,P3,P5} = (0) / (1 − 0) = 0

m9{P1,P2,P3,P4,P5,P7} = (0) / (1 − 0) = 0

m9{P1,P2,P3,P5,P6} = (0) / (1 − 0) = 0

m9{θ) = (0) / (1 − 0) = 0

Factor-6: Dizziness/Headache (G21)

Mass function for this symptom:

ISSN: 2716-3865 (Print), 2721-1290 (Online)

m6{P1,P2,P4,P7} = 0.6

m6{θ) = 0.4

Combination matrix table of mass functions before and after this factor (copied from the worksheet):

m9		m10			
		{P1,P2,P4,P7}	0,6	{θ}	0,4
m9{P1}	0,4	{P1}	0,24	{P1}	0,16
m9{P1,P4}	0	{P1,P4}	0	{P1,P4}	0
m9{P1,P5}	0,6	{P1}	0,36	{P1,P5}	0,24
m9{P1,P2,P5}	0	{P1,P2}	0	{P1,P2,P5}	0
m9{P1,P2,P4,P5}	0	{P1,P2,P4}	0	{P1,P2,P4,P5}	0
{P1,P2,P3,P5}	0	{P1,P2}	0	{P1,P2,P3,P5}	0
m9{P1,P2,P3,P4,P5,P7}	0	{P1,P2,P4,P7}	0	{P1,P2,P3,P4,P5,P7}	0
m9{P1,P2,P3,P5,P6}	0	{P1,P2,P4}	0	{P1,P2,P3,P5,P6}	0
m9{θ}	0	{P1,P2,P4,P7}	0	θ	0

Mass distribution formula after combination (using Dempster's rule):

Conflict value K = 0

m11{P1} = (0,24 + 0,16 + 0,36) / (1 − 0) = 0,76

m11{P1,P4} = (0) / (1 − 0) = 0

m11{P1,P5} = (0,24) / (1 − 0) = 0,24

m11{P1,P2} = (0) / (1 − 0) = 0

m11{P1,P2,P4} = (0) / (1 − 0) = 0

m11{P1,P2,P4,P7} = (0) / (1 − 0) = 0

m11{P1,P2,P5} = (0) / (1 − 0) = 0

m11{P1,P2,P4,P5} = (0) / (1 − 0) = 0

m11{P1,P2,P3,P5} = (0) / (1 − 0) = 0

m11{P1,P2,P3,P4,P5,P7} = (0) / (1 − 0) = 0

m11{P1,P2,P3,P5,P6} = (0) / (1 − 0) = 0

m11{θ) = (0) / (1 − 0) = 0

Factor-7: Body Feels Weak (G22)

Mass function for this symptom:

m7{{P1,P2,P6,P7} = 0.6

m7{θ) = 0.4

Table of mass function combination matrices before and after this factor (copied from the worksheet):

ISSN: 2716-3865 (Print), 2721-1290 (Online)

m11		m12			
		{P1,P2,P6,P7}	0,6	{θ}	0,4
m11{P1}	0,76	{P1}	0,456	{P1}	0,304
m11{P1,P4}	0	{P1}	0	{P1,P4}	0
m11{P1,P5}	0,24	{P1}	0,144	{P1,P5}	0,096
m11{P1,P2}	0	{P1,P2}	0	{P1,P2}	0
m11{P1,P2,P4}	0	{P1,P2}	0	{P1,P2,P4}	0
m11{P1,P2,P4,P7}	0	{P1,P2,P7}	0	{P1,P2,P4,P7}	0
m11{P1,P2,P5}	0	{P1,P2}	0	{P1,P2,P5}	0
m11{P1,P2,P4,P5}	0	{P1,P2}	0	{P1,P2,P4,P5}	0
m11{P1,P2,P3,P5}	0	{P1,P2}	0	{P1,P2,P3,P5}	0
m11{P1,P2,P3,P4,P5,P7}	0	{P1,P2,P7}	0	{P1,P2,P3,P4,P5,P7}	0
m11{P1,P2,P3,P5,P6}	0	{P1,P2,P6}	0	{P1,P2,P3,P5,P6}	0
m11{θ}	0	{P1,P2,P6,P7}	0	θ	0

Mass distribution formula after combination (using Dempster's rule):

Conflict value K = 0

- m13{P1} = (0,456 + 0,304 + 0,144) / (1 − 0) = 0,904
- m13{P1,P4} = (0) / (1 − 0) = 0
- m13{P1,P5} = (0,096) / (1 − 0) = 0,096
- m13{P1,P2} = (0) / (1 − 0) = 0
- m13{P1,P2,P4} = (0) / (1 − 0) = 0
- m13{P1,P2,P7} = (0) / (1 − 0) = 0
- m13{P1,P2,P6} = (0) / (1 − 0) = 0
- m13{P1,P2,P6,P7} = (0) / (1 − 0) = 0
- m13{P1,P2,P4,P7} = (0) / (1 − 0) = 0
- m13{P1,P2,P5} = (0) / (1 − 0) = 0
- m13{P1,P2,P4,P5} = (0) / (1 − 0) = 0
- m13{P1,P2,P3,P5} = (0) / (1 − 0) = 0
- m13{P1,P2,P3,P4,P5,P7} = (0) / (1 − 0) = 0
- m13{P1,P2,P3,P5,P6} = (0) / (1 − 0) = 0
- m13{θ) = (0) / (1 − 0) = 0

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Factor-8: Occasional Sound Loss (G31)

Mass function for this symptom:

m8{{P1,P2,P3,P6} = 0.8

m8{θ) = 0.2

Combination matrix table of mass functions before and after this factor (copied from the worksheet):

m13		m14			
		{P1,P2,P3,P6}	0,8	{θ}	0,2
m13{P1}	0,904	{P1}	0,7232	{P1}	0,1808
m13{P1,P4}	0	{P1}	0	{P1,P4}	0
m13{P1,P5}	0,096	{P1}	0,0768	{P1,P5}	0,0192
m13{P1,P2}	0	{P1,P2}	0	{P1,P2}	0
m13{P1,P2,P4}	0	{P1,P2}	0	{P1,P2,P4}	0
m13{P1,P2,P7}	0	{P1,P2}	0	{P1,P2,P7}	0
m13{P1,P2,P6}	0	{P1,P2,P6}	0	{P1,P2,P6}	0
m13{P1,P2,P6,P7}	0	{P1,P2,P6}	0	{P1,P2,P6,P7}	0
m13{P1,P2,P4,P7}	0	{P1,P2}	0	{P1,P2,P4,P7}	0
m13{P1,P2,P5}	0	{P1,P2}	0	{P1,P2,P5}	0
m13{P1,P2,P4,P5}	0	{P1,P2}	0	{P1,P2,P4,P5}	0
m13{P1,P2,P3,P5}	0	{P1,P2}	0	{P1,P2,P3,P5}	0
m13{P1,P2,P3,P4,P5,P7}	0	{P1,P2,P3}	0	{P1,P2,P3,P4,P5,P7}	0
m13{P1,P2,P3,P5,P6}	0	{P1,P2,P3,P6}	0	{P1,P2,P3,P5,P6}	0
m13{θ}	0	{P1,P2,P3,P6}	0	θ	0

Mass distribution formula after combination (using Dempster's rule):

Conflict value K = 0

- m15{P1} = (0,7232 + 0,1808 + 0,0768) / (1 − 0) = 0,9808
- m15{P1,P4} = (0) / (1 − 0) = 0
- m15{P1,P5} = (0,0192) / (1 − 0) = 0,0192
- m15{{P1,P2} = (0) / (1 − 0) = 0
- m15{P1,P2,P4} = (0) / (1 − 0) = 0
- m15{P1,P2,P7} = (0) / (1 − 0) = 0
- m15{P1,P2,P6} = (0) / (1 − 0) = 0
- m15{P1,P2,P3} = (0) / (1 − 0) = 0
- m15{P1,P2,P3,P6} = (0) / (1 − 0) = 0

ISSN: 2716-3865 (Print), 2721-1290 (Online)

- m15{P1,P2,P6,P7} = (0) / (1 − 0) = 0
- m15{P1,P2,P4,P7} = (0) / (1 − 0) = 0
- m15{P1,P2,P5} = (0) / (1 − 0) = 0
- m15{P1,P2,P4,P5} = (0) / (1 − 0) = 0
- m15{P1,P2,P3,P5} = (0) / (1 − 0) = 0
- m15{P1,P2,P3,P4,P5,P7} = (0) / (1 − 0) = 0
- m15{P1,P2,P3,P5,P6} = (0) / (1 − 0) = 0
- m15{θ) = (0) / (1 − 0) = 0

Based on the results of the Dempster–Shafer method calculation for Patient 1, the highest belief mass value was obtained in P1 (common cold) with m(P1) ≈ 0.9808 (98.08%), while other disease hypotheses had very small/almost zero mass values. In conclusion, Patient 1 is most likely to have the common cold (P1) according to the expert system calculations.

Conclusion of DS Calculations for 20 Patients (in Percentages)

The following table shows the final results of the Dempster-Shafer method calculations for 20 patients, complete with confidence values in percentage form.

Table 7. Conclusion of DS Calculations for 20 Patients (in Percentages)

No.	Patient	Disease Code	Name of Disease	m(P) Value	Percentage
1	Patient 1	P1	Common Flu	0,9808	98,08 %
2	Patient 2	P1	Common Flu	0,9568	95,68 %
3	Patient 3	P1	Common Flu	0,9920	99,20 %
4	Patient 4	P1	Common Flu	0,4000	40,00 %
5	Patient 5	P3	Laryngitis (inflammation of the vocal cords)	0,3200	32,00 %
6	Patient 6	P1	Common Flu	0,4000	40,00 %
7	Patient 7	P1	Common Flu	1,0000	100,00 %
8	Patient 8	P1	Common Flu	0,4000	40,00 %
9	Patient 9	P1	Common Flu	0,4000	40,00 %
10	Patient 10	P4	Sinusitis (sinus inflammation)	0,7059	70,59 %
11	Patient 11	P7	Bronchitis	0,2308	23,08 %
12	Patient 12	P3	Laryngitis (inflammation of the vocal cords)	0,3149	31,49 %
13	Patient 13	P1	Common Flu	0,7722	77,22 %
14	Patient 14	P5	Pneumonia (inflammation of the lungs)	0,7600	76,00 %
15	Patient 15	P5	Pneumonia (inflammation of the lungs)	0,9317	93,17 %
16	Patient 16	P1	Common Flu	0,3454	34,54 %

ISSN: 2716-3865 (Print), 2721-1290 (Online)

17	Patient 17	P1	Common Flu	0,5280	52,80 %
18	Patient 18	P1	Common Flu	0,8665	86,65 %
19	Patient 19	P5	Pneumonia (inflammation of the lungs)	0,6400	64,00 %
20	Patient 20	P7	Bronchitis	0,8000	80,00 %

Table 8. Comparison Table of Accuracy Between the Certainty Factor Method and the Dempster-Shafer Method

Method	Amount of Data	Correct Diagnosis	Incorrect Diagnosis	Accuracy (%)
Certainty Factor	20	14	6	70%
Dempster-Shafer	20	8	12	40%

The Certainty Factor method is superior to the Dempster-Shafer method in producing ISPA diagnoses that are consistent with expert opinions.

Conclusion

Based on the analysis of 20 data points from pediatric patients with acute respiratory infections, it can be concluded that the Certainty Factor method is superior to the Dempster-Shafer method, with accuracy rates of 70% and 40%, respectively. The Certainty Factor method is able to provide diagnostic results that are more in line with expert diagnoses because it is more effective in representing the level of expert confidence in the relationship between symptoms and disease. Therefore, the Certainty Factor method is recommended for use in the analysis and development of expert systems for the diagnosis of ARI in children. For further research, it is recommended to use a larger amount of data and combine other inference methods to improve the accuracy of diagnosis.

Acknowledgment

The author would like to thank the Indonesian Muslim University and the Faculty of Computer Science for their permission and support, which enabled this research to be carried out successfully. The author would also like to thank the experts who contributed greatly by providing knowledge and data validation, as well as the First and Second Supervisors for their guidance, direction, and patience throughout the research process. Additionally, the author would like to express their deepest appreciation to their parents, family, friends, and partner for their prayers, moral support, and motivation, which have strengthened them throughout the completion of this research.

References

Akbar, N., & Kurniawan, M. H. (2026). Infectious Disease and Health Care Utilization Among Under-Five Children in Indonesia: Evidence from the 2024 Indonesia Nutritional Status Survey. *Jurnal Kesehatan Pasak Bumi Kalimantan*, *8*(2), 186-194. https://doi.org/10.26714/seanr.4.4.2022.18-24

Anjasani, A. Y., Anraenia, S., & Kurniati, N. (2020). Sistem Pakar Mendiagnosa Penyakit Sinusitis menggunakan Certainty Factor berbasis Android. *Buletin Sistem Informasi dan Teknologi Islam*, *1*(2), 79–86.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Arnanda, R., Fauzi, A., & Simanjuntak, M. (2024). Diagnosis Penyakit Hypertemia Menggunakan Metode Demster Shafer. *Modem: Jurnal Informatika dan Sains Teknologi*, *2*(4), 102–117. https://doi.org/10.62951/modem.v2i4.235 [1]

Azrin, M., Sakir, S., Julianas, E., Amanda, I., Nadia, P., Sari, R. F., ... & Purnamasari, A. (2025). Management of Acute Respiratory Infections (ARI) in Children and Environmental Risk Factors: A Literature Review. *Nursing Genius Journal*, *2*(2), 45-55.

Azzahra, B., & Prasetyaningrum, P. T. (2024). Analisis perbandingan metode Certainty Factor dan Dempster-Shafer theory pada sistem pakar untuk mendeteksi penyakit virus Parechovirus pada balita. *INNOVATIVE: Journal of Social Science Research*, 4(3), 17389–17400. https://j-innovative.org/index.php/Innovative

Bapu, E. (2019). Analisis Perbandingan Metode Dempster Shafer Dan Certainty Factor Pada Sistem Pakar Untuk Diagnosis Penyakit Dan Hama Tanaman Kakao. *JATI (Jurnal Mahasiswa Teknik Informatika)*, *3*(2), 1-7. [3]

Dezert, T., Dezert, J., & Smarandache, F. (2023). Improvement of proportional conflict redistribution rules of combination of basic belief assignments. *Advances and Applications of DSmT for Information Fusion*, 85.

Dezerta, T., & Dezertb, J. (2023). Improvement of proportional conflict redistribution fusion rules for levee characterization. *Advances and Applications of DSmT for Information Fusion*, 439.

Harliana, & Widayani, W. (2019). Analisis Dempster Shafer Pada Sistem Pakar Pendeteksi Penyakit ISPA. *FAHMA-Jurnal Teknologi dan Ilmu Komputer*, *17*(2), 1-7. [4]

Indriani, A. F. (2019). Tantangan pelayanan kesehatan pada era perkembangan teknologi dan peningkatan populasi di Indonesia. *Jurnal Kesehatan Masyarakat*, 7(2), 112–118.

Kalimatullah, M. T., Wibowo, S. A., & Auliasari, K. (2020). Analisa Perbandingan Metode Certainty Factor Dengan Dempster Shafer Pada Sistem Pakar Untuk Mendiagnosis Penyakit Balita Usia Kurang Dari 5 Tahun. *JATI (Jurnal Mahasiswa Teknik Informatika)*, *4*(1), 1-8. [5]

Kelen, Y. P. K. (2025). Application of the Dempster-Shafer Method in Developing a Web-Based Expert System for Diagnosing Dental and Oral Diseases. *Ultimatics: Jurnal Teknik Informatika*, *17*(2), 184-189.

Li, J., & Zhang, Z. (2024). Pipeline leakage localization method based on transient signal detection and data fusion from multi-sensor. *Journal of Hydroinformatics*, *26*(9), 2235-2250.

Lutpiatina, L., Sulistyorini, L., Notobroto, H. B., Raya, R. P., Utama, R. D., & Thuraidah, A. (2022). Multilevel analysis of lifestyle and household environment for toddlers with symptoms of acute respiratory infection (ARI) in Indonesia in 2007, 2012, and 2017. *Global pediatric health*, *9*, 2333794X221078700. https://doi.org/10.1177/2333794X221078700

Markus, T. B., Ikhsanto, M. N., & Perdana, A. (2023). Analisis Perbandingan Metode Certainty Factor Dan Demster Shafer Pada Diagnosa Penyakit Mata. *Jurnal Cendikia Informatika (JCO)*, *3*(2). https://doi.org/10.51111/jco.v1n2 [6]

Mirino, R., Dary, D., & Tampubolon, R. (2022). Identification of factors causing acute respiratory infection (ARI) of under-fives in community health center work area in

ISSN: 2716-3865 (Print), 2721-1290 (Online)

north jayapura sub-district. *Journal of Tropical Pharmacy and Chemistry*, *6*(1), 15-20. https://doi.org/10.30872/j.trop.pharm.chem.v6i1.214

Moras, J., Dezert, J., & Pannetier, B. (2023). Grid Occupancy Estimation for Environment Perception. *Advances and Applications of DSmT for Information Fusion (Collected Works. Volume 5)*, 157.

Musrin, N. D., & Basri, S. M. A. (2025). Correlation Analysis of Parental Knowledge About Acute Respiratory Infection With Toddler Nutritional Status in Coastal Communities: A Review. *Journal of Health Science and Pharmacy*, *2*(2), 252-264.

Mz, A. R., & Rosana, A. (2020). Pengembangan sistem pakar sebagai alat bantu diagnosis berbasis pengetahuan pakar. *Jurnal Teknologi dan Sistem Informasi*, 5(1), 45–54.

Okta, S., Prasetyaningrum, P. T., & Taqwa, P. (2022). Implementasi metode Dempster-Shafer dalam sistem pakar untuk diagnosis penyakit dengan tingkat akurasi 91%. *Jurnal Sistem Cerdas*, 9(4), 321–330.

Pamungkas, R. A., & Farida, L. D. (2023). Implementasi Dempster Shafer Untuk Deteksi Dini Gizi Buruk Pada Balita. *Jurnal Pseudocode*, *10*(1), 20–28. https://ejournal.unib.ac.id/index.php/pseudocode/article/view/1841 [7]

Prawitasari, N., Dahliah, D., CP, S. S., & Rijal, S. (2025). Relationship Between Upper Respiratory Tract Infection And Acute Otitis Media In Children. *Jurnal EduHealth*, *16*(01), 178-188.

Prieto[1], D. P., de Haan[1], R., & Destercke, S. (2025, April). How to Efficiently Decombine Belief. In *Information Processing and Management of Uncertainty in Knowledge-Based Systems: 20th International Conference, IPMU 2024, Lisbon, Portugal, July 22-26, 2024, Proceedings, Volume 2* (Vol. 1175, p. 91). Springer Nature. https://doi.org/10.1109/CIR65373.2025.11257212

Rizky, F., Zulham, Nasyuha, A. H., Elyas, A. H., & Kartadies, R. (2023). Analisis Perbandingan Certainty Factor dan Dempster Shafer Dalam Diagnosis Penyakit Porfiria Menggunakan Metode Perbandingan Eksponensial. *Building of Informatics, Technology and Science (BITS)*, *5*(1), 171-180. https://doi.org/10.47065/bits.v5i1.3611 [9]

Salamah, U., & Ramadhan, R. (2023). Analisis Perbandingan Metode Dempster Shafer dan Certainty Factor dalam Mendeteksi Penyakit Anemia. *JSAI: Journal Scientific and Applied Informatics*, *6*(2), 168–176. http://ejournal.amikompurwokerto.ac.id/index.php/JSAP/article/view/1841 [10]

Setiyani, S., & Prasetyaningrum, P. T. (2021). Sistem pakar sebagai media penyajian informasi dan pendukung keputusan berbasis ketidakpastian. *Jurnal Teknologi Informasi dan Komunikasi*, 12(3), 201–210.

Shao, H., Pan, L., Chen, J., Gao, X., & Kang, B. (2025). Influence factor-based transformation method for translating mass function to probability in Dempster–Shafer evidence theory. *Engineering Applications of Artificial Intelligence*, *149*, 110385. https://doi.org/10.1016/j.engappai.2025.110385

Smarandache, F., & Dezertb, J. (2023). with Degrees of Intersections. *Advances and Applications of DSmT for Information Fusion (Collected Works. Volume 5)*, 17.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Tiana, J., Dezert, J., & Reinartza, P. (2023). Refined Building Change Detection in Satellite Stereo Imagery Based on Belief Functions. *Advances and Applications of DSmT for Information Fusion (Collected Works. Volume 5)*, 127.

Wiwin Asthiningsih, N. W., Milkhatun, M., & Ari Fakhrur Rizal, A. (2022). History of Low Birth Weight and Exclusive Breastfeeding on the Incidence of Acute Respiratory Infection in Children Under Five Years.

Wu, S. (2025, September). A New Evidence Combination Method Based on Evidence Conflict Coefficient and its Application in Fault Diagnosis. In *2025 International Conference on Computational Intelligence and Robotics (CIR)* (pp. 222-230). IEEE.

Wulandari, R. A., Fauzia, S., & Kurniasari, F. (2024). Investigations on the risk factors of Acute Respiratory Infections (ARIs) among under-five children in Depok City, Indonesia. *Annali di Igiene, Medicina Preventiva e di Comunità*, *36*(1).

Yulianita, M. E., Kasma, A. Y., & Ayumar, A. (2023). Predictive factors of family health management for caring toddlers with acute respiratory infections. *Jurnal Ners*, *18*(2), 184.

Zebua, D., Alfionita, I., Lawa, Y., Siregar, D., & Harefa, L. (2023). Acute respiratory infection and its associated factors among children under five years. *Enfermería clínica*, *33*, S50-S54. https://doi.org/10.30872/j.trop.pharm.chem.v6i1.214

Zhou, Q., & Deng, Y. (2022). Higher order information volume of mass function. *Information Sciences*, *586*, 501-513. https://doi.org/10.1016/j.ins.2021.12.005

ISSN: 2716-3865 (Print), 2721-1290 (Online)