



Expert System for Diagnosing Feline Infectious Peritonitis (FIP) Viral Infection in Cat using the Certainty Factor Method

Hanis Nabila^{1*}, Novriyenni², Adek Maulidya³

^{1,2,3}STMIK Kaputama Binjai

hanisnabila2017@gmail.com^{1*}, novriyenni.sikumbang@gmail.com², adek.maulidya@gmail.com³

Abstract

Feline Infectious Peritonitis (FIP) is one of the most dangerous viral infectious diseases in cats that can lead to death if not treated quickly and properly. This disease is difficult to detect at an early stage because it has symptoms similar to those of other diseases, causing many cat owners to experience difficulties in identifying their pets' health conditions. The lack of knowledge regarding the early symptoms of FIP, along with the limited number of veterinarians and the relatively high cost of medical examinations, has become an obstacle in the process of diagnosing diseases in cats. Therefore, an expert system is needed to assist in the early diagnosis process of Feline Infectious Peritonitis (FIP) based on the symptoms experienced by cats using the Certainty Factor method. Based on the analysis and Certainty Factor calculations conducted according to the selected symptoms, the diagnosis result obtained was Dry Feline Infectious Peritonitis (FIP) with a confidence level of 97.45%.

Keywords: Expert System, Feline Infectious Peritonitis (FIP), Certainty Factor

1. Introduction

Cats are among the most popular companion animals kept by the community, making their health and physical condition important aspects that require proper attention. One of the most serious diseases affecting cats is Feline Infectious Peritonitis (FIP), a viral infection that can be fatal if not diagnosed and treated promptly. Early detection of FIP is particularly challenging because its symptoms often resemble those of other diseases. At PET'S CORNER STABAT Veterinary Clinic, the number of FIP cases can reach approximately 50 patients or more each year.

Limited knowledge among cat owners regarding the early symptoms of FIP, the shortage of veterinary professionals, and the relatively high cost of medical examinations often result in delayed diagnosis and treatment. Consequently, there is a need for a system that can assist cat owners in obtaining preliminary information about their pets' health conditions.

An expert system is a branch of artificial intelligence designed to incorporate the knowledge and reasoning processes of human experts into a computer-based system to assist in solving specific problems [1]. The advantage of an expert system lies not only in its ability to store knowledge but also in its capability to perform reasoning processes to solve complex problems. The Certainty Factor (CF) method is particularly suitable for disease diagnosis systems because it is capable of handling uncertainty and generating diagnostic results with a certain degree of confidence based on the weights assigned by experts [2].

2. Research Methods

The Certainty Factor (CF) method is one of the approaches used in expert systems to address uncertainty in the decision-making process. This method represents the degree of confidence an expert has in a particular fact or hypothesis based on the available evidence. In practice, the Certainty Factor method is commonly applied when experts express their judgments using terms such as "possible," "likely," or "almost certain" when evaluating a specific condition [3]. The CF value is expressed as a numerical value that represents the degree of confidence in a particular conclusion or diagnostic result[4].

The Certainty Factor method involves several calculation stages, which are described as follows:

1. Identifying and organizing the symptom and disease data to be used in the system.

Table 1: Symptoms of Feline Viral Diseases

Symptom Id	Symptom	Disease Type	
		WET FIP	DRY FIP
G01	Persistent fever	Yes	Yes
G02	Loss of appetite	Yes	Yes
G03	Weight loss	Yes	Yes
G04	Lethargy or depression	Yes	Yes
G05	Digestive disorders or diarrhea	Yes	Yes
G06	Jaundice	Yes	Yes
G07	Abdominal enlargement due to fluid accumulation	Yes	-
G08	Fluid accumulation in the chest cavity	Yes	-
G09	Difficulty breathing or rapid breathing	Yes	Yes
G10	Progressive abdominal distension	Yes	Yes
G11	Neurological disorders (seizures, ataxia, or uncoordinated movements)	Yes	Yes
G12	Tremors or behavioral changes	Yes	Yes
G13	Ocular disorders such as uveitis or red eyes	Yes	Yes
G14	Enlarged lymph nodes or abdominal masses	Yes	Yes
G15	Liver or kidney disorders	Yes	Yes
G16	Presence of granulomas (inflammatory lesions in organs)	Yes	Yes

Table 2: Certainty Factor Scale

Certainty Term	CF Value
Not Present	0
Very Uncertain	0,2
Less Certain	0,4
Moderately	0,6
Certain	0,8
Very Certain	1

2. Constructing IF–THEN rules based on the relationships between symptoms and diseases.

An example of the rule structure used in the system is as follows:

```
IF Symptom 1
AND Symptom 2
AND Symptom 3
THEN Disease
```

3. Assigning confidence weight values from both the expert and the user for each symptom.

Table 3: Expert and User Confidence Value

Symptom Id	Symptom	Disease Type	Expert CF Value	User CF Value
G02	Loss of appetite		0,6	0,4
G04	Lethargy or depression		0,4	0,4
G07	Abdominal enlargement due to fluid accumulation		1	0,2
G08	Fluid accumulation in the chest cavity	WET FIP	1	0,2
G11	Neurological disorders (seizures, ataxia, or uncoordinated movements)		0,2	0,8
G13	Ocular disorders such as uveitis or red eyes		0,2	0,8
G02	Loss of appetite		0,6	0,4
G04	Lethargy or depression		0,4	0,4
G07	Abdominal enlargement due to fluid accumulation	DRY FIP	0	0,2
G08	Fluid accumulation in the chest cavity		0	0,2
G11	Neurological disorders (seizures, ataxia, or uncoordinated movements)		1	0,8

G13	Ocular disorders such as uveitis or red eyes	1	0,8
-----	--	---	-----

4. Calculating the Certainty Factor value using the following equations:

$$CF(H,E) = CF(\text{expert}) \times CF(\text{user}) [5]$$

Table 4. Symptom Certainty Factor Value

Symptom Id	Symptom CF Result
G02	0,24
G04	0,16
G07	0,20
G08	0,20
G11	0,16
G13	0,16
G02	0,24
G04	0,16
G07	0
G08	0
G11	0,80
G13	0,80

5. The calculated Certainty Factor values are then combined to obtain the final diagnostic result, which is expressed as a percentage representing the system's confidence level in the diagnosis. For multiple symptoms, the certainty values are combined using the Certainty Factor combination formula:

$$CF_{\text{combine}}(H) = CF(H,E)_{\text{old}} + CF(H,E)_{\text{new}} \times [1 - CF(H,E)_{\text{old}}]$$

$$CF_{\text{combine}} = CF(R1) + [CF(R2) \times (1 - CF(R1))] [5]$$

Table 5: Combined Certainty Factor Value

Symptom Id	Disease Type	Combined CF Result
G02		0,24
G04		0,3616
G07	WET FIP	0,4892
G08		0,5914
G11		0,6567
G13		0,7117
G02		0,24
G04		0,3616
G07	DRY FIP	0,3616
G08		0,3616
G11		0,8723
G13		0,9745

The final confidence percentage is calculated as:

$$\text{Confidence Percentage} = CF \times 100\%$$

$$\text{WET FIP} = 0,7117 \times 100\% = 71,17\%$$

$$\text{DRY FIP} = 0,9745 \times 100\% = 97,45\%$$

Based on the Certainty Factor (CF) calculation results for Feline Infectious Peritonitis (FIP), the system indicates that the probability of the cat having Wet FIP is 71.17%, while the probability of Dry FIP is higher at 97.45%. These results suggest that the cat is more likely to be affected by Dry FIP, as it has the highest confidence value among the evaluated disease types.

3. Results and Discussion

The following figure shows the user interface of the expert system for diagnosing Feline Infectious Peritonitis (FIP). The system was developed using PHP as the programming language and MySQL as the database management system for storing and managing the data required by the application.

1. Home Page

This page is used by users to access information about the system and initiate the FIP disease diagnosis consultation process.



Fig.1: Home Page

2. Consultation Page

This page displays all symptoms associated with Feline Infectious Peritonitis (FIP), allowing users to select the symptoms that correspond to their cat's condition.

Form Konsultasi

Nama Kucing:

Nama Pemilik:

usia:

Pilih Gejala yang Dialami:

Demam berkepanjangan
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Nafsu makan berkurang
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Penurunan berat badan
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Kucing tampak lesu atau depresi
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

gangguan pencernaan atau Diare
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

(jaundice) Penyakit kuning
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Perut membesar akibat cairan
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Penumpukan cairan di dada
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Kesulitan atau napas menjadi cepat
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Distensi abdomen progresif
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Gangguan saraf (kejang, gerakan tidak terkoordinasi/ataxia)
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Tremor atau perubahan perilaku
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Gangguan mata seperti uveitis atau mata merah
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Pembesaran kelenjar getah bening atau massa abdomen
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Gangguan pada hati atau ginjal
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Munculnya granuloma (lesi peradangan pada organ)
 Tidak Tidak Yakini Kurang Yakini Cukup Yakini Yakini Sangat Yakini

Fig.2: Consultation Page

3. Results Page

This page presents the results of the consultation conducted by the user based on the selected symptoms. The diagnosis results are displayed along with the corresponding confidence level generated using the Certainty Factor method.

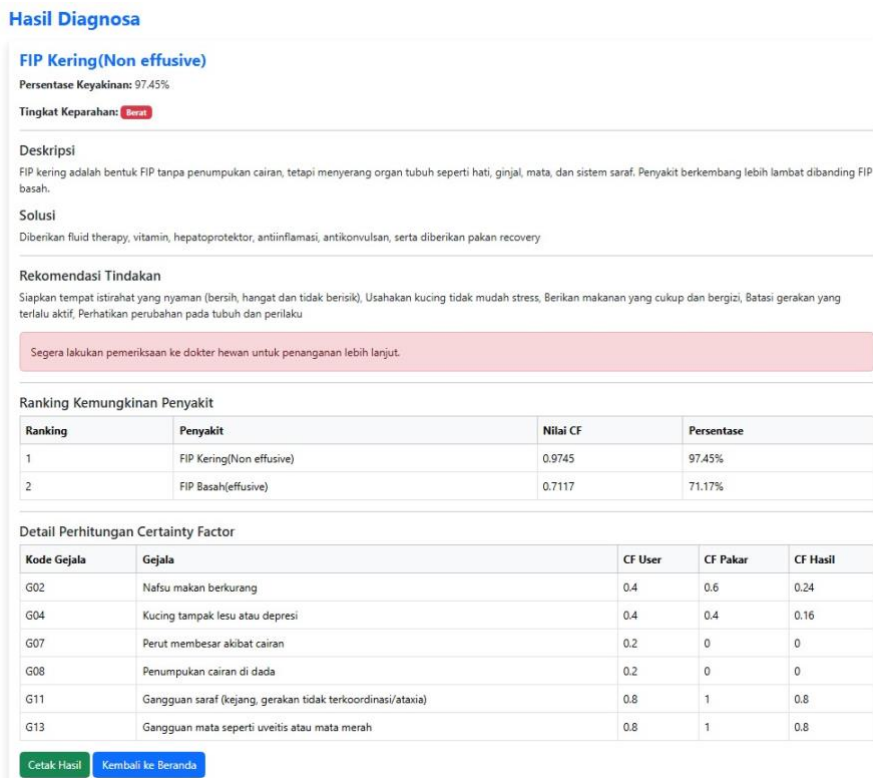


Fig.3: Results Page

4. Conclusion

Based on the results of the study, it can be concluded that the expert system for diagnosing Feline Infectious Peritonitis (FIP) using the Certainty Factor method was successfully developed and is capable of assisting cat owners in performing an initial diagnosis based on the observed symptoms. The Certainty Factor method can be used to determine the confidence level of the type of FIP affecting a cat by combining the confidence values provided by both the expert and the user. The developed system is expected to serve as an initial consultation tool that helps cat owners obtain information about FIP before seeking further examination from a veterinarian. Based on the testing results, the system produced the highest confidence value for Dry FIP, reaching 97.45%.

References

[1] Teresia, V., Razi, F., Syamsu, M., & Ahmad Dahlan, I. (2023). Implementasi Sistem Pakar Diagnosa Penyakit Mulut Pada Kucing Dengan Metode Certainty Factor. In Journal of Science and Social Research (Number 2). <http://jurnal.goretanpena.com/index.php/JSSR>

[2] Sipata, D. I., & Susilawati, I. (2025). Sistem Pakar Diagnosa Gangguan Kecemasan Menggunakan Metode Certainty Factor. JEKIN - Jurnal Teknik Informatika, 5(2), 1007–1021. <https://doi.org/10.58794/jekin.v5i2.1593>

[3] Febriani, H. A., Wijaya, D. P., Pramuntadi, A., & Prastowo, W. D. (2024). Sistem Pakar Diagnosa Penyakit Lambung Menggunakan Metode Certainty Factor Berbasis Web. MALCOM: Indonesian Journal of Machine Learning and Computer Science, 4(4), 1290–1300. <https://doi.org/10.57152/malcom.v4i4.1402>

[4] Mulyani, A., Kurniadi, D., & Multajam, S. I. (2023). Penerapan Metode Certainty Factor pada Sistem Pakar Diagnosis Penyakit Difteri Berbasis Web. Teknika, 12(3), 205–211. <https://doi.org/10.34148/teknika.v12i3.686>

[5] Limbong, T., & Sriadhi. (2021). Pemrograman web dasar. Yayasan Kita Menulis.

[6] Murani, N. A., Wahyuni, S., Pratiwi, R. A., Firdaus, T., & Wardianto. (2025). Analisis Penggunaan Visual Studio Code Sebagai Editor Pemrograman Terbaik Untuk Pemula Pada Mahasiswa Informatika Universitas Nurul Huda. Jurnal Rekayasa Informatika (Jrit), 2(2), 1–10. <https://ejournal.pei.ac.id/index.php/JRIT/index>