JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. XI No 3, Juni 2025, hlm. 485 – 492 ISSN 2550-0201 (Online)
DOI: http://dx.doi.org/10.33330/jurteksi.v11i3.3803
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

APPLICATION EXPERT SYSTEM FOR DIAGNOSIS OF UTERINE DISEASE FUZZY LOGIC

Tri Wanti Titin[1], Rolly Yesputra[2*], Rohminatin[1]
[1]Information System, Universitas Royal
[2]Computer System, Universitas Royal
*email:**titintriwanti6@gmail.com

Abstract: Uterine disease is a serious threat to women's health, which can affect fertility and quality of life. Delayed diagnosis often results in patients not getting optimal early treatment at the H. Abdul Manan Simatupang Kisaran Regional General Hospital. This study aims to develop a fuzzy logic-based expert system to diagnose uterine disease based on the symptoms experienced by patients. This system receives symptom data as input, then performs analysis using the fuzzy logic method to determine the level of possibility of a disease. The final results produced are an initial diagnosis and treatment recommendations. System testing shows that this method is able to identify uterine disease with fairly good accuracy, where one case showed the possibility of Endometriosis with a confidence level of 63%. With this system, patients can obtain initial information about their health condition, so they can take more appropriate and faster medical steps.

Keywords: expert system; fuzzy logic; uterine disease.

Abstrak: Penyakit rahim merupakan ancaman serius bagi kesehatan wanita, yang dapat berdampak pada kesuburan dan kualitas hidup. Keterlambatan diagnosis sering kali menyebabkan pasien tidak mendapatkan penanganan dini yang optimal di Rumah Sakit Umum Daerah H. Abdul Manan Simatupang Kisaran. Penelitian ini bertujuan untuk mengembangkan sistem pakar berbasis logika fuzzy guna mendiagnosis penyakit rahim berdasarkan gejala yang dialami pasien. Sistem ini menerima data gejala sebagai input, kemudian melakukan analisis menggunakan metode logika fuzzy untuk menentukan tingkat kemungkinan suatu penyakit. Hasil akhir yang dihasilkan berupa diagnosis awal dan rekomendasi penanganan. Pengujian sistem menunjukkan bahwa metode ini mampu mengidentifikasi penyakit rahim dengan akurasi yang cukup baik, di mana salah satu kasus menunjukkan kemungkinan penyakit Endometriosis dengan tingkat kepercayaan sebesar 63%. Dengan adanya sistem ini, pasien dapat memperoleh informasi awal mengenai kondisi kesehatannya, sehingga dapat mengambil langkah medis yang lebih tepat dan cepat.

Kata kunci: fuzzy logic; penyakit rahim; sistem pakar.

INTRODUCTION

The development of technology that continues to grow rapidly from time to time, all forms of activities carried out by humans cannot be separated from the use of technology [1]. Computers in the current era of globalization have become a primary need to support human work. The role of computers is currently expanding, not only as a tool for calculating but also as a tool for solving problems faced by humans. One part of computer science that allows computers

JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. XI No 3, Juni 2025, hlm. 485 – 492 ISSN 2550-0201 (Online)
DOI: http://dx.doi.org/10.33330/jurteksi.v11i3.3803
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

to do work as well as humans is artificial intelligence which is part of an expert system. Technological advances allow easier access to information and facilitate the process of identification and medical care, namely for users of expert systems that can facilitate the identification of diseases. In this case, the author will raise the diagnosis of uterine disease.

Expert systems are a field of computer science that utilizes computers so that they can behave intelligently like humans. This system attempts to adopt human knowledge into computers, so that computers can solve problems as experts usually do [2]. Uterine disease is one of the major threats to society, especially women, because the high mortality rate currently occurs in women due to suffering from one of the diseases that attacks the woman's uterus [3]. Uterine disease is the number one killer for women not only in Indonesia but also in the world [4].

This disease attacks a woman's important organ, namely the uterus, although not all diseases that attack a woman's uterus are able to kill them, but there are many other impacts that will affect women's health such as not being able to have children or other bad consequences [5]. This disease is not contagious, but the disease arises due to abnormal physical conditions and unhealthy lifestyles. One of the uterine diseases that exist is Ca cervix, cysts, Myoma a uteri, ca ovaries [6].

Common symptoms of uterine disease include abnormal vaginal bleeding, such as menstrual cycles or after menopause, abnormal vaginal discharge, such as pink or brown containing blood or having a foul odor, pain in the lower abdomen or pelvis, fever, swelling in the abdomen, pain when urinating, recurrent bladder infections, bleeding outside the menstrual cycle and in the form of clots and other symptoms [7]. Most people today ignore or do not respond well to disorders that occur in uterine disease because of the lack of knowledge about the symptoms.

H. Abdul Manan Simatupang Regional General Hospital is a health service institution that provides individual health services that provide inpatient, outpatient and emergency services. The process of diagnosing diseases in patients at H. Abdul Manan Simatupang Regional General Hospital is still carried out conventionally where patients must come to the hospital for consultation and disease checks. Furthermore, the doctor will examine the patient and write the results of the consultation on the patient's medical record card.

Thus, both the public as users of health services and doctors as experts really need a system that can facilitate the process of diagnosing and consulting diseases quickly, efficiently, and affordably. The presence of a system that is able to support the process of consultation and diagnosis remotely is expected to help the public get early information regarding their health conditions, so that preventive measures and treatment can be taken earlier. A computerized expert system to help the process of diagnosing early symptoms of the disease suffered by patients [8].

The expert system method used in this study is Fuzzy Logic. Fuzzy Logic is a calculation algorithm from word variables, to replace calculations through numbers. The series of words used in fuzzy logic are not as accurate as numbers, but the use of words is much closer to human instincts where humans can directly encounter the values of word

JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. XI No 3, Juni 2025, hlm. 485 – 492 ISSN 2550-0201 (Online)
DOI: http://dx.doi.org/10.33330/jurteksi.v11i3.3803
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

variables that have been used every day[9].

Research entitled Risk Factors for the Incidence of Myoma a Uteri in Outpatients at Undata Hospital, Central Sulawesi Province. Concludes that the variables of obesity and the use of hormonal contraception are not risk factors for the occurrence of Myoma a Uteri, while the variable definition of Vitamin D is a risk factor in outpatients at Undata Hospital, Central Sulawesi Province [10]. Next, with the title Expert System for Diagnosing Nasal Polyps Using Fuzzy Logic Method. It can help diagnose nasal polyps earlier, besides that it also makes it easier for patients to find out the diagnosis of nasal polyps so that patients with symptoms of nasal polyps no longer need to consult a specialist doctor and this will also reduce time and costs [11].

The purpose of this study is to develop a fuzzy logic-based expert system that is able to analyze and handle physical symptoms from patient history effectively. By utilizing the ability of fuzzy logic in processing ambiguous or uncertain data, this system is expected to produce a diagnosis that is close to the way doctors work in making medical decisions. Through the development of this system, this study aims to assist medical personnel in providing faster, more precise, and more accurate treatment to patients. In addition, this system is also expected to facilitate the consultation process between patients and doctors by providing relevant and reliable initial information.

METHOD

Fuzzy logic is used to map the relationship between symptoms and uterine disease. Input is in the form of symptom data experienced by the patient, then processed using the fuzzy method to analyze the severity and likelihood of the disease. The output produced is a recommendation for appropriate early treatment to prevent the condition from getting worse [12]. Based on facts, knowledge, or reasoning that can help solve a problem.

The Fuzzy Logic method is one of the components that form soft computing. In many cases, fuzzy logic is used as a way to map problems from input to expected output [13]. Fuzzy Logic is applied to calculate the severity of the disease based on the symptoms entered by the user is able to answer questions that have uncertain *answers* [14]. The data on uterine disease patients at the Abdul Manan Simatupang Kisaran Regional General Hospital are in Table 1.

Table 1. Data on the Number of Uterine Disease Patients in 2024

Types of Disease	Month (Patients)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Agts	Sept	Okt	Nov	Dec
Ca cervix	24	1	3	0	0	0	1	2	1	1	2	0
Kista	38	0	2	0	2	2	5	5	0	1	2	0
Mioma Uteri	10	2	2	0	0	0	1	0	1	0	0	0
Ca Ovarium	6	0	0	1	1	1	0	0	0	0	0	0

Before performing fuzzy inference, researchers must first know how fuzzy logic works in Image 1 [15].

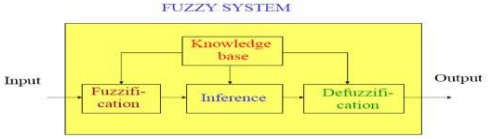

Image 1. How Fuzzy Logic Works

JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. XI No 3, Juni 2025, hlm. 485 – 492 ISSN 2550-0201 (Online)
DOI: http://dx.doi.org/10.33330/jurteksi.v11i3.3803
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

The following is an explanation of the fuzzy inference structure. A fuzzy knowledge base is a collection of fuzzy rules in the form of IF.THEN statements. Fuzzyfication is the process of converting system input that has a definite value into a linguistic variable using membership functions stored in the fuzzy knowledge base.

$$\mu(x) = \begin{cases} 0 & \text{if } X \le a \\ \frac{(X-a)}{(b-a)} & \text{if } a \le \chi \le b \\ & \text{if } \chi \ge b \end{cases} \qquad (1)$$

The inference engine is a process to change fuzzy input into fuzzy output by following the rules (IF-THEN Rules) that have been set in the fuzzy knowledge base.

Defuzzification is a fuzzy output obtained from the inference engine into a firm value using the appropriate membership function when fuzzification is carried out from $= \frac{\mu(z) \text{ . of d-z}}{\mu(z \text{ d-z}} \qquad (2)$

Then look for the value Z:
Formula for finding value Z :

μOpportunity Tall [x]
$= \frac{x-0,1}{((0,9)-(0,1)} = -\frac{0,1}{0,8} = \propto$

$x=(0,8)(x)+(0,1)$

μOpportunity low [x]
$= \frac{(0,9)-(x)}{((0,9)-(0,1)} = -\frac{(0,9)-(x)}{0,8} = \propto$

$x=(0,9)-(0,8)(\alpha)$

$\alpha1=0 = z1=(0)(0,8)+(0,1)=0,1$
$\alpha2=0 = z2=(0)(0,8)+(0,1)=0,1$
$\alpha3=0 = z3=(0,9)-(0,8)\left(\frac{1}{3}\right)=0,633$
$\alpha4=0 = z4=(0,9)-(0,8)(0)=0,9$
$\alpha5=0 = z5=(0,8)(0)+(0,1)=0,1$
$\alpha6=0 = z6=(0,8)(\frac{1}{2})+(0,1)=0,5$
$\alpha7=0 = z7=(0,9)-(0,8)(0)=0,9$

Then the defuzzification process is carried out:

$$z(P1) = \frac{\propto pred1*z1 + \propto pred2*z2 + \ldots \propto pred4*z4}{\propto pred1 + \propto pred2 + \ldots + \propto pred4}$$

$$z(P1) = \frac{(0)(0,1)+(0)(0,1)+\left(\frac{1}{3}\right)(0,633)+(0)(0,9)}{0+0+\left(\frac{1}{3}\right)+0}$$
$$= (\tfrac{1}{3})(0.633)/(\tfrac{1}{3})$$
$$= 0,633$$

$$z(P5) = \frac{\propto pred5*z5 + \propto pred6*z6 \propto pred7*z7}{\propto pred5 + \propto pred6 + \propto pred7}$$

$$z(P1) = \frac{(0)(0,1)+(1/2)(0,5)+\frac{(0)(0,9)}{0}+(0)\left(\frac{1}{2}\right)+0}{0+(\frac{1}{2})+0}$$
$$= (0)(0,1)+\left(\tfrac{1}{2}\right)(0.5)+\tfrac{(0)(09)}{0}+(\tfrac{1}{2})+0$$
$$= (\tfrac{1}{2})(0.5)/(\tfrac{1}{2}))$$
$$= 0,5$$

So the probability of the disease and its percentage is:
P1 = 0,633
P5 = 0,5

RESULTS AND DISCUSSION

In conducting the research, the author used an expert system with the fuzzy logic method through the knowledge data used was uterine disease and its symptoms obtained from the results of interviews with obstetricians and gynecologists at the Abdul Manan Simatupang Kisaran Regional General Hospital. The uterine disease and its symptoms are shown in Table 2 and Table 3.

Table 2. Uterine Disease

Code	Disease Name
P1	Endometriosis Disease
P2	Ovarian Cyst Disease
P3	Uterine Myoma Disease
P4	Uterine Infections
P5	Adenomyosis disease

JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. XI No 3, Juni 2025, hlm. 485 – 492 ISSN 2550-0201 (Online)
DOI: http://dx.doi.org/10.33330/jurteksi.v11i3.3803
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

Table 3. Symptoms of Uterine Disease

Code	Disease Symptoms
G1	Lower abdominal cramps or pelvic pain
G2	Menstruation is irregular, abnormal, and close to the period
G3	Pain or pressure when urinating
G4	Pain, spotting of blood from the vagina
G5	Bloating, swelling, pressure on the stomach
G6	Post menopause bleeding
G7	Post menopause bleeding
G8	Headache and frequent fatigue
G9	Pathogenic vaginal discharge
G10	Pain in the vaginal area
G11	Vaginal bleeding during/after intercourse
G12	Swelling in the legs
G13	Bleeding during menstruation or outside menstruation
G14	Pain in the bladder or other pelvic organs
G15	In the lower part of the uterus the abdomen feels elastic
G16	Pain in the pelvic area

From the results of the knowledge of data acquisition in the first stage, it will be modeled in the form of a decision table. The decision table is used to group symptoms for each disease as shown in Table 4.

Table 4. Uterine Disease Diagnosis Decision Table

Symptom Code	Disease Code				
	P1	P2	P3	P4	P5
G1	√	√			
G2	√	√			
G3	√		√		√
G4	√				
G5		√			
G6		√			
G7		√	√		
G8			√		
G9			√		
G10			√		
G11			√	√	√
G12			√	√	
G13				√	
G14				√	
G15				√	
G16					√

The process of diagnosing uterine disease begins with the input of symptoms experienced by the user (patient). Some of the symptoms entered will be

JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. XI No 3, Juni 2025, hlm. 485 – 492 ISSN 2550-0201 (Online)
DOI: http://dx.doi.org/10.33330/jurteksi.v11i3.3803
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

calculated using the fuzzy logic method based on their respective weights. The results of the diagnosis of the type of uterine disease experienced by the patient are based on the largest density value. For example, a test case for the diagnosis process based on identification with symptoms as shown in Table 5.

Table 5. Test Cases

Symptom Code	Symptom	Disease Code	Disease Name	Weight
G1	Lower abdominal cramps or pelvic pain	P1	Endometriosis	0.63
G2	Menstruation is irregular, abnormal, and close to the period	P2	Ovarian Cyst	0.5
G3	Pain or pressure when urinating	P3	Uterine Myoma	0.5
G4	Pain, spotting of blood from the vagina	P4	Uterine Infection	0.5
G11	In the lower part of the uterus the abdomen feels elastic	P5	Adenomyosis	0.5
G16	Pain in the pelvic area	P1	Endometriosis	0.5

Here are some examples of rules that are taken from all the existing rules. From the rules above, the membership value of each rule's chances is obtained, namely:

R_1 : α1 = IF G1(tall) (0)) and G2(tall) (0)) and G3(tall) (0)) and G4 (tall) (0)) THEN P1 (tall)(0)).

R_2 : α2 = IF G1(currently (0)) and G2(currently (0)) and G3(currently

(0)) and G4 (currently (0)) THEN P1 (currently(0)).

R_3 : α3 = IF G1 (low (2/3)) and G2(low (1/3)) and G3(currently (1/2)) and G4 (currently (1/2)) THEN P1 (low(1/3)).

R_4 : α4 = IF G1(low (2/3)) and G2(low (1/3)) and G3(low (0)) and G4 (tall) (0)) THEN P1 (low(0)).

R_5 : α5 = IF G3(tall) (0)) and G7(tall) (0)) and G9(tall) (0) THEN P5 (tall)(0)).

R_6 : α6 = IF G3 (currently (1/2)) and G7(currently (1/2)) and G9(currently (1/2)) THEN P5 (tall)(1/2)).

R_7 : α7 = IF G3 (currently (1/2)) and G7(low (0)) and G9(low (0)) THEN P5 (low(0)).

Based on the results of manual calculations, it can be concluded that Patient 1 has Endometriosis with a confidence value of 0.63 or 63%. As for using a system developed using PHP and MySQL programming languages to conduct diagnostic testing based on the same symptoms as the manual calculations, it can be shown in Image 2.

JURTEKSI (Jurnal Teknologi dan Sistem Informasi) ISSN 2407-1811 (Print)
Vol. XI No 3, Juni 2025, hlm. 485 – 492 ISSN 2550-0201 (Online)
DOI: http://dx.doi.org/10.33330/jurteksi.v11i3.3803
Available online at http://jurnal.stmikroyal.ac.id/index.php/jurteksi

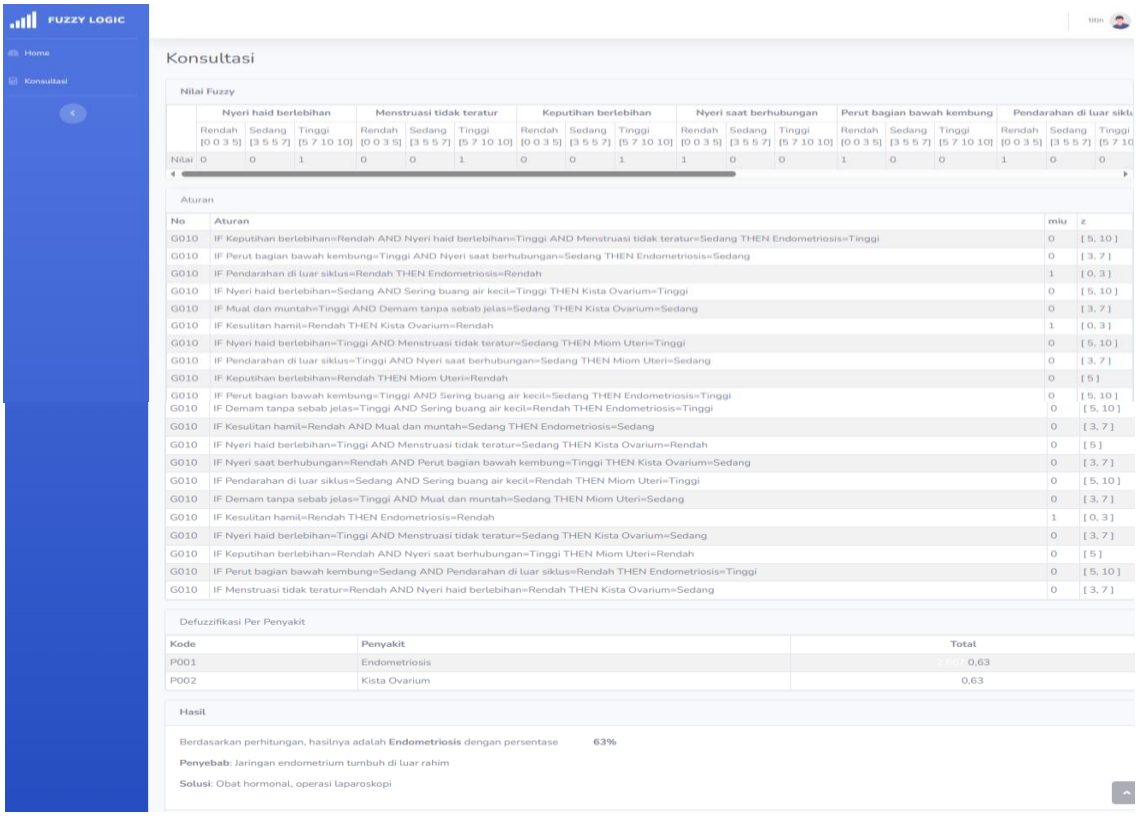

Image 2. System Diagnostic Results

CONCLUSION

This expert system application is able to diagnose uterine disease experienced by patients at the H. Abdul Manan Simatupang Kisaran Regional General Hospital using the fuzzy logic method. This system is made dynamic so that if there are changes or additions to uterine disease or symptoms, it can be done easily. Helping the community in terms of economy, simply by using a cellphone and a stable internet network. Testing using fuzzy logic. The results of the study are that the patient has Endometriosis with a confidence value of 0.63 or 63% to carry out diagnostic testing based on the same symptoms as the manual calculation in providing recommendations between the symptoms that arise with the uterine disease experienced by the patient..

BIBLIOGRAPHY

[1] B. A. Candra Permana, M. Djamaluddin, M. Afandi, and H. Bahtiar, "Penerapan Sistem Pakar Untuk Diagnosa Penyakit Kucing Pada Aplikasi Berbasis Android Dengan Metode Forward Cahining," Infotek J. Inform. dan Teknol., vol. 5, no. 1, pp. 93–98, 2022, doi: 10.29408/jit.v5i1.4444.

[2] I. A. G. S. Putra and N. L. P. Trisnawati, "Sistem Pendeteksi Kesehatan Mental Remaja Menggunakan Metode Forward Chaining Dan Naive Bayes," J. Sist. Inf. Dan Inform., vol. 8, no. 1, pp. 212–222, 2025.

[3] M. Resmasari, M. E. F. Masamah, and I. T. U. Satwari Lisa Yanti, "Pengetahuan Ibu Tentang IVA Test Dengan Pemeriksaan IVA

Test Di Puskesmas Kalibalangan Kecamatan Abung Selatan Kabupaten Lampung Utara Tahun 2024," J. Matern. Aisyah (JAMAN AISYAH), 2024.

[4] D. Yusuf and V. Terisia, "Implementasi Sistem Pakar Menggunakan Metode Forward Chaining Untuk Mendiagnosa Penyakit Rahim," J. Sist. Inf., vol. 2, no. 2, pp. 37–47, 2021, doi: 10.32546/jusin.v2i2.1497.

[5] N. Susanti, A. D. Mrp, and N. A. Azwa, "Analisis Pengetahuan Tentang Kanker Serviks Dan Perilaku Pencegahan Kanker Serviks Pada Wanita," J. Kesehat. Tambusai, vol. 5, no. 3, pp. 6061–6070, 2024.

[6] H. Akbar et al., Teori kesehatan reproduksi. Yayasan Penerbit Muhammad Zaini, 2021.

[7] S. Martodihardjo, "Keputihan: Apakah Normal Atau Tidak," Proceeding B. Recent Clin. APPLIED-Comprehensive Diagnostic Manag. Sex. Transm. Infect. Dly. Pract., vol. 85, 2024.

[8] R. Rahmawati, N. Nurwati, and R. Rohminatin, "Sistem Pakar Konsultasi Penyakit Diare berbasis Web menggunakan Metode Certainty Factor," Edumatic J. Pendidik. Inform., vol. 8, no. 2, pp. 379–388, 2024.

[9] I. M. Y. Kusumah, L. Apriyanti, and P. R. Rafki, "Sistem Pakar Diagnosa Stress Pada Mahasiswa Tingkat Akhir Dengan Menggunakan Metode Certainty Factor Berbasis Android," J. Teknol. Inf. dan Komun., vol. 11, no. 1, pp. 9–18, 2022.

[10] M. Umar, M. Palinggi, D. S. Syahadat, and U. Aiman, "Faktor Risiko Kejadian Mioma Uteri Pada Pasien Rawat Jalan di RSUD Undata Provinsi Sulawesi Tengah," Ghidza J. Gizi dan Kesehat., vol. 7, no. 2, pp. 245–259, 2023, doi: 10.22487/ghidza.v7i2.872.

[11] L. Indrayani, P. Studi Sistem Informasi, and S. Kreatindo Manokwari, "Sistem Pakar Diagnosa Penyakit Polip Hidung Menggunakann Metode Logika Fuzzy," *J. TEKINKOM*, vol. 7, no. 1, pp. 9–16, 2024, doi: 10.37600/tekinkom.v7i1.1.

[12] U. Athiyah, A. P. Handayani, M. Y. Aldean, N. P. Putra, and R. Ramadhani, "Sistem Inferensi Fuzzy: Pengertian, Penerapan, dan Manfaatnya," J. Dinda Data Sci. Inf. Technol. Data Anal., vol. 1, no. 2, pp. 73–76, 2021, doi: 10.20895/dinda.v1i2.201.

[13] N. A. Rini, R. Yesputra, and S. Sudarmin, "Sistem Pakar Untuk Mendiagnosa Sindroma Permentruasi (PMS) Dengan Metode Dempster Shafer Berbasis Web".

[14] R. S. Yakin, "Sistem Pakar Diagnosis Penyakit Tanaman Kacang Tanah Dengan Fuzzy Logic Tsukamoto Berbasis Web," J. Comput. Technol., vol. 1, no. 1, pp. 6–19, 2023.

[15] T. A. Imanzaghi, H. E. Wahanani, and A. M. Rizki, "Implementasi Metode Fuzzy Mamdani pada Sistem Pakar Mendiagnosis Penyakit Demam Berdarah," Bridg. J. Publ. Sist. Inf. dan Telekomun., vol. 3, no. 1, pp. 1–20, 2025.