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EXPERT SYSTEM FOR DETECTING STRESS IN STUDENTS TAKING FINAL ASSIGNMENTS USING THE DEMPSTER SHAFER METHOD

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ABSTRACT

This study aims to address the stress problem often experienced by final year students, especially in the process of completing their final assignments or theses. The researchers designed an expert system application to help students identify their stress levels and provide appropriate management solutions. Using the Dempster-Shafer theory as the basis for calculating the confidence value, this application was developed using the Rapid Application Development (RAD) method and built as a web-based system using PHP and MySQL. The test results showed a stress diagnosis accuracy of 94%, which is categorized as "Very Good" based on the Mean Opinion Score (MOS). Suggestions for further development include exploring alternative methods such as confidence factors and Bayes' theorem, as well as developing a mobile-based application to increase accessibility. This application is expected to be an effective solution in overcoming stress-related challenges faced by final year students during the process of completing their final assignments.

ARTICLE INFO

Keyword:

Student Stress , Expert System Application, Final Project Writing.

1. Introduction

Stress is a common phenomenon in everyday life, a natural response to physical, psychological, and social pressures experienced by individuals. For final-year students, especially when they are in the process of completing their final project or thesis, stress levels often increase due to various factors. This academic process involves not only intellectual aspects but also requires time management skills, communication skills, and strong mental resilience. The challenges faced are diverse, ranging from a lack of understanding of the problem to be researched, limited reference sources, a lack of understanding of relevant theories, a lack of motivation to begin the writing process, being busy with work, and various other issues (Agustina et al., 2022). Difficulty finding relevant literature, interacting with supervisors, and completing the final product within the specified deadline are some of the main challenges faced by students in this process.

Under stress, individuals tend to experience emotional, cognitive, and physical disturbances that can impact academic performance and overall well-being. To address the negative impacts of stress, it is crucial to develop effective coping strategies. One approach taken in this research is through the development of an expert system application. This application is designed to help students identify their stress levels and provide appropriate advice or solutions to their specific circumstances. Academic stress is a state in which a person feels pressured due to excessive pressure or demands from the academic environment that exceed their capabilities, resulting in a feeling of being overwhelmed (Yusuf et al., 2020).

By utilizing advanced information technology and data analysis methods, this expert system application is expected to provide personalized and measurable services to its users. Several features and characteristics distinguish expert systems from other systems. These features serve as key guidelines in expert system development (Saputra, 2023). Through a deep understanding of stress symptoms and the factors that influence them, this application will provide accurate diagnoses and appropriate treatment recommendations. Therefore, it is hoped that this application can serve as an effective tool in helping students manage stress and improve their quality of life during the academic process.

2. Theoretical basis

2.1. Expert system

According to Suyoto (2004), an expert system is a system that is designed and implemented with the help of a particular programming language to handle problems that are usually solved by experts in a particular field.

Kusrini (2006) defines an expert system as a computer-based system that uses knowledge, facts, and reasoning techniques to solve problems that can generally only be solved by an expert in a particular field.

From these two definitions, it can be concluded that an expert system is a computer system capable of mimicking the problem-solving abilities of an expert. The expert referred to here is an individual with specialized expertise in a field that enables them to solve problems that are difficult for laypeople, such as doctors, mechanics, psychologists, and so on.

2.2. Dempster Shafer

According to Kurniawati Pratama (2014), the Dempster Shafer theory was first introduced by Arthur P. Dempster and Glenn Shafer. They conducted an uncertainty experiment by replacing a single probability with a range of probabilities. Then, Shafer published Dempster's theory in his book entitled "Mathematical Theory of Evidence" in 1976. The Dempster Shafer theory is a mathematical framework

that aims to process separate information or evidence together to calculate the probability of an event, using belief functions and reasonable thinking.

According to Rikhiana and Fadlil (2013), Dempster Shafer's theory can generally be explained in an interval [Belief, Plausibility]. Belief (Bel) is a measure of the strength of evidence in supporting a set of propositions, with a value between 0 and 0.9. Plausibility (Pl) is a value that indicates the extent to which a proposition can be accepted, calculated as 1 minus the Bel value of the negation of the proposition.

In Dempster Shafer theory, there is a concept of a frame of discernment indicated by θ, which is the set of all possible hypotheses. The purpose of a frame of discernment is to provide a confidence measure for each element in it. The probability density function (m) is used to determine the confidence value for each element in the frame of discernment. If θ contains n elements, then there are 2n subsets of θ, and the sum of all m values in the subsets of θ is 1. If there is no information available to choose a hypothesis, the value of m for θ is 1.0.

In the context of computing the combined density function m, if X and Y are two subsets of θ with density functions m1 and m2 respectively, then the combination function of m1 and m2 as m3 can be computed. The two values m1 and m2 are combined to produce the value m3, which indicates the intersection of the two density functions or the absence of intersection between them.

2.3. Unified Modeling Language (UML)

According to Hasanah FN and Untari RS (2020:64), the Unified Modeling Language (UML) is a widely used language standard in the industry for specifying requirements, analyzing, designing, and describing architectures in object-oriented programming. Edwar Ali (2019:124) defines UML as an object-oriented language used to specify, visualize, build, and document software systems and for business modeling. Rosa and Shalahuddin (2018:133) emphasize that UML is a standard used to specify requirements, analyze, design, and describe architectures in object-oriented programming. UML is visual and is used to model systems through text and diagrams. UML diagrams are divided into three main categories: structure diagrams, behavior diagrams, and interaction diagrams. Structure diagrams describe the static structure of a system, while behavior diagrams describe the system's activities or the changes that occur within it. Meanwhile, interaction diagrams are used to describe interactions between systems or between subsystems within the system itself. From this explanation, it can be concluded that UML is a series of diagrams used to abstract object-oriented systems or software, facilitating continuous application development.

2.4. Website

According to Sari, Abdilah, and Sunarti (2019:1), a website is a series of digital pages containing information in the form of text, animation, images, sound, and video, connected via the internet. Asropudin (2013:109) defines the web as a series of pages starting with the main page containing information, advertisements, and applications. Based on this explanation, it can be concluded that the web is a service or series of pages containing information and applications that can be accessed by internet users.

2.5. Database

According to Sutarman (2012:15), a database is a series of interrelated and organized files, or a collection of records that store data and their relationships. According to Ladjamudin (2013:129), a database is a collection of data (can be large in number) stored in storage media such as magnetic disks, optical disks, magnetic drums, or other secondary storage media. From this explanation, it can be

concluded that a database is a collection of interrelated files used to store data in a particular storage medium.

3. Problem Analysis

3.1. Research methods

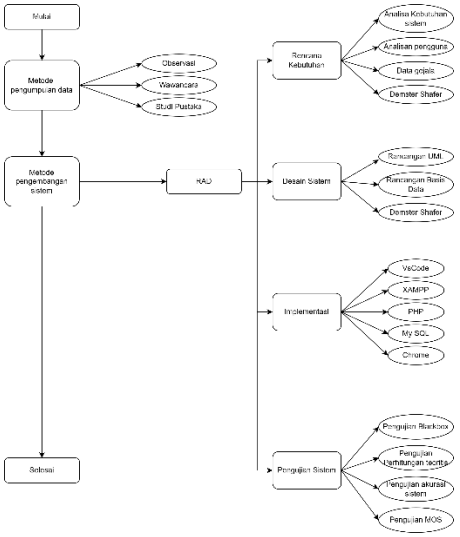

Figure 1. Research Method

This research employs a descriptive qualitative research method with a case study approach. In this approach, researchers investigate an event, activity, process, or individual in detail. This case study approach explains that qualitative research produces descriptive data consisting of written or spoken words from participants and observable behavior. This study aims to understand and explain the phenomenon of stress experienced by students in preparing their final assignments. To achieve this goal, researchers conducted observations of the surrounding environment, interviewed experts, and involved the participation of 10 students in this study.

3.2. Method of collecting data

In order to compile this research, the author collected data and information through several methods. First, an interview was conducted with Psychologist Ms. Lisa Puspasari M.Psi to gain a deeper understanding of stress, determine the stress level for each symptom, determine the weighting of an expert's score, and find solutions for stress management. In addition, interviews were also conducted with 10 students from STMIK DCI to represent all students who are preparing their final assignments. The purpose of these interviews was to understand the problems faced by students during the preparation of their final assignments and identify relevant symptoms.

Second, the author conducted direct and systematic observations of students preparing their final assignments. Data obtained from these observations were recorded in observation notes for further analysis. Observations were conducted to gain a deeper understanding of the final assignment writing process and the challenges students faced.

Finally, the author conducted an information search through library sources such as books, journals, e-books, and websites. The purpose of this literature review was to gain a deeper understanding of the basic theories relevant to this research. This information search helped

the author broaden his insight and knowledge regarding the research topic and ensure the validity and accuracy of the research results.

3.3. System Development Methods

The software development method applied in this research is Rapid Application Development (RAD). This approach was chosen because it simplifies the system development process, making it more efficient, adaptive, and flexible in a shorter timeframe.

First, in the Requirements Planning stage, users and researchers interact to identify the purpose of creating the application or system and determine the information requirements, particularly regarding stress in students. Through interviews with 10 students representing the population and psychologist Ms. Lisa Puspasari M.Psi, the authors collected data on the problems faced, stress levels, and solutions to address them.

Second, in the System Design phase, the focus is on the overall system design. This design develops the concepts from the previous phase and serves as a guideline for program development. In this phase, the author uses the Unified Modeling Language (UML) to create Use Case, Activity, Sequence, and Class diagrams to represent the system architecture. Furthermore, the database design is prepared to encompass various features, from the home page to the consultation results.

Third, in the Implementation phase, the system design is realized in the form of a computer program according to the previous plan. This implementation process determines how the system will run and builds the program based on the previously created design. The author used the PHP, CSS, and HTML programming languages, as well as MySQL, XAMPP, and Visual Studio software to code and build the system.

4. Result and Discussion

4.1. SYSTEM DESIGN

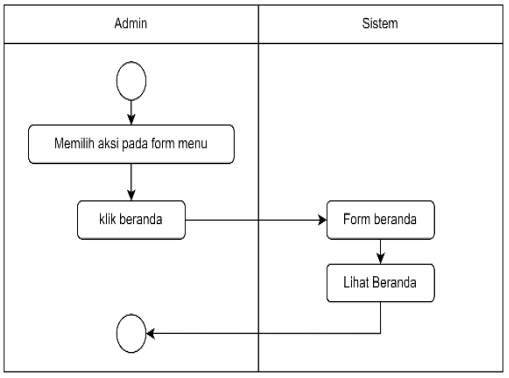

Figure 2. Home Activity Diagram

Figure 2 is a flowchart illustrating how the form menu works on a website. Users have the option to log in as an admin or a student. The process begins when the user selects the desired action from the form menu. If the user chooses to go to the home page, the system displays the home page form. On the home page, the user can view available information without having to fill out a form or submit data.

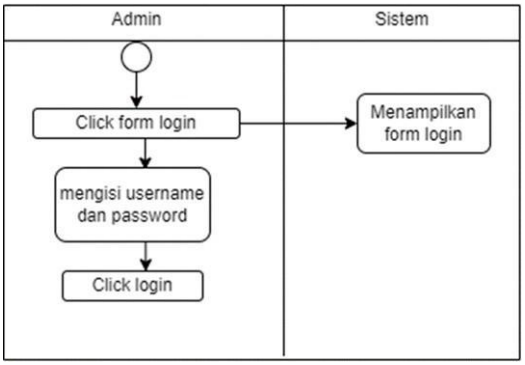

Figure 3. Login Activity Diagram

Figure 3 is a flowchart illustrating the user login process on a system, which applies to two types of users: System Admins and Regular Users. The process begins when the user clicks on the login form, which can be a button or a link labeled "login form" or "sign in."

The system then displays a login form, which typically contains fields for entering a username and password. The user then fills in the fields with their username and password. The final step is for the user to click the "login" or "sign in" button to submit their login credentials to the system.

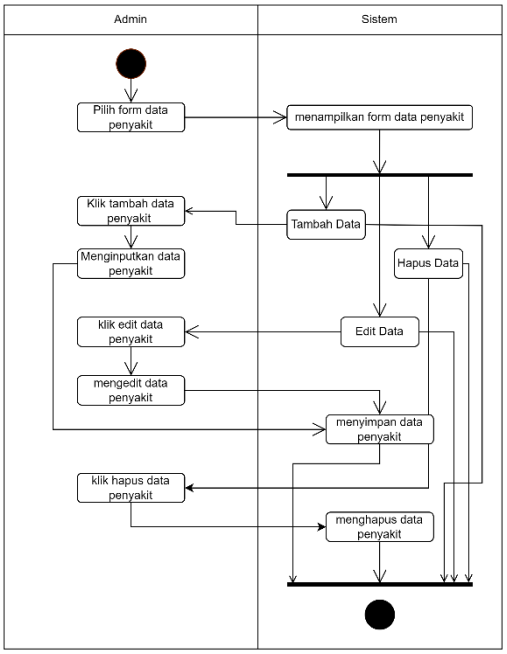

Figure 4. Disease Data Activity Diagram

Figure 4 is a flowchart explaining the steps for adding and editing disease data in a system, which can be performed by the admin. The process begins when the admin selects a form for disease data. Next, there are several action options available. First, if the admin selects the option to add new disease data, the system will display a form for entering new disease data. The admin then fills in the form with the disease data to be added, and after that, the system will save the new disease data. Second, if the admin chooses to edit existing disease data, the system will display the disease data first. The admin then makes edits to the desired data, and once completed, the system will save the changes made to the disease data.

Finally, if the admin wishes to delete disease data, the system will first display a

confirmation message. The admin then chooses to confirm or cancel the deletion. If confirmed, the system will delete the selected disease data. This process ends once the admin completes the selected action, whether adding, editing, or deleting disease data.

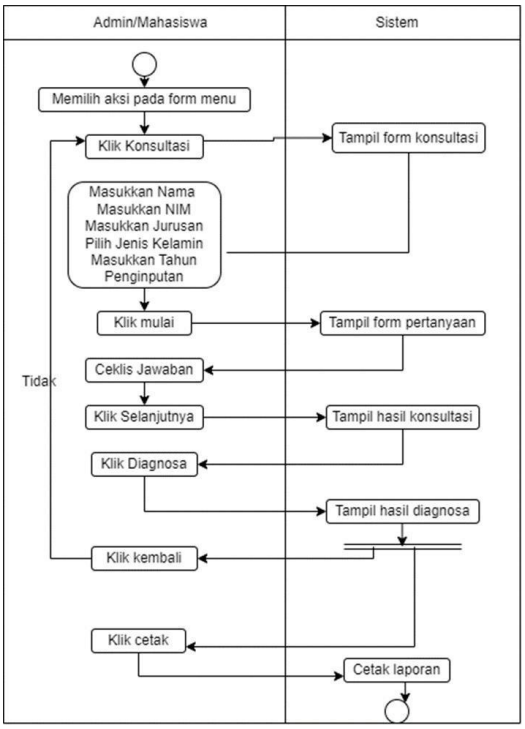

Figure 5. Activity Diagram of Consultation Data

Figure 5. This is a flowchart depicting the student consultation process within a system accessible to both students and administrators (although the administrator's actions are not detailed in the diagram). The process begins when a system user, whether a student or an administrator, logs in. The student then has several action options available.

If a student chooses to consult, the system will display a consultation form. Students are then asked to fill out the form with information such as name, student ID number, study program, gender, and year of enrollment. Once all information is filled in, students click "start" to continue. The system then checks whether all information has been filled in completely. If there is any information still missing, the system will prompt the student to complete the form. However, if all information has been filled in, the system will display a question form. Students answer the questions on the consultation form and click "continue" to continue the process.

Next, the system will display the consultation results. Students have the option to view the diagnosis or print the report. Selecting "diagnosis" will display the results, while selecting "print" will generate a printable report.

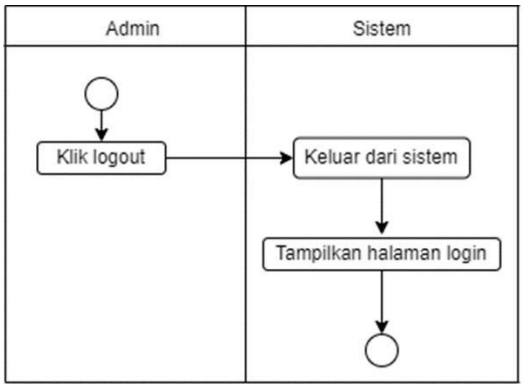

Figure 6. Logout Activity Diagram

The activity diagram in Figure 6 is a logout activity which ultimately returns the user to the login page.

4.2. IMPLEMENTATION

During the system implementation phase, an overview of the system that has been designed and built will be presented, and its feasibility will be tested. The following are the results of the system design implementation:

4.2.1. Admin Implementation

This expert system implementation will outline the workflow and interface of the developed expert system for student stress. This expert system is designed as a website-based application. In this expert system, stress detection in students completing their theses is carried out through several main pages, such as the homepage, disease diagnosis menu, disease information menu, and a system information menu for users. In addition, there is a login interface, homepage, disease data, symptom data, and relationship data for administrators.

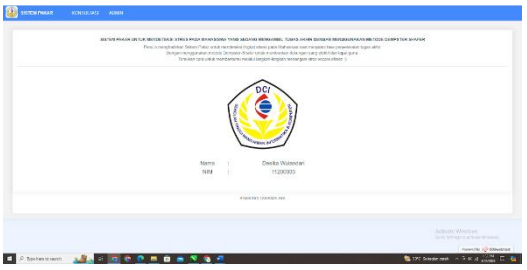

Figure 7. Home Page

Figure 7 illustrates that when users open the website, they are immediately directed to the main homepage. This view displays the various menus available within the system, including the consultation menu and the admin menu. The main homepage acts as a starting point, making it easy for users to access the system's key features.

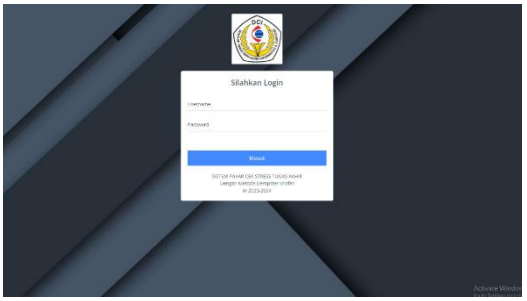

Figure 8. Login Page

Figure 8 shows a login page specifically designed for admins to access the system. Admins can log in by entering a valid username and password in the provided fields. This is the first step an admin must take to access the system's administrative features.

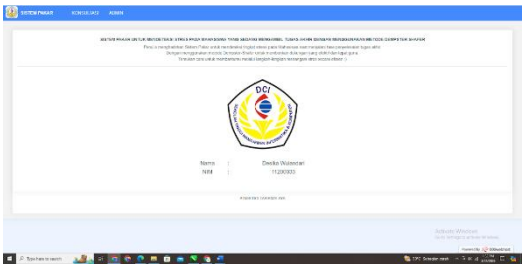

Figure 9. Logout Page

Figure 9 illustrates that if an admin wishes to log out of the system, they can easily log out by clicking the "logout" menu option. This will end the admin's login session and redirect them to the login page or home page, depending on the system settings.

Figure 10. Disease Data Page

Figure 10 shows the disease data page, which displays all disease information stored in the system database. This menu displays the disease code, name, and solution. Admins also have the ability to add, edit, and delete diseases through this menu. If an admin selects the "Add Disease" option on the disease data page, they will be redirected to the "Add Disease" page. Here, the admin is asked to fill in the available fields, such as the disease code, diagnosis name, and solution.

Meanwhile, if the admin selects the "edit disease" option on the disease data page, they will be redirected to the disease edit page. On this page, the admin is asked to fill in the pre-populated fields with new data such as the disease code, diagnosis name, and solution. If the admin selects the "delete disease" option on the disease data page, a pop-up window will appear on the admin page to confirm whether the disease data will be deleted. After confirmation, the admin can proceed or cancel the disease data deletion action.

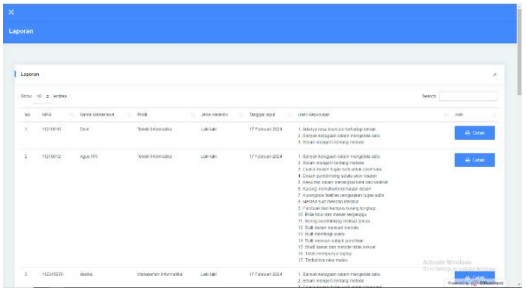

Figure 11. Report Data Page

Figure 11 shows the report data page displaying all consultation data stored in the system. This menu displays consultation identification information such as number, student

ID number, name, major, gender, year of input, and decision result. Admins also have the option to refresh the page and print the report. If they choose to print the report, they will be directed to print it in PDF format. This allows them to save or print the report for further reference or documentation.

4.2.2. Implementation of Consultation

The consultation process is implemented through two main pages. First, the consultation page displays an identification form that users must complete, along with a complete list of symptoms from which to select based on their condition. The consultation results page then displays the results of the consultation process, including user identification information, selected symptoms, and the percentage calculated using the Dempster-Shafer method.

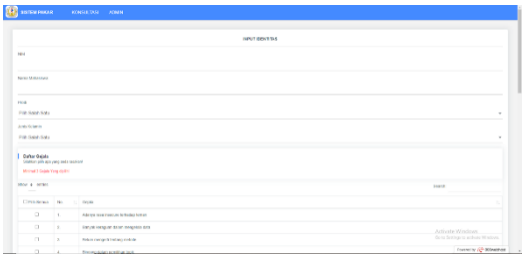

Figure 12. Consultation Page

Figure 12 is a page that displays the consultation results which include input of user identity, selected symptoms, and calculation results using the Dempster Shafer method in percentage form.

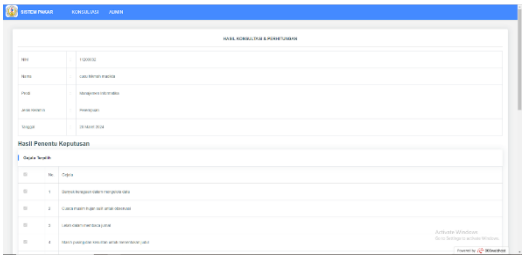

Figure 13. Consultation Results Page

4.3. System Testing

In this study, four testing techniques were used to assess the feasibility of an expert system in detecting stress in students completing their final assignments. Black box testing was conducted to verify the system's functionality, demonstrating that the system successfully performed the login process and displayed pages related to admin operations. Furthermore, system accuracy testing utilized data from 15 student consultations, which were compared with expert diagnosis results. The majority of students obtained diagnostic results consistent with the expert diagnosis. These test results indicate that the expert system developed met expectations.

5. Conclusion

Based on the research conducted, it can be concluded that the developed expert system application has great potential in helping overcome stress problems often experienced by final year students, especially during the process of completing their final assignments or theses. By using the Dempster-Shafer method as the basis for calculating the confidence value, this system

is able to provide a stress diagnosis with an accuracy of 94%, which is considered very good based on the Mean Opinion Score (MOS). In addition, system functionality testing also showed that the application can operate well, especially in terms of the login process and the display of pages related to admin operations. From the results of this test, it can be concluded that the expert system application has provided diagnostic results in accordance with expectations, so it is expected to be an effective solution in overcoming stress-related challenges faced by final year students during the process of completing their final assignments. Suggestions for further development include exploring alternative methods such as confidence factors and Bayes' theorem, as well as the development of a mobile-based application to increase accessibility.

Reference

Agustina, R., & Ikhlas, A. (2022). Analysis of Students' Difficulties in Writing Scientific Papers at STKIP Muhammadiyah Sungai Penuh. Pendekar: Journal of Character Education, 5(4), 6-11. Available online at: http://journal.ummat.ac.id/index.php/pendekar

Ali Edwar. 2019. Software Engineering. CV MFA. Yogyakarta.

Al-Bahra Bin Ladjamudin. 2013. Information System Analysis and Design. Graha Ilmu. Yogyakarta.

Andi Sutarman. 2012. Introduction to Information Technology. Jakarta: PT. Bumi Aksara. Asropudin, Pipin. 2013. Dictionary of Information and Communication Technology. Bandung: Titian. Ilmu.

Anhar, 2010, "PHP & MySQL Self-Taught", Agromedia Pustaka, Jakarta Ardhana, Y.M.Kusuma.2012.PHPCompleting a 30 Million Website. Jakarta: Jasakom

Aryani, F. (2016). Learning Stress: A Counseling Approach and Intervention. Makassar: Edukasi Mitra Grafika.

Bolung, M. & Tampangela, HRK, 2017. Analysis of Software Development Methodology Usage. ELTIKOM Journal, Vol.1 No.1 (2598-3288)

Darmono, Sapardi Djoko. 2002. Guidelines for Sociological Research in Literature. Jakarta: Balai Pustaka.

Darmono, A & Hasan, A. (2002). Completing a Thesis in One Semester. Jakarta: Grasindo.

Dahria Muhammad, Rosindah Silalahi, Mukhlis Ramadhan, 2013, Dempster Shafer Method Expert System for Determining Types of Developmental Disorders in Children, SAINTIKOM Journal Volume 12 No 1.

Elyza Gustri Wahyuni, Widodo Prijodiprojo. 2013. Expert System Prototype for Detecting Coronary Heart Disease Risk Level Using the Dempster Shafer Method. IJCCS, Vol. 7, No. 2.

Hidayat, AA 2007, Nursing Research Methods and Data Analysis Techniques, Salemba Medika Publisher.

Hasanah FN, and Untari RS 2020. Software Engineering. UMSIDA Press. Sidoarjo.

Haviluddin, Haryono, AT and Rahmawati D. 2016. Application of PHP and MySQL Programs. Muawarman University Press. Samarinda.

Iurea, C., 2018. The Impact of Academic Stress on Students. [online] Available at: https://doi.org/10.4018/978-1-5225-2960-6.ch008

J. Moleong, Lexy. 2014. Qualitative Research Methods, Revised Edition. PT Remaja Rosdakarya, Bandung.

Kusumadewi, S., 2003. Artificial Intelligence (Techniques and Applications). Yogyakarta: Graha Ilmu.

Kurniawati Pratama, D. (2014). Implementation of the Dempster Shafer Method in an Expert System for Diagnosing Types of Diabetes Mellitus.

L. Erawan. 2015. Web Programming. Semarang: Faculty of Computer Science.

Manish Kumar, SKSD, 2015. A Comparative Study of Black Box Testing and White Box Testing Techniques. International Journal of Advanced Research in Computer Science and Management Studies, Volume 3, pp. 32-44.

MawakhiraYusuf, N., & Yusuf, JM (2020). Factors Influencing Academic Stress. Psyche 165 Journal, 13(02), 235-239.

Quantitative Social Research Methods. Bandung: Refika. Aditama. Subramanyam, KR (2017).

Muri Yusuf. 2014. "Quantitative, Qualitative & Combined Research Methods". Jakarta: Prenadamedia Group.

Muthohir Moh. 2021. Easy Website Creation for Beginners. Semarang: Prima Agus Teknik Foundation.

Nugroho, Bunafit. 2013. Basic PHP-MySQL Web Programming with Dreamweaver. Yogyakarta: Gava Media

Paryati Sudarman. (2004). Effective Learning in Higher Education. Simbiosa Rekatama Media, Bandung.

Pressman, RS2015. Software Engineering: A Practitioner's Approach Book I. Yogyakarta: Andi

Priyoto, 2014. The Concept of Stress Management. Yogyakarta: Nuha Medika

Reddy, KJ & AnjanaThattil, KRMa, 2018 Academic Stress and its Sources. Among University Students. Biomedical and Pharmacology, pp. 531-537.

Rikhiana, Esthi Dyah and Abdul Fadlil. 2013. Implementation of an expert system to diagnose internal diseases in humans using the Dempster Shafer method. Journal of Informatics Engineering Volume 1 Number 1 eISSN: 2338-5197.

Riyanto (2015: 1), Xampp is an open source PHP and MySQL package, management: informatics

Rosnelly, Rika. 2012. Expert System Concepts and Theories. Yogyakarta: Andi.

Rosa AS and Shalahuddin, M. (2018). Structured and Object-Oriented Software Engineering. Informatics. Bandung

Siswoyo et al. (2007). Educational Science. Yogyakarta: UNY Press.

Saputra, A. (2023). Academic Report Card Processing Information System for SMAN 7 Padang Using PHP Programming Language and MySQL Database. Journal of Applied Informatics Science (JSIT), 2(2), 64-69. Available online at: https://rcf-indonesia.org/home/.

Sari AO, Abdilah A, Sunarti. 2019. Web Programming. First Edition: First Printing - 2019. Graha Ilmu. Yogyakarta.

Sethi, A., 2017. A Review Paper On Levels, Types & Techniques in Software Testing. International Journal of Advanced Research in Computer Science, Volume 8, pp. 269-271.

S.Kom, Kusrini. (2006), Expert System "Theory and Applications", Andi Publisher. Yogyakarta.