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The use of the C4.5 Algorithm for Applications Initial Assessment of Disabilities People the Case Study of the Ministry Social Center Wyata Guna Bandung

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Abstract

The development of information technology is snowballing, data is processed quickly and practically. Several problems often arise. Social instructors often find it difficult to process the data to determine which social service decisions should be provided. Persons with Disabilities are any person who experiences physical, intellectual, mental, and sensory limitations in the long term in interacting with the environment and may experience obstacles and difficulties in participating fully and effectively with other citizens based on equal rights. The Initial Assessment Form is a decision-making instrument through a process called the Initial Assessment. Later, the need for Social Welfare Services (PPKS) can be known as whether the quality is ready to be educated and included in the residential, community, or family categories. The method in this research is to use the Engineering Research Method. The decision tree model produces an accuracy level of 86.6%, the test data is suitable, and 13.3% is not suitable. In determining the service category and calculating the C4.5 Algorithm, it is better to add the number of datasets so that the accuracy of the value is higher.

Keywords: C4.5 Decision Tree Algorithm, Initial Assessment, PPKS, Web.

1. Introduction

The development of information technology is growing very quickly, data is processed quickly and practically. Data is generated by sophisticated information technology from industry, economics, and medicine. Several problems often occur due to a lack of knowledge and implementation related to technology, especially in the social area. Social extension workers often find it difficult to process the data obtained and then determine the social service decisions that must be provided. Expert systems have been used in various applications such as akinator applications and websites.

Persons with Disabilities are any person who has experienced physical, intellectual, mental and/or sensory limitations for a long time and who, in interacting with the environment, may experience obstacles and difficulties in participating fully and effectively with other citizens based on equal rights. The need for Social Welfare Services is an individual, family, group, and/or community who, because of an obstacle, difficulty, or disturbance, cannot carry out their social functions, so they need social services to fulfill their physical, spiritual and social needs adequately and reasonably. The process of re-functionalization and development to enable a person to be able to carry out his social functions properly in community life, social rehabilitation services that use family-based, community and/or residential approaches through activities to support the fulfillment of a decent life, family support, social care, physical therapy, psychosocial therapy, mental therapy, vocational training for entrepreneurship development, social assistance, social assistance and accessibility support in the Social Rehabilitation program (ATENSI), (Liberman et al., 2002).

Algorithm C4.5 is a decision tree classification algorithm that is widely used because it has the main advantages of being able to produce decision trees that are easy to interpret, have an acceptable level of accuracy, and are efficient in handling discrete and numeric type attributes (Dalimunthe & Situmorang, 2021; Lee et al., 2020) and is also helpful in exploring data, finding hidden relationships between several candidate input variables and a target variable (Masud et al., 2021; Shaheed et al., 2023).

The need for Social Welfare Services until now still lacks support in terms of fulfilling Social Welfare services, especially in the field of Technology. There are still many facilities that have not been automated. Social workers still

use the old way of conducting social counseling, such as filling out the initial assessment form, which still uses paper and is stored in the archives. A supporting application is needed for Social Workers to make it easier for them to carry out Social Counseling, and a database that can store initial assessment data in real-time. So that later the data that has been entered easily and quickly can be processed to produce a decision quickly and accurately. Using the C4.5 Algorithm method, this problem can be solved because the C4.5 Algorithm can make decisions based on existing datasets. Supported by a website-based application, all data will be even more practical to process.

At the Ministry of Social institutions, data can be obtained from each social extension worker with a reference from the Integrated Social Welfare Data (DTKS). The data is a decision-making instrument through the Preliminary Assessment, later the quality of the Social Welfare Services (PPKS) can be known whether they are ready to be educated and fall into the residential, community, or family category. It would be nice if the initial assessment form is available in the website application and the data is entered into a database that can be accessed via the website, later Social Workers can easily fill in the required biodata, easily fill out the assessment instruments, and produce a determining indicator whether the PPKS is in a suitable category. Residential, Community, or Family. The Ministry of Social Affairs very much needs this system, especially the Ministry of Social Services Wyata Guna Bandung or, more fully, the Social Rehabilitation Center for Sensory Blind (BRPSN) so that later social workers do not have to use paper anymore and the data that has been recapitulated is appropriately stored in the database. So that later the Social Workers/Peksos can accelerate the performance of the social counseling being carried out.

Based on the explanation above, the author is interested in conducting a research entitled "Implementation of Algorithm C4.5 for the Initial Assessment Application of Persons with Disabilities at the Ministry of Social Center Wyata Guna Bandung". This research was conducted to create a website-based application to make it easier to fill in the initial assessment for social workers and to easily determine the right indicators for the need for Social Welfare Services (PPKS).

2. Literature Review

2.1. Application of the C4.5 Algorithm for the Diagnosis of Pneumonia in Mobile-Based Toddlers using the C4.5 Algorithm

According to previous research conducted by Akbar Muhajidin and Denny Pribadi in 2017 entitled Application of the C4.5 Algorithm for the Diagnosis of Pneumonia in Mobile-Based Toddlers using the C4.5 Algorithm, Expert Systems, and Android programming. This research was successful in helping users, especially parents, obtain information about pneumonia that attacks children under five without having to consult directly with medical personnel.

2.2. Data Mining: Classification Using the C4.5 Algorithm

Previous research conducted by Kurniawan et al. (2021) entitled Prediction for Cooperative Credit Eligibility Using Data Mining Classification with C4. 5 Algorithm. In this discussion, we use the decision tree model to produce several models that can be used to classify.

2.3. Application of the C4.5 Algorithm to the Application of Graduation Prediction for Students in Informatics Study Program Algorithm C4.5

In the research conducted by Ratna Puspita Sari Putri and Indra Wasp in 2018 entitled Application of the C4.5 Algorithm to the Application of Graduation Prediction for Students in Informatics Study Program Algorithm C4.5. Using Decision Trees, Expert Systems, and Website Applications, produce decision trees that are cut using a confidence value of 0.4, resulting in 70.70% precision, 50.65% recall, and 61.57% accuracy. Trees cut using a confidence value of 0.25 produce 73.77% precision, 48.84% recall, and 62.44% accuracy.

3. Materials and Methods

3.1. Materials

Data collection in this study used a sampling technique obtained from the Wyata Guna Bandung Office data. The sample data taken is from the initial assessment form for the family, community, and residential service criteria categories. The author obtained 43 data with a composition of 14 data for the family service category, 14 for the community category, and 15 for the residential service category. The data is processed, and the attribute values are determined. The attribute values are used to calculate the entropy and gain values so that the results are in the form of a decision tree. The author determines as many as 10 attribute values, from these attributes, the author gets 3 branch nodes. After all, values produce output from family, community, or residential service categories. The author conducted a sample test by testing 15 original data that had not been processed and tested using the decision tree rules. Found an accuracy rate of 86.6% the data tested was correct, and 13.4% of the data tested was wrong.

3.2. Methods

The research method carried out by the authors in this study using the RnD method is a strategy or research method that is powerful enough to improve practice. The development method used in preparing this final project is an object-oriented analysis and design method modeled using UML (Unified Modeling Language) diagrams.

The flow of research conducted by the author begins with the problem formulation stage, which aims to discover the problems experienced in the research and have been mentioned in Chapter 1 in sub-chapter 1.2 Problem Formulation. This chapter describes the problem that will be raised for research. The issues raised will later be studied, and information related to the problem will be obtained. Then the observation and interview stages were conducted by the author to the head of Sub. The Administration Section discusses what kind of application is expected and what is appropriate to make it easier for Social Workers to carry out the ATENSI program, specifically in filling out the assessment form.

The author also interviewed one of the Social Workers at Balai Wyata Guna to find out the systematics of filling out the assessment and how to make a decision based on the results of the completed assessment form so that later it can produce the specified output. Then the business modeling stage is carried out to model the business scheme to find out how the business process is running. The author designs application development, such as UML diagrams using OOP concepts that the author learns from Wieringa (1998). The author uses 5 diagrams because the application built is not too big enough to use 5 diagrams, including; Usecase Diagrams, Class Diagrams, State Machine Diagrams, Sequence Diagrams, and Activity Diagrams. The author analyzes what kind of rules must be followed during the process of filling out the Initial Assessment and how is the systematic implementation of the Initial Assessment. Anyone can fill out the Initial Assessment form. The business modeling stage is carried out when the writer finishes carrying out the final project Seminar, and the writer is also making a mockup of the application display, which will be made in collaboration with social workers so that the application can later be easily and familiarly accessible to an extension worker/social worker. Then the data modeling stage and the c4.5 algorithm process model what data is needed based on business modeling and define the attributes and their relationships with the data the author has obtained. Determine the Entropy and Gain values based on existing formulas and data until finally, the C4.5 algorithm can determine the appropriate results. Then, the author carries out the stage of making this application design using Visual Studio Code as a platform for making application building codes. The author uses PHP and Javascript to create a website-based application according to the mockup created at the Business Modeling stage. Making the application is also continued by integrating code from the C4.5 algorithm with the website created so that the website can be used and run as it should. The author also creates a local database using MySQL as a means of database storage. Then the testing phase, the author conducts testing using the Black Box testing method, testing is carried out by emphasizing functionality and how the application works properly. Then when it is running and there are no errors, the author submits the application to be tested by the social worker that the author chooses. If the application has been declared to have no problems and runs as expected, then the author is considered to have completed this Initial Assessment application project.

4. Results and Discussion

The results of this study were to produce 10 attributes and 3 branch nodes out of a total of 45 data which were used as datasets, and the entropy and gain values were calculated, a decision tree model was found that could be used to determine appropriate service criteria for persons with disabilities, the resulting accuracy level was 86.6%. The website application created can also function as filling out the initial assessment form as well as determining the appropriate service category for persons with disabilities. The website created can also search by entering the name of the patient you want to search for. It can also function to delete data that is no longer used.

As explained in the results, this study produced a decision tree that can be used to determine appropriate service criteria for persons with disabilities at the Wyata Guna Bandung. This decision tree model has an accuracy rate of 86.6%, which is tested with correct results, and 13.3% of the data tested with wrong results. The data tested were 15 data taken from the data archive of the Wyata Guna Bandung Office. The decision tree model can also be implemented into a website application to make it easier for social workers to carry out the social counseling process in the form of an initial assessment. The website can be used to fill out the initial assessment form and provide the right service decisions for prospective patients. The website can also be used to search for patient data based on the name entered in the search field. Besides that, it can also function to delete stored patient data.

5. Conclusion

Algorithm C4.5 in the Initial Assessment Application for Persons with Disabilities uses 10 attributes, namely gender, type of disability, assistive devices, causes of disability, current illnesses, drugs currently being taken, previous treatment, need for treatment, health problems, and previous trauma. By looking for entropy and gain to be used as a decision tree with an accuracy rate of 86.6%, the test data is suitable, and 13.3% is not appropriate.

The design of the decision support system in this study has been made by developing applications using Rapid Application Development (RAD), the Object Oriented Analysis and Design (OOAD) development model, the design model, the Unified Modeling Language (UML), and applications are built using HTML, PHP, Javascript, and the database use MySQL.

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