

## DESIGNING AN INFORMATION SYSTEM SIMULATION OF PSYCHOLOGICAL TEST QUESTIONS USING THE C4.5 METHOD AT THE WEB-BASED HRC LAVANDA PSYCHOLOGY BUREAU

Rini Wulandari<sup>1</sup>, Charles Jhony Mantho Sianturi<sup>2\*</sup>

<sup>1,2</sup>Sistem Informasi, <sup>2</sup>Informatika  
Fakultas Teknik dan Ilmu Komputer  
Universitas Potensi Utama, Medan Indonesia  
<https://potensi-utama.ac.id/>  
riniw330@gmail.com<sup>1</sup>, 79sianturi@gmail.com<sup>2</sup>  
(\*) Corresponding Author

### Abstract

Psychological tests or psychological tests are a diagnostic effort with specific measuring tools created by psychologists to reveal a picture of a person's potential or to distinguish a person's behaviour from others through particular problems. Not all psychological tests can be easily computerized, and an accounting application can be easily modelled mathematically. At the very least, it must be admitted that at this time, there are very few psychological tests in Indonesia that are well computerized. It will be troublesome if the test is intended for recruitment purposes, especially if the company concerned needs the test results as quickly and accurately as possible. Seeing this background, the author wants to help and provide easy solutions by utilizing the internet media, a field of information and media that is very useful for everyone. The C4.5 method is applied to classify personality test questions, interest aptitude tests, SPM tests, and arithmetic tests to produce accurate calculations for the classification of psychological test questions. With the information system for the psychological test questions using the C4.5 method, it is hoped that the public can more easily access the simulated psychological test questions easily and quickly.

Keywords: Information System; Psychological Test Questions Simulation; C4.5 Method.

### Abstrak

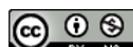
*Tes psikologi atau psikotes pada dasarnya merupakan suatu upaya diagnostik dengan alat-alat ukur tertentu yang diciptakan oleh para pakar psikologi untuk mengungkap gambaran potensi yang dimiliki oleh seseorang atau untuk membedakan perilaku seseorang dengan orang lain melalui pemberian persoalan-persoalan tertentu. Tidak semua tes psikologi dapat dengan mudah dikomputerisasi, seperti halnya mengkomputerisasi sebuah, katakanlah aplikasi akuntansi, yang dapat dengan mudah dibuatkan model matematisnya. Paling tidak, harus diakui bahwa pada saat ini, masih sedikit sekali tes psikologi di Indonesia yang sudah terkomputerisasi dengan baik. Hal ini akan merepotkan apabila tes ini dimaksudkan misalnya untuk keperluan Recruitment, terutama bila perusahaan yang bersangkutan membutuhkan hasil tes secepat dan seakurat mungkin. Melihat latar belakang tersebut, penulis ingin membantu dan memberikan solusi mudah dengan memanfaatkan media internet yang merupakan ladang informasi dan media yang sangat bermanfaat bagi semua orang. Dengan adanya sistem informasi soal ujian psikotes menggunakan metode C4.5, diharapkan masyarakat dapat lebih mudah mengakses simulasi soal ujian psikotes secara mudah dan cepat. Metode C4.5 diterapkan dalam klasifikasi soal tes kepribadian, tes minat bakat, tes SPM dan tes berhitung sehingga akan menghasilkan perhitungan akurat terhadap klasifikasi soal ujian psikotes.*

Kata Kunci : Sistem Informasi; Simulasi Soal Ujian Psikotes; Metode C4.5.

### INTRODUCTION

Psychological tests or psychological tests are a diagnostic effort with specific measuring tools created by psychologists to reveal a picture of a person's potential or to distinguish one person's behaviour from others through particular problems

(Sidik et al., 2018). Not all psychological tests are easy to computerize, and accounting applications can be easily modelled mathematically. At the very least, it admitted that at this time, there are very few psychological tests in Indonesia that are well computerized. Most of these tests still have to be assessed and analyzed manually, which will take a



long time if the test takers number in the tens or hundreds of people (Pratama et al., 2019). It will be inconvenient if the test is intended for recruitment purposes, especially if the company requires test results as quickly and accurately as possible. Seeing this background, the author wants to help and provide easy solutions by utilizing the internet media, a field of information and media that is very useful for everyone. Especially for job applicants who want to find, send and register job applications where they want, to design and create a website Development of Web-Based Online Psychological Tests that can determine personality and measure a person's level of intelligence online (Nugraha et al., 2015).

Therefore, the author wants to design an application that can assist in providing a simulation of psychological test questions using the web-based C4.5 method. One of the clustering techniques in data mining is the clustering method. Understanding scientific clustering in data mining is the grouping of several data or objects into clusters (groups) so that each set will contain data that is as similar as possible and different from other collections (Nasari & Sianturi, 2016)

A web-based information system is a combination of site-based information technology on the internet network, which is equipped with features and is designed in such a way to specify input data, aiming to simplify and accelerate data. Processing even for novice users (Prayogi et al., 2021).

One of the successes of banking is in classifying its customers. Classification activities are closely related to profiling documents (Rusito & Firmansyah, 2016). Proofing is one of the activities of recording guarantee documents which later the data classified according to the provisions set by the management. This activity serves as a collection of customer data as creditors. The method used in this system uses the C4.5 decision tree algorithm and is one of the existing methods of classification in data mining. There are three stages in making this application: the data processing stage, the decision tree stage, and the interpretation stage.

Selection of majors to have the skills to enter the world of work (Sambani & Nuraeni, 2017). A data mining process obtains the direction pattern following the CRIPS-DM steps. However, there are often problems in the process because the school still has difficulty determining policies for determining the majors of prospective students, requires many assessment factors, and limited time to process all data. Therefore, the school needs to know the pattern of student majors based on report cards, medical tests, and sports. Later this pattern

will make it easier for the school to determine which major is suitable for the prospective student.

From the results of the previous discussion, the party's schools can find the pattern of values and interests for selecting majors for prospective student applicants so that the school can provide direction appropriate for students in choosing majors. From calculation results through system calculations and manual results obtained for data, a level of accuracy is 100% and b. Data by 80%, which means that C4.5 recommended processing student data in terms of help give the best decision selection student major (Anestiviya et al., 2021)

One problem in the distribution scholarship is how to select students who deserve a scholarship. This research uses Decision The Tree Method of the C4.5 Algorithm and RapidMiner 5.3 as software to create a model to assist decision-making in the scholarship recipient selection process. (Hijriana & Rasyidan, 2017)

Functional testing of the system and the web browser can run well as expected. While the results of data processing on the system obtained the results of the amount of data with information increased by 20 data, report decreased by 2 data and information remained 5 data or about 74.07% constituted up information that seen on the graph of results. (Rahman et al., 2020)

Knowing the intelligence potential of children is undoubtedly essential for parents. By analyzing the ability of the right and left brain, a child can be directed and developed accordingly with their respective skills. The power of children's brains at 6 to 12 years old is perfect for making parents and teachers more selective in determining suitable learning methods to apply to children. The system built in this research makes it possible to know the potential of the brain's intelligence for a child with a classification based on an alternative from the state of intelligence of the right brain or left brain that is provided in the database to determine the potential of children. (Ginting et al., 2021)

Student data increasing from year to year is evidence for developing Data Mining. The number of students processed to find out based on the criteria any student deserves the title of success with several attributes such as gender, attendance, lecture sessions, average NEM and origin school. In this case, the researchers analyzed Amik Tunas Bangsa Jl. Sudirman no. 1,2,3 Pematangsiantar. (Luvia et al., 2017)

In the implementation of the tryout, not all students can solve problems correctly. It impacts the results of the tryout and a lousy value. Therefore, schools need data mining with classification methods to help predict a student's readiness to face



The activities carried out in each stage of the waterfall diagram are as follows:

### 1. Planning

Planning to form a strategic work structure and see the importance of data mining built for system users. System planning is carried out to take into account the resources needed in making the system, including hardware, software and human devices as system users, mencakup perangkat keras, perangkat lunak dan perangkat manusia sebagai pengguna sistem.

### 2. Requirements analysis

Requirements analysis is to analyze the requirements of existing systems and add new techniques to the design if needed. The basic needs that must live in making this application are::

- This application requires data about psychological tests that use as input in a web-based thesis guidance system.
- This application requires a minimum of Processor Core I3 laptop hardware, 4 GB RAM, and 500 Hard drives. Requires Windows Operating System, PHP programming language, and MySQL database.

### 3. System Design

It is the stage of interpreting the needs that users analyze more easily by displaying it in Unified Modeling Language (UML), using case diagrams, class diagrams, activity diagrams, and sequence diagrams.

### 4. Coding Testing

It is a data translator or troubleshooting software designed in a predefined and used programming language. Application of the C4.5

algorithm in the form of a programming language used to build information systems. The design of this information system uses Visual Studio Code software and Localhost.

### 5. Testing

The system testing phase is the software testing phase that was built. This test begins by making a test case for each function in the software for data mining systems which is then continued on the interface to ensure that there are no errors, that everything is going well, and that the input given results are as required.

### 6. System Maintenance

The application of the software being tested is placed into a system owned by the user. After everything goes according to plan, system maintenance is performed. It is necessary because the designed system requires changes due to errors or developments in the field of information technology.

### Dataset

The data set used in the study is downloaded at the following URL <https://github.com/CharlesSianturi/Psikotes/blob/main/Data%20Psikotes.xlsx>

## RESULTS AND DISCUSSION

When constructing a decision tree, the number of branches may reflect noise or outliers in the training data—pruning trees to identify and remove trunks. Pruned trees will be smaller and easier to grasp. Such trees are usually also faster and better at classifying i.

Case study:

Table 1. Test Data Using Selected Attributes

Attribute Value	Amount of data	Number of Sanguine	Number of Cholerics	Total Melancholy	Number of Phlegmatic	Entropy	Gain
jenis_kelamin='L'	50	20	9	6	15	1.862	
jenis_kelamin='P'	50	17	5	12	16	1.882	0.025
usia='13'	56	22	7	12	15	1.89	
usia='14'	32	13	5	4	10	1.846	
usia='15'	12	2	2	2	6	1.792	0.033
sekolah='Negeri'	50	17	8	11	14	1.947	
sekolah='Swasta'	50	20	6	7	17	1.822	0.013
jawaban_b<=10	67	27	0	13	27	1.516	
jawaban_b>10	33	10	14	5	4	1.828	0.278
jawaban_b<=15	98	37	12	18	31	1.876	
jawaban_b>15	2	0	2	0	0	0	0.059
jawaban_b<=20	100	37	14	18	31	1.897	
jawaban_b>20	0	0	0	0	0	0	0
jawaban_d<=10	51	28	10	13	0	1.438	
jawaban_d>10	49	9	4	5	31	1.498	0.43
jawaban_d<=15	85	37	14	17	17	1.88	
jawaban_d>15	96	37	14	18	27	1.903	
jawaban_d<=20	4	0	0	0	4	0	0.07



Table 1 information :

Selected attribute = Answer A <=10, with gain value = 0.564  
 (answer\_a<=10)  
 Number of data = 51

Total Sanguine = 0  
 Total Choleric = 10  
 Total Melancholy = 15  
 Total Phlegmatic = 26  
 Entropy All = 1.476

**Table 2. Test Data With Selected Attributes**

Attribute Value	Amount of data	Number of Sanguine	Number of Cholerics	Total Melancholy	Number of Phlegmatic	Entropy	Gain
jenis_kelamin='L'	25	0	7	5	13	1.469	
jenis_kelamin='P'	26	0	3	10	13	1.39	0.047
usia='14'	13	0	2	3	8	1.335	
usia='13'	28	0	6	10	12	1.531	
usia='15'	10	0	2	2	6	1.371	0.026
jawaban_a<=20	51	0	10	15	26	1.476	
jawaban_a>20	0	0	0	0	0	0	0
jawaban_b<=5	13	0	0	3	10	0.779	
jawaban_b>5	38	0	10	12	16	1.557	0.117
jawaban_b<=10	32	0	0	10	22	0.896	
jawaban_b>10	19	0	10	5	4	1.467	0.367
jawaban_b<=15	50	0	9	15	26	1.457	
jawaban_b>15	1	0	1	0	0	0	0.048
jawaban_b<=20	51	0	10	15	26	1.476	
jawaban_b>20	0	0	0	0	0	0	0
jawaban_d>5	48	0	9	13	26	1.442	0.065
jawaban_d<=10	17	0	6	11	0	0.937	
jawaban_d>10	34	0	4	4	26	1.022	0.482
jawaban_d<=15	38	0	10	14	14	1.568	
jawaban_d>15	13	0	0	1	12	0.391	0.208
jawaban_d<=20	48	0	10	15	23	1.504	
jawaban_d>20	3	0	0	0	3	0	0.06

Table 2 Information :

Selected attribute = Answer C <=10, with gain value = 0.54  
 (answer\_a<=10) AND (answer\_c<=10)  
 Total data = 28

Total Sanguine = 0  
 Total Choleric = 10  
 Total Melancholy = 0  
 Total Phlegmatic = 18  
 Entropy All = 0.94

**Table 3. Test Data With Selected Attributes**

Attribute Value	Amount of data	Number of Sanguine	Number of Cholerics	Total Melancholy	Number of Phlegmatic	Entropy	Gain
jenis_kelamin='L'	16	0	7	0	9	0.989	
jenis_kelamin='P'	12	0	3	0	9	0.811	0.027
usia='13'	14	0	6	0	8	0.985	
usia='15'	6	0	2	0	4	0.918	
usia='14'	8	0	2	0	6	0.811	0.019
sekolah='Negeri'	14	0	5	0	9	0.94	
sekolah='Swasta'	14	0	5	0	9	0.94	0
jawaban_a<=5	2	0	2	0	0	0	
jawaban_a>5	26	0	8	0	18	0.89	0.114
jawaban_a<=10	28	0	10	0	18	0.94	
jawaban_a>10	0	0	0	0	0	0	0
jawaban_a<=15	28	0	10	0	18	0.94	
jawaban_a>15	0	0	0	0	0	0	0
jawaban_d<=5	1	0	1	0	0	0	
jawaban_d>5	27	0	9	0	18	0.918	0.055
jawaban_d<=10	6	0	6	0	0	0	
jawaban_d>10	22	0	4	0	18	0.684	0.403
jawaban_d<=15	18	0	10	0	8	0.991	
jawaban_d>15	10	0	0	0	10	0	0.303
jawaban_d<=20	25	0	10	0	15	0.971	



Attribute Value	Amount of data	Number of Sanguine	Number of Cholerics	Total Melancholy	Number of Phlegmatic	Entropy	Gain
jawaban_d>20	3	0	0	0	3	0	0.073

Table 3 Information :

Selected attribute = Answer B <=10, with gain value = 0.578  
 $(\text{answer\_a}<=10) \text{ AND } (\text{answer\_c}<=10) \text{ AND } (\text{answer\_b}<=10)$   
 LEAF || Decision = Phlegmatic  
 $(\text{answer\_a}<=10) \text{ AND } (\text{answer\_c}<=10) \text{ AND } (\text{answer\_b}<=10)$

Total data = 13

Total Sanguine = 0

Total Choleric = 10

Total Melancholy = 0

Total Phlegmatic = 3

Entropy All = 0.779

Table 4. Test Data With Selected Attributes

Attribute Value	Amount of data	Number of Sanguine	Number of Cholerics	Total Melancholy	Number of Phlegmatic	Entropy	Gain
jenis_kelamin='L'	8	0	7	0	1	0.544	
jenis_kelamin='P'	5	0	3	0	2	0.971	0.071
usia='13'	7	0	6	0	1	0.592	
usia='15'	4	0	2	0	2	1	
usia='14'	2	0	2	0	0	0	0.153
sekolah='Negeri'	6	0	5	0	1	0.65	
sekolah='Swasta'	7	0	5	0	2	0.863	0.014
jawaban_a<=5	2	0	2	0	0	0	
jawaban_a>5	11	0	8	0	3	0.845	0.064
jawaban_a<=10	13	0	10	0	3	0.779	
jawaban_a>10	0	0	0	0	0	0	0
jawaban_a<=15	13	0	10	0	3	0.779	
jawaban_a>15	0	0	0	0	0	0	0
jawaban_a<=20	13	0	10	0	3	0.779	
jawaban_a>20	0	0	0	0	0	0	0
jawaban_b<=5	0	0	0	0	0	0	
jawaban_b>5	13	0	10	0	3	0.779	0
jawaban_b<=10	0	0	0	0	0	0	
jawaban_b>10	13	0	10	0	3	0.779	0
jawaban_b<=15	12	0	9	0	3	0.811	
jawaban_b>15	1	0	1	0	0	0	0.03
jawaban_b<=20	13	0	10	0	3	0.779	
jawaban_b>20	0	0	0	0	0	0	0
jawaban_c<=5	1	0	1	0	0	0	
jawaban_c>5	12	0	9	0	3	0.811	0.03

Table 4 information :

Selected attribute = Answer B <=10, with gain value = 0.578

$(\text{answer\_a}<=10) \text{ AND } (\text{answer\_c}<=10) \text{ AND } (\text{answer\_b}<=10) \text{ AND } (\text{answer\_d}<=10)$

LEAF || Decision = Choleric

$(\text{answer\_a}<=10) \text{ AND } (\text{answer\_c}<=10) \text{ AND } (\text{answer\_b}<=10) \text{ AND } (\text{answer\_d}<=10)$

Total data = 7

Total Sanguine = 0

Total Choleric = 4

Total Melancholy = 0

Total Phlegmatic = 3

Entropy All = 0.985

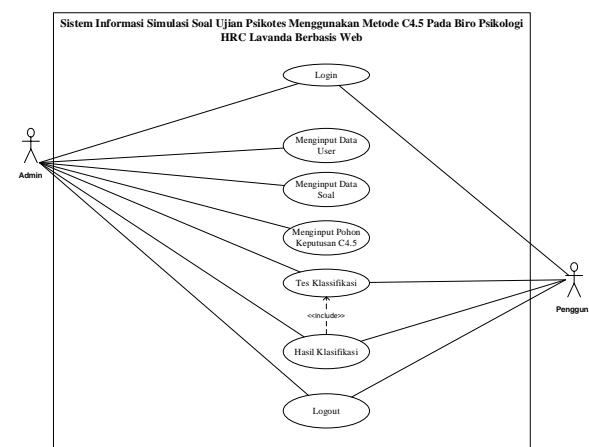


Figure 2. Use Case Diagram

The system design uses the use case diagram shown in Figure 2.

Result Display

## 1. Display of Personality Question Classification Form

The display of this page displays the number of questions filled in by students/users, as shown in Figure 3:

No. 1

Perlu kerihutan, sering menggunakan isyarat tangan, lengan, dan wajah secara hidup (Animated)

Orang yang mau melukai sesuatu - bagian hal yang beru dan berani bertekad untuk me-ngeusinya (Adventurous)

Suka menyelidiki bagian - bagian yang logis (Analytical)

Mudah menyusulkan diri dan senang dalam setiap soal (Adaptable)

No. 2

Penuh ketegangan dan selera humor yang baik, (Playful)

Menganalisa se-seorang dengan logika dan fakta, bukan dengan pesona / kekuasaan, (Persuasive)

Melaukan sesuatu sampai selesai sebelum yang lain, (Persistent)

Tampak tidak ter-ganggu dan tenang serta menghindari setiap bentuk keracuan, (Peaceful)

No. 3

Orang yang memandang beranda orang lain sebagai kesempatan untuk bersikap manis dan menghibur, bukannya sebagai tantangan / kesempatan bisnis, (Sociable)

Orang yang yakin dengan catatanya sendiri, (Strong-Willed)

Bersedia mengorbankan dirinya untuk memenuhi kebutuhan orang lain.

Dengan mudah memerlukan orang lain tanpa perlu banyak mengungkapkan pendapat sendiri, (Submissive)

No. 4

Bisa membuat hati orang lain melalui pesona kepribadian, (Covincing)

Figure 3. Personality Question Classification Form

## 2. Display of Classification Result Form

This page display displays the results of the classification of questions that have been input by students/users, as shown in Figure 4:

**Klasifikasi Karakteristik Kepribadian Manusia**  
 (INTERVIEW DECISION TREE CLASSIFICATION)

Home Klasifikasi Logout

### Klasifikasi

Klasifikasi karakteristik kepribadian Anda:  
 Melankolis

Figure 4. Classification Result Form Display

## 3. Display of Interest Talent Classification Form

This page displays the number of questions filled in by students/users, as shown in Figure 5.

**Tes Minat Bakat**

GRUP A	GRUP B	GRUP C
Petani	AHLU PEMBUAT ALAT-ALAT	AUDITOR
Insiyur Sipil	AHLU STATISTIK	AHLU METREOLOGI
Akuntan	INSINYUR KIRIA INSUDRI	SALESMAN
Ilmuwan	PENYIAR RADIO	ARISTEK
Manager Perjalanan	ARTIS KOMERSIAL	PENULIS DRAMA
Semirman	PENGARANG	KOMPONIS
Wartawan	DIRIGEN ORKEST	KEPALA SEKOLAH
Plansis Korser	PSIKOLOG PENDIDIKAN	PEGAWAI KOTAPRAJA
Guru Sekolah Dasar	SEKRETARIS PERUSAHAAN	AHLU MELBEL
Manajer Bank	AHLU BANGUNAN	DOKTER HEWAN
Tukang Kayu	AHLU BEDAH	JURU UKUR TANAH
Dolter	AHLU KETUHANAN	TUKANG BUBUT

GRUP D	GRUP E	GRUP F
AHLU BIOLOGI	PETIGAS WAWANCARA	PEMOTRET
AGEN BRO ILAN	PERANCANG PERHISAN	PENULIS MAJALAH
BUKU PENGETAHUAN	PERANCANG PERATAKAN	PERANCANG
AHLU SISWAH	GURU MUSIK	ORGANISASI KEPERAMILAN
KRITIKUS MUSIK	PERINAMA ROHANI	PELETIGAS PENGIRIM BARANG
PEREWA SOSIAL	PETIGAS ARSIP	PELETIGAS PERMATA
PEGAWAI KURANGI	TUKANG BATU	AHLU KACA MATA
TUKANG CAT	DOKTER GIGI	AHLU SORTIR KULIT
APOTEKER	PROSPERITOR	INSTALATOR

Figure 5. Display of Interest Talent Classification Form

## CONCLUSIONS AND SUGGESTIONS

### Conclusion

From the results of the author's research, several conclusions can be drawn, including the author designing a psychological test simulation information system at the web-based HRC Lavanda Psychology bureau with data processing needed in

creating a psychological exam simulation information system in the form of a list of psychological test exam questions. With the information system on psychological test questions using the C4.5 method, the public can more easily access the simulation of psychological test questions easily and quickly. The C4.5 method is applied to classify personality test questions, interest aptitude tests, SPM tests, and arithmetic tests to produce accurate calculations for the classification of psychological test questions.

### Suggestion

Several suggestions have been given based on the research results and conclusions described above. The information system for the simulation of psychological test questions was developed using other classification methods. In the future, an information system about psychological tests will be produced by adding other types of psychological test questions. This psychological test simulation information system has a future data backup system feature.

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