

IMPLEMENTATION OF SELECTION OF EMPLOYEE CANDIDATES BY UTILIZING SOCIAL MEDIA USING LINEAR REGRESSION ALGORITHMS AND TOPSIS METHODS: A CASE STUDY OF A BOARDING SCHOOL

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ABSTRACT

Efficiency in the selection of prospective employees can have a significant impact on increasing costs and extending the time required in the recruitment process of HR Information Systems in boarding schools. However, the hiring process is often still done manually and traditionally, resulting in high costs and time and lack of efficiency. Social media has become an important part of modern society, including in the employee recruitment and selection process. Social media can be used to obtain more comprehensive information about prospective employees, such as educational background, skills, work experience, and personality. This research investigates using Linear Regression Algorithm on social media classification and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method as ranking criteria in classifying prospective employees. One of the proposed solutions is to utilize information from social media to evaluate the potential and personality of prospective employees. This research specifically reviews the application of Linear Regression Algorithm and TOPSIS method in categorizing prospective employees based on information obtained from social media, focusing on HR Information System in a particular boarding school. The results showed that the application of social media classification system with linear regression algorithm with Mean absolute error 10.50, Residual sum of squares (MSE): 147.16, R-squared: 1.0 and TOPSIS method with an accuracy rate of 0.51238 for the first rank can improve the efficiency of the recruitment process.

KEYWORDS

Linear Regression, TOPSIS Method, Social Media Classification, Recruitment, Boarding School



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INTRODUCTION

In the ever-evolving digital era, the recruitment process has become one of the most important aspects of Human Resources (HR) management in various organizations (Solikhah & Amelia, 2022). This process involves the selection and evaluation of prospective employees to ensure that they have the qualifications that match the company's needs. HR effectiveness can contribute significantly and gain a competitive advantage in achieving educational goals, ensuring the safety and well-being of students, and maintaining a smooth learning process (Nawaz, 2016).

The influence of human resource information systems on employees' work tasks is so significant that maintaining the quality of HRIS has become one of the top priorities for organizations (Srivastava, Dev and Bajaj, 2021). By implementing HRIS, boarding schools can increase the efficiency of resource use, reduce administrative burden, improve data accuracy, and enable more optimized decision-making.

The recruitment process is often still done manually and traditionally, resulting in high costs and time and lack of efficiency. With information systems that are traditional and not integrated, schools have difficulty managing data and information at large (Ben Moussa and El Arbi, 2020). In addition, the development of social media also provides new opportunities in obtaining information about potential employee candidates.

Previous research with the use of several combinations of methods from machine learning including this personality classification method uses the logistic regression method with TF-IDF and AHP weighting. From the classification with these two weights on the social behavior approach has an average accuracy of 24.95% (Prameswari and Setiawan, 2019).

Therefore, this research aims to improve the efficiency of the recruitment process by using social media classification method supported by linear regression algorithm and TOPSIS method. This research will be conducted on the HR information system in a boarding school. In addition, the HR division also takes a long time in making work reports because they have to search and check employee data and work contracts one by one (Chairul Anwar, 2019).

Utilizing social media as a data source can assist the HR department in obtaining additional information about job applicants such as their online activities or interactions with others. By using linear regression algorithm and TOPSIS method, the information from social media can be classified so as to facilitate the identification of potential employees who match the needs of boarding school management. This concept makes it possible to evaluate and select the most optimal HR management alternative for boarding schools. (Suroso & Setyawatie, 2019).

This concept makes it possible to evaluate and select the most optimal HR management alternative for boarding schools. This research is expected to contribute to the development of HR information systems in boarding schools, so as to improve the efficiency and effectiveness of the recruitment process.

RESEARCH METHOD

The data collection process has a central role, because the choice of data collection methods will affect the quality and accuracy of the data collected during the implementation of research with a variety of different methods. Data collection methods are carried out with the aim of obtaining essential information to achieve research objectives. Data collection techniques in this study are surveys, observations, documentation which are described as follows:

1. Survey

The survey method can be utilized to collect data from prospective employees who are undergoing the recruitment process. The survey can take the form of a questionnaire that includes questions related to the prospective employee's profile, skills, experience, and other important information relevant to the recruitment process.

2. Observation

Make direct observations of prospective employees who take part in the recruitment stage to collect data on the behavior and characteristics of these individuals. Observations are made when prospective employees undergo various tests or interview sessions.

3. Data from Social Media

Data collection from social media platforms such as LinkedIn, Instagram, or other platforms used by prospective employees to search for job opportunities. Data from social media includes profile information, work experience, qualifications, and relevant references.

4. Data from HRIS

Collect data from the HR information system (HRIS) in boarding schools that includes information about prospective employees who have applied and gone through the initial recruitment stages. HRIS data will provide a comprehensive view of prospective employees who have followed the selection process.

5. Historical Data

Collection of historical data about prospective employees who have previously been recruited by boarding schools. This historical data will serve as a reference for analysis using a linear regression algorithm in classifying the most optimal social media.

Data analysis techniques in this study include linear regression analysis, TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method, descriptive statistical analysis, integration of HRIS Data and Social Media Data, and Recruitment Decision Making.

RESULT AND DISCUSSION

New employee selection using TOPSIS uses 5 criteria including application management documents obtained from GPA scores (C1), test scores during the ongoing acceptance of prospective boarding school employees obtained from the

Psychotest Score (C2), through the use of Media obtained from the level of interaction (C3), the number of uploads (C4), and the number of followers (C5). The data used in this study are: first, the work experience of prospective employees includes data on the type of work, company/school, and length of service. Based on this data, the prospective employees analyzed in this study have various work experiences, ranging from zero to more than ten years. The most popular types of jobs are in education, finance, and services. The most popular companies are schools, multinational companies and national private companies. Second, the social activities of prospective employees include data on organizational involvement, social activities, and social media usage. Based on the data, it can be concluded that the prospective employees analyzed in this study have different levels of social involvement. Most prospective employees are actively involved in organizational and social activities. Some prospective employees also actively use social media to share information and interact with others. And, third, the future employees' social media data is relevant to the research objective, which is to predict employee performance. Information about a prospective employee's education and work experience can be used to predict the employee's abilities and skills. Social activities of prospective employees can be used to predict the employee's personality and behavior.

In this research, a linear regression algorithm is used to classify social media data of prospective employees based on predetermined criteria. The criteria used in this research are as follows:

1. Academic ability (GPA)
2. Psychotest Score
3. Number of Uploads

Linear regression also helps identify the relationship between the variables in the social media data and the candidate's abilities. This relationship can be depicted in the form of a linear regression equation.

1. Plotting the data

	IPK_NA	nilai_psikotest	jumlah_unggahan	jumlah_pengikut
0	8	64	22	88
1	2.84	70	0	74
2	3.45	67	3	71
3	4.4	66	21	83
4	2.82	76	11	97
...
829	3.38	62	0	86
830	3.55	65	0	101
831	3.51	69	12	85
832	81	66	6	71
833	2.74	63	4	82

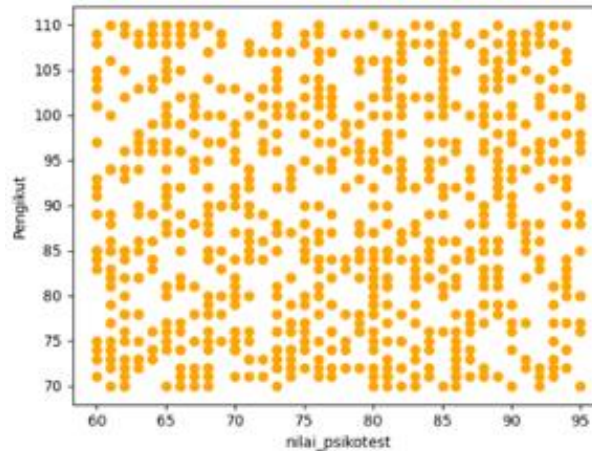
834 rows x 4 columns

Dataset for social media classification

Data plotting is done between the score_psychotest as X and the number of followers as Y.

```
plt.scatter(cdata.nilai_psikotest, cdata.jumlah_pengikut, color='orange')  
plt.xlabel("nilai psikotest")  
plt.ylabel("Pengikut")  
plt.show()
```

Plotting the data



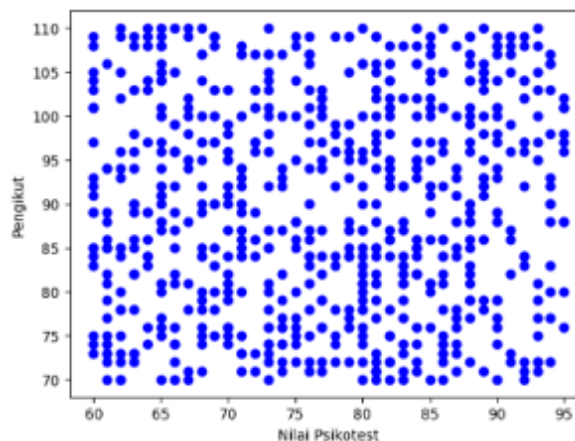
Data plot results

2. Perform data division for train.

The data that has been plotted will be divided based on the following steps:

```
mks = np.random.rand(len(data)) < 0.8  
train = cdata[mks]  
test = cdata[~mks]  
  
plt.scatter(train.nilai_psikotest, train.jumlah_pengikut, color='blue')  
plt.xlabel("nilai Psikotest")  
plt.ylabel("Pengikut")  
plt.show()
```

Data sharing process



The result of the data sharing process

```
Coefficients: [[0.07061499]]  
Intercept: [84.1707793]
```

Figure 6. Results of the data train

3. Plotting to Get Regression Results

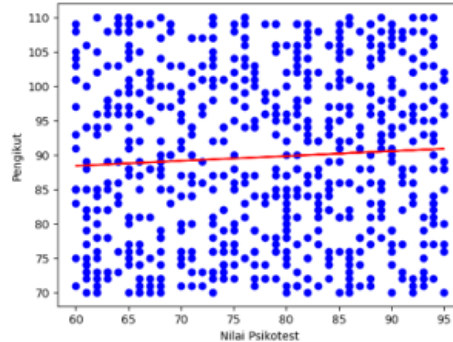


Figure 7. Results of the plotted linear regression model

4. Perform Accuracy Calculation

Mean absolute error (MAE) is a measure of how far the average prediction result deviates from the true value. A smaller MAE value indicates that the prediction is more accurate.

```
# menghitung error
from sklearn.metrics import r2_score

test_x = np.asarray(test[['nilai_psikotest']])
test_y = np.asarray(test[['jumlah_pengikut']])
test_y_ = regr.predict(test_x)

# hitung R-squared
r2 = r2_score(test_y, test_y_)

print("Mean absolute error: %.2f" % np.mean(np.absolute(test_y_ - test_y)))
print("Residual sum of squares (MSE): %.2f" % np.mean((test_y_ - test_y) ** 2))
print("R-squared: ", r2)
```

Figure 8. Accuracy Calculation

Residual sum of squares (MSE) is a measure of how far the total deviation of the predicted result is from the true value. A smaller MSE value indicates that the prediction is more accurate.

R2-squared is a measure of how well the model predicts the true value. A larger R2-square value indicates that the model is more accurate.

```
Mean absolute error: 10.50
Residual sum of squares (MSE): 147.16
R-squared: 1.0
```

Figure 9. Error calculation results

Based on these values, it can be concluded that the model predictions have good accuracy. The low MAE and MSE values indicate that the average prediction results do not deviate too far from the actual values. The defined R2-squared value indicates that the model is more accurate.

Linear regression results are used as one of the determining factors in the selection process of prospective employees. In addition to linear regression results, other factors that can also be used in the employee selection process are ability test results, interviews, and recommendations from superiors or coworkers.

Here is an example of how linear regression results can be used in the employee selection process:

1. Candidates who have high ability scores across all criteria will rank higher in the selection process.
2. Candidates who have high ability scores in criteria relevant to the job they are applying for will rank higher in the selection process.

The Topsis method is a Multiple Attribute Decision Making (MADM) method used to determine the best choice from a number of alternatives. This method is based on the concept of the closest distance to the positive ideal solution and the farthest distance to the negative ideal solution. Topsis Method Implementation Steps.

1. Describe the criteria
2. Create a decision matrix
3. Determine criteria weights
4. Calculating positive and negative ideal vectors
5. Calculating the distance of alternatives to positive and negative ideal vectors
6. Ranking prospective employees

The following is an example of the implementation of the Topsis method for ranking prospective employees:

1. Criteria, Alternatives and Weights

ALTERNATIF	KRITERIA				
	C1	C2	C3	C4	C5
A1	3	3	2	1	3
A2	4	3	2	2	3
A3	4	2	3	1	3
A4	4	3	3	3	3
	ASSET	ASSET	HABBIT	HABBIT	HABBIT
BOBOT	0,2	0,15	0,25	0,1	0,3

TOPSIS analysis table

Table 1. Criteria data and weights

GPA	(A)	0,25
Value_psychotest	(B)	0,25
Interaction level	(C)	1,15
Number of uploads	(D)	0,15
Number of followers	(E)	0,2

2. TOPSIS Method Testing Results

From TOPSIS research, test results are obtained through Microsoft Excell applications and models using PHP.

METODE TOPSIS					
ALTERNATIF	KRITERIA				
	C1	C2	C3	C4	C5
A1	3	3	2	1	3
A2	4	2	2	2	1
A3	4	1	3	1	3
A4	4	2	3	3	2
	ASST	ASST	HABBI	HABBI	HABBI
BOBOT	0,2	0,15	0,3	0,25	0,1
MEMBUAT MATRIX TERNORMALISASI (R)					
PEMBAGI	7,548534	4,242041	5,09902	3,872983	4,795832
R	0,39736	0,707107	0,392232	0,258199	0,625543
	0,529813	0,471405	0,392232	0,516398	0,208514
	0,529813	0,235702	0,588348	0,258199	0,625543
	0,529813	0,471405	0,588348	0,774597	0,417029
MEMBUAT MATRIX TERNORMALISASI TERBOBOT (Y)					
Y	0,079472	0,106066	0,11767	0,06455	0,062554
	0,105963	0,070711	0,11767	0,129099	0,020851
	0,105963	0,035355	0,176505	0,06455	0,062554
	0,105963	0,070711	0,176505	0,193649	0,041703

TOPSIS test results (1)

SOLUSI IDEAL POSITIF					
A+	0,079472	0,035355	0,11767	0,06455	0,020851
SOLUSI IDEAL NEGATIF					
A-	0,105963	0,035355	0,11767	0,06455	0,020851
JARAK ANTARA NILAI TERBOBOT TERHADAP SOLUSI IDEAL POSITIF DAN NEGATIF					
$D_i^+ =$	D1+	0,082092	D1-	0,096261	$D_i^- = \sqrt{\sum_{j=1}^n (y_{ij} - y_j^-)^2}$
	D2+	0,07822	D2-	0,073598	
	D3+	0,076827	D3-	0,072115	
	D4+	0,150049	D4-	0,147692	
NILAI REPRENSI					
V1	0,51238		1	$V_i = \frac{D_i^-}{D_i^- + D_i^+}$	
V2	0,484777		3		
V3	0,484183		4		
V4	0,496042		2		

TOPSIS test results (2)

Model Metode TOPSIS			Hasil Perhitungan			
Data Keputusan						
Kriteria	Alternatif	Nilai	Alternatif	Nilai	Bobot	Nilai Total
			Ternormalisasi	Ternormalisasi	Ternormalisasi	Ternormalisasi
Nilai Pekerjaan	A1	35	A1	0,2571	0,20	0,0514
Jumlah Urahan	A1	100	A2	0,4286	0,15	0,0643
Tingkat Intelekt	A1	50	A3	0,4286	0,30	0,1286
Jumlah Pengeluaran	A1	1000	A4	0,4286	0,25	0,1071

TOPSIS test results (3)

The data used in this research is secondary data obtained from the company. The data is in the form of data about the process of recruiting prospective employees, selection criteria, and selection results.

1. Data analysis was conducted using the Topsis method. This method is used to calculate the distance of alternatives to positive ideal vectors and negative ideal vectors. The smallest total distance to the positive ideal vector and the largest total distance to the negative ideal vector are used to rank alternatives.
2. The results show that the Topsis method can be used to improve efficiency in the recruitment process. This method can help schools to: Shorten the time of the selection process, Save the cost of the selection process, Increase the objectivity of the assessment of prospective employees.
3. Topsis method is an effective method to increase efficiency in the recruitment process. This method can help companies to get the best employees at a more efficient cost.
4. A conceptual framework can help you to theoretically explain how the Topsis method can be used to improve efficiency in the hiring process.
5. An explanation of the selection criteria can help you to understand how the selection criteria affect the selection outcome.
6. The explanation of the data analysis results can help you to understand how the Topsis method can be used to calculate the distance of alternatives to the positive ideal vector and the negative ideal vector.
7. Recommendations you can give to help companies improve efficiency in the recruitment process.
8. Conceptual framework

Efficiency in the recruitment process can be defined as the company's ability to complete the process in a timely, cost-effective, and resource-efficient manner. The efficiency of the recruitment process can be improved by using the Topsis method. The Topsis method is a MADM method used to determine the best choice from a number of alternatives. This method is based on the concept of the closest distance to the positive ideal solution and the farthest distance to the negative ideal solution.

In the context of the recruitment process, the Topsis method can be used to shorten the selection process time, helping companies to shorten the selection process time by reducing the number of prospective employees who need to be selected, saving the cost of the selection process by reducing the number of tests and interviews that need to be conducted, increasing the objectivity of the assessment of prospective employees by using clear selection criteria and appropriate selection methods.

Selection criteria are factors used to assess prospective employees. The right selection criteria can help companies to get the best employees. There are several selection criteria that are commonly used, including Academic ability, Technical skills, Work experience, Personality

1. The selection criteria used should be relevant to the job being applied for. For example, if the job requires high communication skills, then the selection criteria should include communication skills.
2. The results of data analysis show that the Topsis method can be used to improve efficiency in the recruitment process. This method can help companies to:

3. The Topsis method can help schools to shorten the selection process time by reducing the number of prospective employees who need to be selected, helping schools to save the cost of the selection process by reducing the number of tests and interviews that need to be conducted, helping companies to increase the objectivity of assessing prospective employees by using clear selection criteria and appropriate selection methods, The efficiency of the recruitment process can help schools to increase employee satisfaction. This can happen because new employees feel that the company values their time and effort.

There are several things that schools can do to improve the efficiency of the recruitment process, including Technology can help companies to streamline the recruitment process. For example, schools can use an application system to manage prospective employee data, conduct online selection, and send selection result announcements, Clear selection criteria can help companies to focus on candidates who meet the requirements. This can help the company to reduce the time and cost needed for the selection process, the right selection method can help the company to assess prospective employees objectively. This can help the company to get the best employees.

A well-trained recruitment team can help schools to make the selection process more efficient and effective. The following are some examples of the application of efficiency in the recruitment process A school uses an application system to manage prospective employee data. This system can help schools to track the status of candidates and send notifications to candidates about the selection process, Using online tests to assess the skills of candidates. Online tests can help schools to save time and money for the selection process. Using panel interview method to assess prospective employees. The panel interview method can help schools to get a more objective assessment of prospective employees. By implementing efficiency in the recruitment process, companies can increase productivity, save costs, and increase employee satisfaction, The selection process of prospective employees becomes faster and more accurate because social media data can provide additional relevant information.

Here are some of the advantages of HR information systems in Boarding Schools

1. The implementation of linear regression algorithm and TOPSIS method in HR information system in boarding schools provides advantages in improving efficiency and accuracy in selecting prospective employees.
2. The system is able to identify potential employees quickly and efficiently, thus reducing the time and effort required in the recruitment process.

CONCLUSION

Based on the description of the background, research problems and problem formulation to improve efficiency in the recruitment process of prospective employees in pesantren through a method that combines social media analysis, linear regression, and the TOPSIS approach. Some of the main findings of this research are.

1. Integrating social media data analysis into the recruitment process has the potential to provide additional insights into candidate qualifications that may not be detected through traditional methods.
2. Although linear regression was used in this study, it was found to be suboptimal for the classification task. The linear regression results are more suitable for predicting continuous values than classifying categorical labels.
3. The results showed that the application of social media classification system with linear regression algorithm with Mean absolute error 10.50, Residual sum of squares (MSE): 147.16, R-squared: 1.0 and TOPSIS method with an accuracy rate of 0.51238.

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