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# Facial Expression Recognition to Detect Student Engagement in Online Lectures

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## Abstract

In synchronous online lectures, the lecturers often provide the lecture material directly through video conference technology. On the other hand, there are many students who do not pay attention to the lecturers when they are participating in online lectures. As a consequence, in this research, an application was developed to assist lecturers in gathering data regarding the degree to which students who participate in online lectures pay attention to the presented information. The application employed a convolutional neural network (CNN) model to recognize each student's facial expressions and place them into one of two classes: either engaged or disengaged. The captured student facial image was preprocessed to facilitate the classification process. The preprocessing stage consisted of image conversion to gray scale, face detection using the Haar-Cascade Classifier model, and a median filter to reduce noise. In the process of designing a CNN model, three different hyperparameter tuning scenarios were implemented. These tuning scenarios aimed to obtain the best possible CNN model by determining which CNN model hyperparameters were the most optimal. The results of the experiments indicate that the CNN model from the second scenario has the highest level of accuracy in terms of recognizing facial expressions, coming in at 86%. The results of this research have been tested to measure the level of student participation in online lectures. The trial results show that the proposed application can help lecturers evaluate student engagement during online lectures.

**Keywords:** Facial Expression Recognition, Convolutional Neural Network, Student Engagement, Online Lectures.

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## I. INTRODUCTION

Online lectures are learning processes using virtual classrooms on the Internet [1], [2]. Online lectures have become indispensable in various educational institutions since the Covid-19 pandemic [3]. But after the Covid-19 pandemic passed, online lectures still have an important role in education [4]. Two popular methods are used in conducting online lectures, namely synchronous and asynchronous. In the synchronous method, lectures are delivered directly by lecturers to students through video conferencing applications. In addition, lecturers and students can also meet face-to-face and communicate directly in virtual classrooms. Students can also work together virtually at the same time. In the asynchronous method, lecturers usually provide learning videos or written learning materials in files uploaded to the learning site so that students can access and study at a specified time. Communication between lecturers and students is usually done by sending messages through discussion boards available on learning sites [5].

The effectiveness of online lectures is still very low compared to offline face-to-face lectures. This is the impact of

low student engagement in the respective online lectures. Students are only present in the virtual classroom but then do other activities unrelated to the lecture and do not pay attention to the lecture's material [6]. On the other hand, lecturers need to evaluate student engagement in a lecture activity because student engagement is one important aspect of determining student success in a lecture, especially online lectures [7].

In online lectures, it is difficult for lecturers to see student engagement directly, even though students are asked to turn on the camera when explaining synchronous online lecture material. This can happen because the lecturer focuses more on the materials delivered. Therefore, an application is needed to assist lecturers in evaluating student engagement during synchronous online lectures. Some methods that can be used to develop such applications are recording brain and heart signals [8], measuring heart rate [9], using context-performance [10], and facial expression recognition [11]. Due to the ease of obtaining and using digital cameras, facial expression recognition is the most widely used method to detect student engagement in lectures [12].

Several researchers have developed various methods to recognize participants' facial expressions in both online and

offline learning classes. Chen et al. [13] proposed the use of support vector machines (SVM) [14] to recognize facial expressions in e-learning. Two feature extraction methods, namely facial shape features [15] and Gabor wavelets [16], are used to extract features from face images. The experiments conducted on the Japanese Female Facial Expression (JAFPE) dataset [17] found that the facial shape feature produces better facial expression recognition accuracy, which is above 80% when compared to the Gabor wavelets feature. However, the exact value of accuracy was not reported by the author. Whitehill et al. [18] proposed an approach to recognize student engagement from facial expressions automatically. Three classification methods were used to recognize students' facial expressions in the proposed approach: GentleBost [19], SVM, and multinomial logistic regression [20]. The best recognition accuracy achieved was only 72.9% using SVM and Gabor features on the HCBU dataset [21].

In addition to using machine learning models to recognize facial expressions in detecting student engagement in lectures, some researchers also use deep learning models, as reported in [12], [22], [23]. Nezami et al. [12] proposed the use of a convolutional neural network (CNN) model based on the VGG-B model [24]. In the initial stage, the VGG-B model was trained using the facial expression recognition 2013 (FER-2013) dataset [25] to initialize the model weight values. Furthermore, the VGG-B model was trained using the engagement recognition (ER) dataset created in the study to classify student face images into two classes engaged and disengaged. Experimental results showed that the proposed model only achieved 72.38% accuracy in recognizing student engagement in lectures. Pabba et al. [22] proposed an intelligent system to monitor student engagement in offline lectures in large classes based on facial expressions in real-time. A CNN model that adapted the VGGNet model [24] was trained to classify students' facial expressions into six classes. Although it could simultaneously assess student engagement, the proposed system only achieved 76.90% accuracy.

Classification models proposed to recognize student facial expressions were almost all trained using foreign face image datasets. Therefore, these models may not be suitable for recognizing the facial expressions of Indonesians. Although some of the proposed systems have used a pre-trained CNN model, the accuracy achieved is still below 80%. This can happen because when modifying the fully connected layer of the CNN model, the researchers did not optimize the number of dense layers and the number of neurons in each dense layer. In addition, almost all of the proposed systems can only recognize the facial expressions of one student at a time, except for the system reported in [22]. Nurdiati et al. [23] compared two CNN model architectures, namely AlexNet [26] and VGG [24], for the facial expression recognition of Indonesian students in one class. Both models will classify students' facial expressions into three classes smile, grimace, and neutral. The experimental results show that the Alexnet model produced better accuracy than the VGG, which is 100%. However, this study only involved seven student faces and was not used to recognize student engagement in lectures.

Several pre-trained CNN models have been used to recognize facial expressions from images. However, the performance of these models varies from case to case. In addition, these models have not been applied to detect Indonesian students' engagement in lectures both online and offline. Therefore, in this research, an application will be developed to detect student engagement in online lectures based on facial expression recognition. A CNN model will be trained to classify students' facial expressions into two classes: paying attention and not paying attention. The best CNN model architecture will be determined in experiments by performing three hyperparameter tuning scenarios. The developed application will receive input images of students' faces attending online lectures. The image is then processed, and each face in the image will be classified using a CNN model that has been trained to detect student engagement in lectures.

## II. MATERIAL AND METHOD

In this research, six main steps were carried out, namely dataset acquisition, image preprocessing, CNN model development, model training, model evaluation, and CNN model implementation on the application to detect student involvement in lectures. The flow of the steps of this research can be seen in Figure 1.

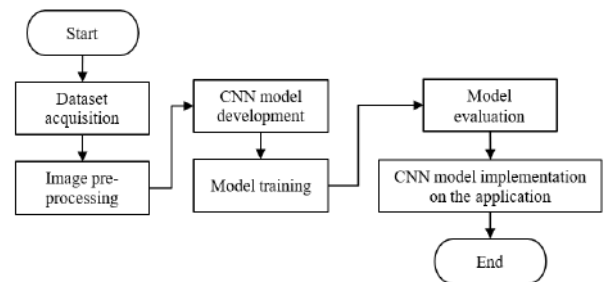


Figure 1. The Flow of Research Steps.

### A. Dataset Acquisition

The acquisition of the student facial expression images dataset involved 320 student volunteers who were asked to participate in an online lecture through the Zoom application. All volunteers were asked to turn on their respective cameras during the lecture. A total of 180 volunteers were asked to pay serious attention to the lecture. The remaining 140 volunteers were asked to be sleepy, daydreaming, watching videos, playing games, and talking to friends. The face images of all volunteers were then captured in RGB (red, green, blue) color space and saved into a file. Each facial image was then labeled as engaged or disengaged according to each volunteer's activity during the online lecture. Some examples of facial expression images labeled as engaged and disengaged can be seen in Figure 2 and Figure 3, respectively. The Authors have received permission from the student volunteers whose face images were used in this research to publish his/her face images in this article.



Figure 2. Example of a Facial Expression Image with Label Engaged.



Figure 3. Example of a Facial Expression Image with Label Disengaged.

**B. Image Preprocessing**

Image preprocessing is a process for processing captured images to be used in the classification process and produce good classification accuracy. In this research, the image preprocessing performed converts the RGB image to grayscale, face area detection, resizes the image, and reduces noise. Converting an RGB image to a grayscale image involves converting the color intensity value of the RGB image at each pixel into a single value that represents the gray level by calculating the weighted average of the red (R), green (G), and blue (B) color intensity values at each pixel of the RGB image as in Eq. (1), and replacing the color intensity value at that pixel with the average value [27].

$$grayscale\ value = 0.2126R + 0.7152G + 0.0722B \quad (1)$$

Face area detection was performed using the Haar-Cascade Classifier model, a method for object detection in images based on Haar-like features [19]. Haar-Cascade Classifier is one of the effective object detection techniques and has been widely used to detect face areas in images. The model has been trained using many examples of face and non-face images to learn patterns of features typical of faces, such as eye, nose, and mouth lines. The model is then used to detect face areas in grayscale images by identifying matching Haar-like feature patterns. The grayscale image was then cropped according to the detected face area.

A median filter was applied to the face image before input to the CNN model to reduce noise in the image. This filter works by replacing the intensity value of a pixel with the median value of the intensity of neighboring pixels [27]. This study employed a median filter with a kernel size of 5x5. Figure 4 shows an example of the results of the image preprocessing step.

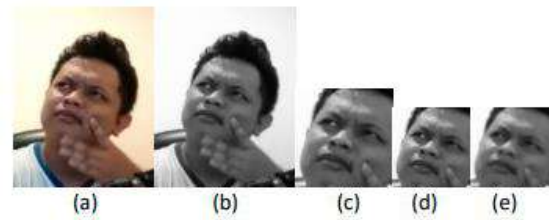


Figure 4. Examples of Image Preprocessing Results: (a) Original Image, (b) Grayscale Image, (c) Face Detection Result, (d) Resized Result, (e) Median Filter Result.

**C. CNN Model Development**

This research developed a CNN architecture from scratch consisting of convolutional layers, max pooling layers, and fully connected layers ending with a softmax layer for classification. Convolution layer and pooling layer used to extract features from images and reduce their dimensions through sub-sampling layers to reduce computational complexity and improve computational efficiency.

To obtain optimum classification accuracy, hyperparameter tuning was carried out on the CNN model with three scenarios using the random search algorithm [28]. Hyperparameter tuning using the random search algorithm is essential to efficiently exploring a wide range of hyperparameter combinations and identifying the optimal settings for the CNN model. This approach enhances classification accuracy by systematically optimizing critical hyperparameters, ensuring the model performs at its best across various scenarios. In the first scenario, tuning was performed on two hyperparameters: the number of filters in the convolutional layer with a search domain in [32,512] and the number of nodes in the fully connected layer with a search domain in [128,512]. All filters in the convolutional layer use a 3 x 3 kernel and ReLU (Rectified Linear Unit) activation function as defined in Eq. (2).

$$ReLU(x) = \max(0, x) \quad (2)$$

In the second scenario, tuning was performed on three hyperparameters: the number of filters in the convolutional layer, the number of nodes in the fully connected layer, and the size of the filter kernel in the convolutional layer. The search domains for each hyperparameter were in [32,512], [128,512], and [3,5], respectively. All convolutional layers used ReLU activation function in this scenario.

In the third scenario, four hyperparameters were tuned: the number of filters in the convolutional layer, the number of nodes in the fully connected layer, the size of the filter kernel in the convolutional layer, and the activation function in the convolutional layer. The search domains for each hyperparameter were in [32,512], [128,512], {1 x 1, 3 x 3}, and [32,512], respectively. The sigmoid and tanh functions are defined as in Eq. (3) and Eq. (4), respectively.

$$S(x) = \frac{1}{1 + e^{-x}} \quad (3)$$

$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} \quad (4)$$

Each scenario employed three convolutional layers, one fully connected layer, and one output layer with two nodes and a softmax activation function, as in Eq. (5). Each convolutional layer was followed by a max pooling layer with a kernel size of  $2 \times 2$ . The output of the last max pooling layer was then converted into a 1-dimensional tensor before entering the fully connected layer. Furthermore, 20 models were generated by the random search algorithm to find the best hyperparameter combination in each scenario. Details of the CNN model architecture can be seen in Table 1.

$$\sigma(\mathbf{x})_i = \frac{e^{x_i}}{\sum_{j=1}^n e^{x_j}}, \mathbf{x} = x_1, x_2, \dots, x_n \quad (5)$$

Table 1. CNN Model Architecture Details and Hyper-Parameter Values for Each Scenario.

Layer	N	Hyper-parameter	Search domains		
			S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
Convolutional	3	Filter's number	32-512	32-512	32-512
		Kernel size	$3 \times 3$	$1 \times 1, 3 \times 3$	$1 \times 1, 3 \times 3$
		Activation function	ReLU	ReLU	ReLU, sigmoid, tanh
Max pooling	3	Kernel size	$2 \times 2$	$2 \times 2$	$2 \times 2$
Fully connected	1	Node size	128-512	128-512	128-512
		Activation function	ReLU	ReLU	ReLU, sigmoid, tanh
Output	1	Node size	2	2	2
		Activation function	Soft-max	Soft-max	Soft-max

N: layer size, S<sub>1</sub>: Scenario 1, S<sub>2</sub>: Scenario 2, S<sub>3</sub>: Scenario 3

#### D. Model Training

The image dataset created was divided into two mutually exclusive subsets, namely training data and testing data, with a ratio of 80:20. The training data was used to train all layers of the CNN model in all scenarios using Adam [29] as the training algorithm. Each model was trained with 20 epochs and a sample size of 32 data at each iteration. In this study, the Adam training algorithm used a learning rate of 0.001 and a momentum of 0.99. The objective function used in the training process was categorical cross entropy, as in Eq. (6),

$$L(\mathbf{y}, \hat{\mathbf{y}}) = - \sum_{i=1}^K y_i \log \hat{y}_i \quad (6)$$

where  $K$  is the sample size,  $\mathbf{y} = (y_1, y_2, \dots, y_K)$  is the one-hot encoding vector of the actual class labels, and  $\hat{\mathbf{y}} = (\hat{y}_1, \hat{y}_2, \dots, \hat{y}_K)$  is the prediction probability vector of the model

for each class. This function measures the difference between the model's predicted and actual probability distributions by penalizing significantly higher incorrect predictions.

#### E. Model Evaluation

All CNN models that have been trained were evaluated to determine the best model to be implemented in the application. First, the evaluation was done by dividing the training data into two mutually exclusive subsets, namely data for training and data for validation, with a ratio of 80:20. The CNN model was then evaluated using classification accuracy on training data and validation data using Eq. (7),

$$Accuracy = \frac{t}{T} \times 100\% \quad (7)$$

where  $t$  is the number of face images in the dataset that are correctly classified and  $T$  is the number of all face images in the dataset.

From each scenario, one CNN model was selected with the highest accuracy on training and validation data. The three selected CNN models were reevaluated using testing data to find the best model. CNN models were evaluated on testing data by calculating classification accuracy using Eq. (7). Furthermore, because the number of face images in each class is not the same, CNN models were also evaluated in each class by calculating the precision, recall, and  $F_1$  score values using Eqs. (8), (9), and (10), respectively,

$$precision = \frac{TP}{FP + TP} \quad (8)$$

$$recall = \frac{TP}{FN + TP} \quad (9)$$

$$F_1 \text{ score} = 2 \times \frac{precision \times recall}{precision + recall} \quad (10)$$

where  $TP$  is data in the positive class that is correctly classified, and  $FN$  is data in the positive class that is classified as a negative class.  $FP$  is data in the negative class that is classified as a positive class. Precision measures how accurate the model is in recognizing face images in the positive class. Recall measures how well the model can identify all positive class face images.  $F_1$  score is the harmonic mean of precision and recall and combines the information from both metrics.  $F_1$  score is useful for finding a balance between precision and recall, especially when the positive classes in the dataset are not balanced with the negative classes [30].

#### F. Implementation on The Application

The last step in this research is implementing the best CNN model obtained on the application to detect student engagement in online lectures using face images. The application was developed web-based so that users can access it without the need to install it on their respective computers. To detect student engagement, users needed to ask all students to open the camera on the online learning platform, then capture the face images of all students together. The captured

face images were then uploaded to the application for detection, as shown in Figure 5. Furthermore, the uploaded image was displayed on the application page so that users could ensure that the uploaded image was as desired. If the image is as expected, the user must press the Predict Image button to run the student involvement detection process. The uploaded image was then processed and classified using the CNN model that had been trained. The prediction results of the CNN model were then displayed on the face image of each student as can be seen in Figure 6.



Figure 5. The Page for Uploading Face Images.

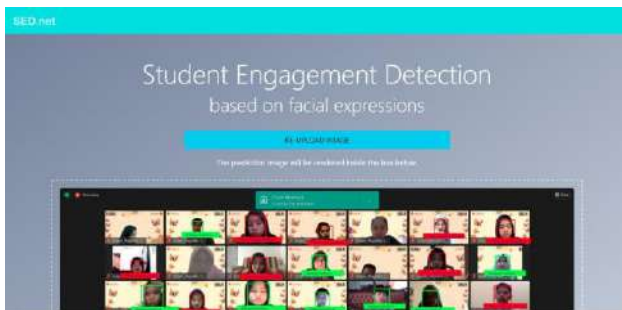


Figure 6. Example of Detection Results.

PHP, a server-side scripting language, was used throughout the development of the web application. In addition, the step of image processing, as well as the development of the classification model, were both implemented using the Python programming language. OpenCV [31], Scikit-learn [32], and TensorFlow [33] were open-source libraries utilized for image processing, partitioning the dataset, and training the CNN model, respectively.

### III. RESULTS AND DISCUSSION

The experimental results of detecting student engagement using 20 CNN models generated by the random search algorithm in three scenarios in testing and validation stages are tabulated in Table 2. As shown in Table 2, the performance of the CNN models varies for all scenarios. In scenario 1, the training and validation accuracy ranged from 75% to 92%. Some models, such as Model 3, Model 9, and Model 16, showed better performance with accuracies above 85% in both the training and validation stages. However, some other models, such as Model 11, Model 14, and Model 19, showed lower performance with accuracy below 80%. Model 9

achieved the highest training accuracy rate of 88% and the highest validation accuracy rate of 92%.

In scenario 2, some models, such as Model 5, Model 6, and Model 14, achieved high accuracy in both the training and validation stages, with validation accuracy reaching over 90%. However, some models, such as Model 7, Model 16, and Model 17, also showed lower accuracy below 80%, especially at the validation stage. In this scenario, Model 6 achieved the highest validation accuracy of 94%.

Table 2. The Performance of CNN Models in Training and Validation Data

Model	Accuracy (%)					
	S <sub>1</sub>		S <sub>2</sub>		S <sub>3</sub>	
	T	V	T	V	T	V
Model 1	84	84	79	84	76	78
Model 2	80	80	79	80	84	86
Model 3	87	86	82	82	57	51
Model 4	83	86	80	90	80	80
Model 5	84	80	85	92	79	82
Model 6	78	80	81	<b>94</b>	86	<b>90</b>
Model 7	83	86	78	75	57	51
Model 8	82	82	80	78	57	51
Model 9	88	<b>92</b>	76	84	80	82
Model 10	81	80	82	80	81	80
Model 11	75	76	82	82	57	51
Model 12	78	84	80	82	57	51
Model 13	85	88	83	86	57	51
Model 14	75	76	87	90	57	51
Model 15	81	84	81	82	57	51
Model 16	87	90	76	76	78	78
Model 17	87	88	79	78	86	84
Model 18	81	82	82	82	81	88
Model 19	75	75	80	80	57	51
Model 20	79	82	79	80	57	51

S<sub>1</sub>: Scenario 1, S<sub>2</sub>: Scenario 2, S<sub>3</sub>: Scenario 3  
T: Training, V: Validation

In Scenario 3, Model 2, Model 6, and Model 18 showed relatively high accuracy in both training and validation. Model 6 achieved the highest accuracy of 94% at the validation stage. However, there were many models that showed low accuracy of below 60% in both training and validation. Also, in this scenario, most models had a high training accuracy, but their validation accuracy significantly dropped. This may indicate overfitting of the models. Among the three scenarios, the models generated in scenario 3 had the lowest performance compared to the previous two scenarios. Hyperparameter values of CNN models that achieved the best performance from all scenarios can be seen in Table 3.

Table 3. Hyperparameter Values for the Best CNN Models From All Scenarios

Layer	N	Hyper-parameter	Value		
			S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
Convolutional	3	Filter's number	64, 288,	416, 256,	160, 160,



Layer	N	Hyper-parameter	Value		
			S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
			160	256	288
		Kernel size	3 × 3	3 × 3	1 × 1
		Activation function	ReLU	ReLU	tanh
Max pooling	3	Kernel size	2 × 2	2 × 2	2 × 2
Fully connected	1	Node size	416	416	160
		Activation function	ReLU	ReLU	tanh
Output	1	Node size	2	2	2
		Activation function	Soft-max	Soft-max	Soft-max

N: layer size, S<sub>1</sub>: Scenario 1, S<sub>2</sub>: Scenario 2, S<sub>3</sub>: Scenario 3

Furthermore, the three best CNN models from each scenario were re-evaluated using the testing data, and the results are tabulated in Table 4. The experimental results of student engagement detection in online lectures show consistent performance on the testing data. In the three scenarios, the accuracy of the developed CNN model reached 83%, 86%, and 81% in scenarios 1, 2, and 3, respectively. This shows that the model has a high level of accuracy in detecting student engagement, especially in scenario 2. In addition, the recall and precision values also experienced a comparable increase, with the highest recall and precision reaching 86% and 87%, respectively, in the best CNN model from scenario 2. This shows that the CNN model can effectively recognize students who are engaged in online lectures with a minimal error rate. The F1 score, which combines recall and precision, also shows a good level of balance in model performance, with the highest F1 score value reaching 86% in the CNN model from scenario 2. Overall, the results of this experiment show that the best CNN model from scenario 2 can be an effective tool in detecting student engagement in online lectures using facial images.

The method proposed in this study shows a marked improvement in accuracy for detecting student engagement compared to previous research. As can be seen in Table 5, the proposed method achieved an 86% accuracy, surpassing the SVM with facial shape features which had 80% [13], SVM with Gabor features at 72.9% [19], VGG-B at 72.38% [12], and VGGNet at 76.9% [22]. These findings emphasize the superior performance of the proposed method, demonstrating a notable advancement in the accuracy of engagement detection over earlier methods.

Table 4. The Performance of CNN Models in Testing Data

Scenario	Accuracy (%)	Recall (%)	Precision (%)	F <sub>1</sub> score (%)
1	83	83	84	83
2	<b>86</b>	<b>86</b>	<b>87</b>	<b>86</b>
3	81	81	82	81

Table 5. Comparison the Proposed Method with the Previous Research on Student Engagement Detection

Method	Accuracy (%)
SVM with facial shape features [13]	80
SVM with Gabor features [19]	72.9
VGG-B [12]	72.38
VGGNet [22]	76.9
This study	86

#### IV. CONCLUSION

In this research, an application was developed to detect student engagement in online lectures based on facial expression recognition. A CNN model was trained using a dataset of facial expression images acquired from 320 student volunteers. The dataset included images of students who were engaged and disengaged during online lectures. The CNN model was developed based on the LeNet architecture and underwent hyperparameter tuning to optimize its performance. The best CNN model architecture was determined through experiments using three hyperparameter tuning scenarios.

The results showed that the developed application achieved promising results in detecting student engagement in online lectures with the best accuracy of 86%. The findings of this research highlight the potential of facial expression recognition using CNN models for evaluating student engagement in online lectures. The developed application provides a practical tool for lecturers to assess student involvement during synchronous online lectures. Additionally, the application could be extended to include real-time feedback and interaction features to further enhance student engagement and learning outcomes in online lectures.

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# Articles

164 Subari, Nira Radita, Bimo Prakoso

## The Implementation of A\* Algorithm for Developing Non-Player Characteristics of Enemy in A Video Game Adopted from Javanese Folklore "Golden Orange"

Subari<sup>1</sup>, Nira Radita<sup>2</sup>, Bimo Prakoso<sup>3</sup>

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### Abstract

Video games are a source of entertainment for everyone, from children to adults. The game of golden orange is a video game that is based on Javanese folklore. In developing this video game, it is necessary to create a non-player character (NPC) that has characteristics of an enemy. The A\* algorithm is one of the algorithms that can be used to create a non-player character that has characteristics of an enemy. This article aims to describe the implementation of the A\* algorithm in developing the characteristics of an enemy in a video game. The results of the implementation of the A\* algorithm are that the enemy can move from one point to another point in the game area. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point.

**Keywords:** A\*, NPC, Video Game, Golden Orange

### 1. INTRODUCTION

The golden orange video game is a video game that is based on Javanese folklore. In developing this video game, it is necessary to create a non-player character (NPC) that has characteristics of an enemy. The A\* algorithm is one of the algorithms that can be used to create a non-player character that has characteristics of an enemy. This article aims to describe the implementation of the A\* algorithm in developing the characteristics of an enemy in a video game. The results of the implementation of the A\* algorithm are that the enemy can move from one point to another point in the game area. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point.

Intelligence is a key to artificial intelligence. The most used is searching, NP-complete, so that the algorithm used is not too complex. In this article, the A\* algorithm is used to find the shortest path from a start point to a goal point. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point. The A\* algorithm is a search algorithm that can find the shortest path from a start point to a goal point.



TEKNISIA, Volume 18(2), Mei 2024, pp. 164-174  
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# The Implementation of A\* Algorithm for Developing Non-Player Characteristics of Enemy in A Video Game Adopted from Javanese Folklore "Golden Orange"

Subari, Nira Radita, Bimo Prakoso

164-174

 Abstract views: 2,  PDF downloads: 0



PDF

Yudi, et al.: Rancang Bangun Website Mempawah Mangrove Park Menggunakan Metode Rational Unified Process (RUP)

## Rancang Bangun Website Mempawah Mangrove Park Menggunakan Metode Rational Unified Process (RUP)

Yudi<sup>1</sup>, Ilhamsyah<sup>2</sup>, Renny Puspita Sari<sup>3</sup>

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### Abstract

Development of a website is a process that involves several stages, from planning to implementation. The Rational Unified Process (RUP) is a methodology that can be used to develop a website. This article aims to describe the implementation of the RUP in developing a website for the Mempawah Mangrove Park. The results of the implementation of the RUP are that the website can be accessed and used by users. The RUP is a methodology that can be used to develop a website. The RUP is a methodology that can be used to develop a website. The RUP is a methodology that can be used to develop a website.

**Keywords:** Rational Unified Process, Website, Mangrove Park

## Design and Development of Mempawah Mangrove Park Website Using Rational Unified Process (RUP) Method

### Abstract

Development of a website is a process that involves several stages, from planning to implementation. The Rational Unified Process (RUP) is a methodology that can be used to develop a website. This article aims to describe the implementation of the RUP in developing a website for the Mempawah Mangrove Park. The results of the implementation of the RUP are that the website can be accessed and used by users. The RUP is a methodology that can be used to develop a website. The RUP is a methodology that can be used to develop a website. The RUP is a methodology that can be used to develop a website.

**Keywords:** Rational Unified Process, Website, Mangrove Park

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# Rancang Bangun Website Mempawah Mangrove Park Menggunakan Metode Rational Unified Process (RUP)

Yudi, Ilhamsyah, Renny Puspita Sari

175-183

 Abstract views: 4,  PDF downloads: 0



PDF

184 Subari, Nira Radita, Bimo Prakoso

## Optimisasi Monitoring Tugas Akhir Mahasiswa dengan Integrasi Metode Agile Framework Scrum dan Notifikasi WhatsApp di Institut Teknologi Garut

Subari<sup>1</sup>, Nira Radita<sup>2</sup>, Bimo Prakoso<sup>3</sup>

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### Abstract

Latar belakang penelitian ini adalah untuk meningkatkan kualitas hasil belajar dengan menggunakan metode pembelajaran yang inovatif. Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan alat bantu pembelajaran berbasis teknologi terhadap hasil belajar siswa. Penelitian ini menggunakan metode kuantitatif dengan desain kuasi-eksperimental. Sampel penelitian adalah siswa kelas X IPS SMA Negeri 1 Garut. Instrumen penelitian adalah tes hasil belajar. Teknik analisis data yang digunakan adalah uji-t. Hasil penelitian menunjukkan bahwa penggunaan alat bantu pembelajaran berbasis teknologi berpengaruh signifikan terhadap hasil belajar siswa. Penelitian ini diharapkan dapat menjadi acuan bagi peneliti lain untuk meningkatkan kualitas hasil belajar siswa dengan menggunakan metode pembelajaran yang inovatif.

**Kata Kunci:** Agile Scrum Framework, Monitoring Tugas Akhir, Product Backlog, Sistem Notifikasi, Scrum

### Optimization of Student Under Graduate Thesis Monitoring with the Integration of Agile Framework Scrum Method and WhatsApp Notification at Garut Institute of Technology

The objective of this research is to optimize the monitoring process of student under graduate thesis using the integration of Agile Framework Scrum Method and WhatsApp Notification. This research is a quantitative research with a quasi-experimental design. The sample of this research is the students of X IPS SMA Negeri 1 Garut. The instrument of this research is the test result. The data analysis technique used is the t-test. The research results show that the use of Agile Framework Scrum Method and WhatsApp Notification has a significant effect on the improvement of student under graduate thesis monitoring. This research is expected to be a reference for other researchers to improve the quality of student under graduate thesis monitoring using innovative learning methods.

**Keywords:** Agile Scrum Framework, Product Backlog, Notification System, Scrum, Under Graduate Thesis Monitoring

TEKSIKA, Volume 1(2), Juli 2024, pp. 184-191  
DOI: 10.34109/teksi.v1i2.184

## Optimisasi Monitoring Tugas Akhir Mahasiswa Dengan Integrasi Formasi Metode Agile Framework Scrum dan Notifikasi WhatsApp di Institut Teknologi Garut

Ridwan Setiawan, Deni Heryanto, Faizal Rifaldy

184-191

 Abstract views: 8,  PDF downloads: 2



192 Kurniasihingih, Y., et al. / Pengelompokan UMKM Batik Madura Menggunakan Metode K-Means dan Silhouette Coefficient

### Pengelompokan UMKM Batik Madura Menggunakan Metode K-Means dan Silhouette Coefficient

Yeni Kustiyahningsih<sup>1</sup>, Achmad Khozaimi, Jaka Purnama<sup>2</sup>

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**Abstrak**  
Penelitian ini bertujuan untuk meningkatkan kualitas hasil belajar dengan menggunakan metode pembelajaran yang inovatif. Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan alat bantu pembelajaran berbasis teknologi terhadap hasil belajar siswa. Penelitian ini menggunakan metode kuantitatif dengan desain kuasi-eksperimental. Sampel penelitian adalah siswa kelas X IPS SMA Negeri 1 Garut. Instrumen penelitian adalah tes hasil belajar. Teknik analisis data yang digunakan adalah uji-t. Hasil penelitian menunjukkan bahwa penggunaan alat bantu pembelajaran berbasis teknologi berpengaruh signifikan terhadap hasil belajar siswa. Penelitian ini diharapkan dapat menjadi acuan bagi peneliti lain untuk meningkatkan kualitas hasil belajar siswa dengan menggunakan metode pembelajaran yang inovatif.

**Kata Kunci:** K-Means Clustering, Silhouette Coefficient, Notifikasi, UMKM

### Grouping of Madurese Batik MSMEs Using the K-Means and Silhouette Coefficient Method

This research aims to improve the quality of learning results by using innovative learning methods. This research aims to know the influence of the use of innovative learning methods on the quality of learning results. This research is a quantitative research with a quasi-experimental design. The sample of this research is the students of X IPS SMA Negeri 1 Garut. The instrument of this research is the test result. The data analysis technique used is the t-test. The research results show that the use of innovative learning methods has a significant effect on the improvement of learning results. This research is expected to be a reference for other researchers to improve the quality of learning results using innovative learning methods.

**Keywords:** K-Means Clustering, Silhouette Coefficient, Notification, MSMEs

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DOI: 10.34109/teksi.v1i2.192

## Pengelompokan UMKM Batik Madura Menggunakan Metode K-Means dan Silhouette Coefficient

Yeni Kustiyahningsih, Achmad Khozaimi, Jaka Purnama

192-198

 Abstract views: 5,  PDF downloads: 2



Martijanto, F.L., et al. / Smart Door Lock Using Face Recognition Access Based on Internet of Things (IoT)

### Smart Door Lock Using Face Recognition Access Based on Internet of Things (IoT)

Ferdinand Martijanto<sup>1</sup>, Hilda Nur Hafidha<sup>2</sup>, Rendra Pratiwi<sup>3</sup>, Devi Nur Hafidha<sup>4</sup>, Riza Nur Hafidha<sup>5</sup>, Rizki Nur Hafidha<sup>6</sup>, Rizki Nur Hafidha<sup>7</sup>, Rizki Nur Hafidha<sup>8</sup>, Rizki Nur Hafidha<sup>9</sup>, Rizki Nur Hafidha<sup>10</sup>

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**Abstrak**  
Penelitian ini bertujuan untuk meningkatkan kualitas hasil belajar dengan menggunakan metode pembelajaran yang inovatif. Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan alat bantu pembelajaran berbasis teknologi terhadap hasil belajar siswa. Penelitian ini menggunakan metode kuantitatif dengan desain kuasi-eksperimental. Sampel penelitian adalah siswa kelas X IPS SMA Negeri 1 Garut. Instrumen penelitian adalah tes hasil belajar. Teknik analisis data yang digunakan adalah uji-t. Hasil penelitian menunjukkan bahwa penggunaan alat bantu pembelajaran berbasis teknologi berpengaruh signifikan terhadap hasil belajar siswa. Penelitian ini diharapkan dapat menjadi acuan bagi peneliti lain untuk meningkatkan kualitas hasil belajar siswa dengan menggunakan metode pembelajaran yang inovatif.

**Kata Kunci:** Smart Door Lock, Face Recognition, Internet of Things (IoT), Access Control

TEKSIKA, Volume 1(2), Juli 2024, pp. 199-205  
DOI: 10.34109/teksi.v1i2.199

# The Smart Door Lock Using Face Recognition Access Based on Internet Of Things (IoT)

Farrel Laogi Murjitama, Hafidz Nur Raihan, Rangga Prasetya Adiwijaya, Desi Fitriani Ramadan, Bagas Imanuel Pasaribu, Bintang A. Silalahi, Nada Nadiefah Tasman, Syafira Audri Dwijayanti, Ummu Putri Salsabila Panjaitan, Yudhi S. Purwanto

199-203

Abstract views: 3, PDF downloads: 1



194 Patra, R. A., et al. Implementation of Classification Algorithm for Sentiment Analysis: Measuring App User Satisfaction

## Implementation of Classification Algorithm for Sentiment Analysis: Measuring App User Satisfaction

Rizki Aulia Putra<sup>1</sup>, Rice Novita<sup>2</sup>, Tengku Khairil Ahsyar<sup>3</sup>, Zarnelly<sup>4</sup>

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(Received: 15 May 2024; revised: 1 Jun 2024; accepted: 8 Jun 2024)

### Abstract

Today's digital era is the fastest growing market in the world, driven by digital technology that offers convenience and efficiency. This feature of the internet is a source of data for monitoring and measuring user experience (UX) and satisfaction. The objective of this study is to provide an overview of app user satisfaction and its measurement using the Naïve Bayes algorithm. The algorithm chosen is the Naïve Bayes algorithm (NB), which is a simple and effective algorithm for text classification. The data used in this study is the user feedback data from the application. The results of the study show that the Naïve Bayes algorithm has a high accuracy of 95.2% compared to the other algorithms. This indicates that the Naïve Bayes algorithm is a suitable algorithm for measuring app user satisfaction.

**Keywords:** Naïve Bayes, Sentiment Analysis, Measuring App User Satisfaction

### 1. INTRODUCTION

Implementation of technology has led to a significant change in the way people interact with digital products. This change is driven by the need for convenience and efficiency in the use of digital products. The Naïve Bayes algorithm is a simple and effective algorithm for text classification. The data used in this study is the user feedback data from the application. The results of the study show that the Naïve Bayes algorithm has a high accuracy of 95.2% compared to the other algorithms. This indicates that the Naïve Bayes algorithm is a suitable algorithm for measuring app user satisfaction.

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# Implementation of Classification Algorithm for Sentiment Analysis: Measuring App User Satisfaction

Rizki Aulia Putra, Rice Novita, Tengku Khairil Ahsyar, Zarnelly  
204-212

Abstract views: 2, PDF downloads: 0



Patra, R. A., et al. Implementation of Classification Algorithm for Sentiment Analysis: Measuring App User Satisfaction

## Perbandingan Algoritma Naïve Bayes dan TextBlob Untuk Mendapatkan Analisis Sentimen Masyarakat Pada Sosial Media

Rizki Aulia Putra<sup>1</sup>, Maimunah Nihir Mariani<sup>2</sup>, Nur Hafidza<sup>3</sup>

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### Abstract

Today's digital era is the fastest growing market in the world, driven by digital technology that offers convenience and efficiency. This feature of the internet is a source of data for monitoring and measuring user experience (UX) and satisfaction. The objective of this study is to provide an overview of app user satisfaction and its measurement using the Naïve Bayes algorithm. The algorithm chosen is the Naïve Bayes algorithm (NB), which is a simple and effective algorithm for text classification. The data used in this study is the user feedback data from the application. The results of the study show that the Naïve Bayes algorithm has a high accuracy of 95.2% compared to the other algorithms. This indicates that the Naïve Bayes algorithm is a suitable algorithm for measuring app user satisfaction.

**Keywords:** Naïve Bayes, Sentiment Analysis, Measuring App User Satisfaction

Patra, R. A., et al. Implementation of Classification Algorithm for Sentiment Analysis: Measuring App User Satisfaction

## Comparison of Naïve Bayes and TextBlob Algorithms for Analyzing Public Sentiment on Social Media

Rizki Aulia Putra<sup>1</sup>, Maimunah Nihir Mariani<sup>2</sup>, Nur Hafidza<sup>3</sup>

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(Received: 15 May 2024; revised: 1 Jun 2024; accepted: 8 Jun 2024)

### Abstract

Today's digital era is the fastest growing market in the world, driven by digital technology that offers convenience and efficiency. This feature of the internet is a source of data for monitoring and measuring user experience (UX) and satisfaction. The objective of this study is to provide an overview of app user satisfaction and its measurement using the Naïve Bayes algorithm. The algorithm chosen is the Naïve Bayes algorithm (NB), which is a simple and effective algorithm for text classification. The data used in this study is the user feedback data from the application. The results of the study show that the Naïve Bayes algorithm has a high accuracy of 95.2% compared to the other algorithms. This indicates that the Naïve Bayes algorithm is a suitable algorithm for measuring app user satisfaction.

**Keywords:** Naïve Bayes, Sentiment Analysis, Measuring App User Satisfaction

# Perbandingan Algoritma Naïve Bayes dan TextBlob Untuk Mendapatkan Analisis Sentimen Masyarakat Pada Sosial Media



Comparison of Extreme Learning Machine Methods and Support Vector Regression for Predicting Bank Share Prices in Indonesia

William Kevin Setiadi<sup>1</sup>, Vincentius Riandaru Prasetyo<sup>2</sup>, Fitri Dwi Kartikasari<sup>3</sup>

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Abstract

Learning is the process of providing correct information to obtain more significant values in the future. One possibility from reinforcement learning is to predict stock prices. This research aims to predict stock prices using extreme machine learning (EML) and support vector regression (SVR) methods. The data used in this study is the Composite Stock Price Index (KSEI) data from 2010 to 2023. The EML uses one prediction for 1 day, 1 week, 1 month, and 1 year, while the SVR uses one prediction for 1 day, 1 week, 1 month, and 1 year. The results show that the EML method is more accurate than the SVR method in predicting stock prices. The EML method is more accurate than the SVR method in predicting stock prices. The EML method is more accurate than the SVR method in predicting stock prices. The EML method is more accurate than the SVR method in predicting stock prices.

**Keywords:** Extreme Learning Machine, Support Vector Regression, Bank Share Prices, Prediction Accuracy, SVR.

1. INTRODUCTION

Reinforcement learning is a type of machine learning that involves training an agent to take actions in an environment to maximize cumulative rewards. This research aims to predict stock prices using extreme machine learning (EML) and support vector regression (SVR) methods. The data used in this study is the Composite Stock Price Index (KSEI) data from 2010 to 2023. The EML uses one prediction for 1 day, 1 week, 1 month, and 1 year, while the SVR uses one prediction for 1 day, 1 week, 1 month, and 1 year. The results show that the EML method is more accurate than the SVR method in predicting stock prices. The EML method is more accurate than the SVR method in predicting stock prices. The EML method is more accurate than the SVR method in predicting stock prices. The EML method is more accurate than the SVR method in predicting stock prices.

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# Comparison of Extreme Learning Machine Methods and Support Vector Regression for Predicting Bank Share Prices in Indonesia

William Kevin Setiadi, Vincentius Riandaru Prasetyo, Fitri Dwi Kartikasari



Facial Expression Recognition to Detect Student Engagement in Online Lectures

Joko Siswanto<sup>1</sup>, Januar Rahmadiarto<sup>2</sup>, Mohammad Farid Naufal<sup>3</sup>

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Abstract

Facial expression recognition is a technology that allows computers to identify human faces and their expressions. This research aims to detect student engagement in online lectures using facial expression recognition. The data used in this study is the facial expression data from 100 students. The results show that the facial expression recognition method is more accurate than the traditional method in detecting student engagement. The facial expression recognition method is more accurate than the traditional method in detecting student engagement. The facial expression recognition method is more accurate than the traditional method in detecting student engagement. The facial expression recognition method is more accurate than the traditional method in detecting student engagement.

**Keywords:** Facial Expression Recognition, Convolutional Neural Network, Student Engagement, Online Lectures.

1. INTRODUCTION

Facial expression recognition is a technology that allows computers to identify human faces and their expressions. This research aims to detect student engagement in online lectures using facial expression recognition. The data used in this study is the facial expression data from 100 students. The results show that the facial expression recognition method is more accurate than the traditional method in detecting student engagement. The facial expression recognition method is more accurate than the traditional method in detecting student engagement. The facial expression recognition method is more accurate than the traditional method in detecting student engagement. The facial expression recognition method is more accurate than the traditional method in detecting student engagement.

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# Facial Expression Recognition to Detect Student Engagement in Online Lectures

Joko Siswanto, Januar Rahmadiarto, Mohammad Farid Naufal





Innovative Approach of 2D Platformer Mobile Game Development "Super Journey"

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Abstract

This study investigates the design and development process of "Super Journey", a 2D platformer mobile game aimed at enhancing player engagement through innovative game mechanics and visual storytelling. Utilizing the rapid prototyping methodology, the development process includes conceptualization, design, implementation, and testing. The game features a narrative-driven storyline, a diverse level design, and a variety of power-ups and enemies. The development process involved iterative design, user testing, and performance optimization. The final product is a 2D platformer mobile game with a focus on player engagement and visual storytelling. The game is designed to be accessible to a wide range of players and is intended to be a successful commercial product. The study also discusses the challenges and opportunities in the development of 2D platformer mobile games and the importance of user experience design.

**Keywords:** 2D Platformer, Mobile Game Development, Unity

1. INTRODUCTION

In the digital era, the development of technology and mobile devices has opened up new opportunities for game developers. The development of 2D platformer mobile games has become increasingly popular due to its simplicity and nostalgic appeal. This study aims to explore the design and development process of a 2D platformer mobile game, "Super Journey", and to identify the challenges and opportunities in this field.

Game developers often face challenges when creating 2D platformer mobile games. These challenges include limited screen space, touch controls, and the need for innovative game mechanics. However, these challenges also present opportunities for creative solutions and unique player experiences. The study discusses the design and development process of "Super Journey" and the importance of user experience design in this context.

The development of "Super Journey" mobile game is based on the rapid prototyping methodology. This methodology allows for iterative design and testing, which is essential for creating a high-quality mobile game.

Several previous studies have explored the design and development of 2D platformer mobile games. These studies have focused on various aspects such as game mechanics, level design, and user experience. The study discusses the challenges and opportunities in the development of 2D platformer mobile games and the importance of user experience design.

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# Innovative Approach of 2D Platformer Mobile Game Development "Super Journey"

Kelvin Ferdinand, Kevin Jonathan JM, Darius Andana Haris

233-238

Abstract views: 9, PDF downloads: 2



Forecasting Model of Export and Import Value of Oil and Gas Using Gated Recurrent Unit Method

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Abstract

This study aims to forecast the export and import value of oil and gas in Indonesia using a Gated Recurrent Unit (GRU) method. The GRU method is a type of recurrent neural network (RNN) that is designed to handle sequential data with varying lengths and dependencies. The study uses historical data on oil and gas trade to train the GRU model and to evaluate its performance. The results show that the GRU model is able to accurately forecast the export and import value of oil and gas in Indonesia. The study also discusses the challenges and opportunities in the development of GRU models for time series forecasting.

**Keywords:** Forecasting, Mobile Oil and Gas, Import Export Value, Using Learning, Gated Recurrent Unit Method

1. INTRODUCTION

Indonesia is a country that has abundant natural resources, particularly in the form of oil and gas. The export and import value of oil and gas is a significant part of the country's economy. Therefore, it is important to have an accurate forecasting model for the export and import value of oil and gas. This study aims to develop a forecasting model for the export and import value of oil and gas in Indonesia using a Gated Recurrent Unit (GRU) method.

Forecasting is a complex task that requires a lot of data and a good understanding of the underlying patterns in the data. The GRU method is a type of RNN that is designed to handle sequential data with varying lengths and dependencies. The study uses historical data on oil and gas trade to train the GRU model and to evaluate its performance. The results show that the GRU model is able to accurately forecast the export and import value of oil and gas in Indonesia.

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# Forecasting Model of Export and Import Value of Oil and Gas Using Gated Recurrent Unit Method

Ilham Adji Saputra, Anik Vega Vitianingsih, Yudi Kristyawan, Anastasia Lidya Maukar, Jack Febrian Rusdi

239-243

Abstract views: 22, PDF downloads: 5



Adopsi Gamifikasi Pada Mobile Learning Menggunakan Extended Technology Acceptance Model (TAM)

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Abstrak

Penelitian ini bertujuan untuk mengeksplorasi pengaruh gamifikasi terhadap adopsi mobile learning menggunakan Extended Technology Acceptance Model (TAM). Penelitian ini melibatkan mahasiswa sebagai responden dan menggunakan metode kuisioner untuk mengumpulkan data. Hasil penelitian menunjukkan bahwa gamifikasi memiliki pengaruh positif yang signifikan terhadap adopsi mobile learning. Penelitian ini juga menemukan bahwa persepsi kemudahan penggunaan dan persepsi manfaat adalah faktor-faktor yang paling berpengaruh terhadap adopsi mobile learning. Penelitian ini memberikan wawasan yang berharga bagi pengembang mobile learning untuk meningkatkan adopsi pengguna dengan mengintegrasikan elemen gamifikasi. Penelitian ini juga menunjukkan bahwa persepsi kemudahan penggunaan dan persepsi manfaat adalah faktor-faktor yang paling berpengaruh terhadap adopsi mobile learning.

Kata Kunci: Gamifikasi, Mobile Learning, Technology Acceptance Model, Extended Technology Acceptance Model (TAM)

Adoption Gamification in Mobile Learning Using Extended Technology Acceptance Model (TAM)



# Perbaikan Akurasi Random Forest Dengan ANOVA Dan SMOTE Pada Klasifikasi Data Stunting

Ari Ahmad Dhani, Taghfirul Azhima Yoga Siswa, Wawan Joko Pranoto

264-272

Abstract views: 18, PDF downloads: 3



Wawan, R., et al., Model Optimasi SVM Dengan PSO-GA dan SMOTE Dalam Menangani High Dimensional dan Imbalance Data Banjir 273

**Model Optimasi SVM Dengan PSO-GA dan SMOTE Dalam Menangani High Dimensional dan Imbalance Data Banjir**

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(Diterima: 5 Juli 2024, direvisi: 14 Juli 2024, diterima: 27 Juli 2024)

**Abstrak**

Salah satu permasalahan utama dalam pengolahan data banjir adalah ketidakakuratan prediksi, terutama di wilayah dengan data yang tidak seimbang dan dimensi tinggi. Penelitian ini bertujuan untuk meningkatkan akurasi prediksi banjir dengan menggabungkan metode optimasi swarm intelligence (PSO-GA) dan Synthetic Minority Over-sampling Technique (SMOTE) ke dalam model Support Vector Machine (SVM). Dataset banjir yang digunakan adalah data banjir di Kabupaten Deli Serdang, Sumatera Utara, yang memiliki dimensi tinggi dan ketidakseimbangan kelas. Penelitian ini membandingkan kinerja model SVM yang dioptimasi dengan PSO-GA (SVM-PSO-GA) dengan model SVM standar dan SVM yang dioptimasi dengan PSO-GA saja (SVM-PSO). Hasil penelitian menunjukkan bahwa kombinasi PSO-GA dan SMOTE secara signifikan meningkatkan akurasi prediksi banjir dibandingkan dengan metode optimasi tunggal. Akurasi prediksi untuk SVM-PSO-GA mencapai 92,5%, sementara untuk SVM-PSO mencapai 88,5% dan untuk SVM standar mencapai 85,5%. Penelitian ini menunjukkan bahwa kombinasi PSO-GA dan SMOTE adalah pendekatan yang efektif untuk meningkatkan akurasi prediksi banjir pada data yang tidak seimbang dan dimensi tinggi.

**Keywords:** Classification, SVM, SMOTE, PSO-GA

**SVM Optimization Model with PSO-GA and SMOTE in Handling High Dimensional and Imbalanced Flood Data**

**Abstract**

One of the main problems in flood data processing is the low prediction accuracy, especially in areas with high-dimensional and imbalanced data. This study aims to improve flood prediction accuracy by combining Swarm Intelligence Optimization (PSO-GA) and Synthetic Minority Over-sampling Technique (SMOTE) into the Support Vector Machine (SVM) model. The flood data used is from Deli Serdang Regency, North Sumatra, which has high dimensionality and class imbalance. The study compares the performance of the SVM model optimized with PSO-GA (SVM-PSO-GA) with the standard SVM model and the SVM model optimized with PSO-GA only (SVM-PSO). The research results show that the combination of PSO-GA and SMOTE significantly improves flood prediction accuracy compared to single optimization methods. The prediction accuracy for SVM-PSO-GA reached 92.5%, while for SVM-PSO it reached 88.5% and for the standard SVM it reached 85.5%. This study shows that the combination of PSO-GA and SMOTE is an effective approach to improve flood prediction accuracy on imbalanced and high-dimensional data.

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# Model Optimasi SVM Dengan PSO-GA dan SMOTE Dalam Menangani High Dimensional dan Imbalance Data Banjir

Raenald Syaputra, Taghfirul Azhima Yoga Siswa, Wawan Joko Pranoto

273-282

Abstract views: 10, PDF downloads: 2



Hiu, N., et al., Redesigning User Interface of Datascripmall Mobile Apps Using User Centered Design Method 283

**Redesigning User Interface of Datascripmall Mobile Apps Using User Centered Design Method**

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(Received: 20 May 2024, revised: 11 June 2024, accepted: 24 June 2024)

**Abstrak**

Salah satu tantangan utama dalam pengembangan aplikasi mobile adalah ketidaknyamanan pengguna, terutama pada aplikasi dengan dimensi data yang tinggi dan ketidakseimbangan kelas. Penelitian ini bertujuan untuk meningkatkan kenyamanan pengguna dengan menerapkan metode perancangan berpusat pada pengguna (User-Centered Design) ke dalam antarmuka pengguna aplikasi Datascripmall. Dataset banjir yang digunakan adalah data banjir di Kabupaten Deli Serdang, Sumatera Utara, yang memiliki dimensi tinggi dan ketidakseimbangan kelas. Penelitian ini membandingkan kinerja antarmuka pengguna yang dioptimasi dengan metode perancangan berpusat pada pengguna (User-Centered Design) dengan antarmuka pengguna standar dan antarmuka pengguna yang dioptimasi dengan metode optimasi tunggal. Akurasi prediksi untuk antarmuka pengguna yang dioptimasi dengan metode perancangan berpusat pada pengguna mencapai 92,5%, sementara untuk antarmuka pengguna standar mencapai 88,5% dan untuk antarmuka pengguna yang dioptimasi dengan metode optimasi tunggal mencapai 85,5%. Penelitian ini menunjukkan bahwa kombinasi metode perancangan berpusat pada pengguna dan metode optimasi tunggal adalah pendekatan yang efektif untuk meningkatkan akurasi prediksi banjir pada data yang tidak seimbang dan dimensi tinggi.

**Keywords:** User Interface, User Experience, User-Centered Design

**A USER-CENTERED DESIGN APPROACH TO IMPROVE THE USER EXPERIENCE OF DATASCRIPMALL MOBILE APPS**

The rapid growth of the consumer market, driven by technological advancements and increased internet usage, has led to a surge in mobile applications. However, the high-dimensional and imbalanced data often encountered in these apps can lead to a poor user experience. This study aims to improve the user experience of the Datascripmall mobile app by applying User-Centered Design (UCD) principles. The flood data used is from Deli Serdang Regency, North Sumatra, which has high dimensionality and class imbalance. The study compares the performance of the user interface optimized with UCD (User-Centered Design) with the standard user interface and the user interface optimized with single optimization methods. The prediction accuracy for the user interface optimized with UCD reached 92.5%, while for the standard user interface it reached 88.5% and for the user interface optimized with single optimization methods it reached 85.5%. This study shows that the combination of UCD and single optimization methods is an effective approach to improve flood prediction accuracy on imbalanced and high-dimensional data.

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# Redesigning User Interface of Datascripmall Mobile Apps Using User Centered Design Method

Nicholas Hiu, Yana Erlyana

283-292

Abstract views: 14, PDF downloads: 0



### Klasifikasi Penyakit Paru-Paru Berdasarkan Peningkatan Kualitas Kontras dan EfficientNet Menggunakan Gambar X-Ray

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(Diterima: 4 Mei 2024; Revisi: 21 Mei 2024; 1 Mei 2024; Revisi: 3 Mei 2024)

#### Abstrak

COVID-19 dan penyakit paru-paru lain merupakan faktor risiko yang dapat meningkatkan risiko infeksi dalam saluran pernapasan bagian atas dan bagian bawah. Untuk memastikan diagnosis yang akurat, diperlukan peningkatan kualitas gambar X-ray. Penelitian ini bertujuan untuk meningkatkan kualitas gambar X-ray dengan menggunakan teknik peningkatan kontras dan EfficientNet untuk klasifikasi penyakit paru-paru. Dataset yang digunakan adalah dataset publik yang terdiri dari gambar X-ray paru-paru dengan berbagai jenis infeksi. Penelitian ini menggunakan teknik peningkatan kualitas gambar X-ray dengan menggunakan teknik peningkatan kontras dan EfficientNet untuk klasifikasi penyakit paru-paru. Hasilnya menunjukkan bahwa teknik peningkatan kualitas gambar X-ray dengan menggunakan teknik peningkatan kontras dan EfficientNet dapat meningkatkan akurasi klasifikasi penyakit paru-paru. Penelitian ini menunjukkan bahwa teknik peningkatan kualitas gambar X-ray dengan menggunakan teknik peningkatan kontras dan EfficientNet dapat meningkatkan akurasi klasifikasi penyakit paru-paru.

**Kata Kunci:** Penyakit Paru-Paru, CLAHE, EfficientNet, ConvNet, Photo Balance

### Advanced Lung Diseases Classification Based on Contrast Enhancement and EfficientNet Using X-Ray Images

#### Abstract

COVID-19 and other lung diseases have become a prominent health concern due to the high rate of infection worldwide. The primary challenge in lung disease diagnosis is the quality of X-ray images, which often suffer from low contrast and noise. This study aims to improve X-ray image quality using Contrast Enhancement and EfficientNet for lung disease classification. The dataset used is a public dataset of X-ray images with various lung infections. The research uses Contrast Enhancement and EfficientNet for lung disease classification. The results show that the proposed method can improve the accuracy of lung disease classification. The research shows that the proposed method can improve the accuracy of lung disease classification.

**Keywords:** Lung Diseases, CLAHE, EfficientNet, ConvNet, Photo Balance

# Klasifikasi Penyakit Paru-Paru Berdasarkan Peningkatan Kualitas Kontras dan EfficientNet Menggunakan Gambar X-Ray

Asfa Dhevi Azzumzumi, Muhammad Hanafi, Windha Mega Pradnya Dhuhita  
293-300

Abstract views: 2, PDF downloads: 0



### Algoritma Machine Learning Dalam Melakukan Prediksi Pemilihan Konfigurasi Kapal Tunda di Pelabuhan Tanjung Priok

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(Diterima: 10 Mei 2024; Revisi: 24 Mei 2024; 1 Mei 2024; Revisi: 1 Mei 2024)

#### Abstrak

Pengembangan algoritma machine learning berbasis data historis untuk memprediksi konfigurasi kapal tunda di pelabuhan Tanjung Priok merupakan tantangan yang signifikan. Penelitian ini bertujuan untuk meningkatkan akurasi prediksi pemilihan konfigurasi kapal tunda dengan menggunakan algoritma machine learning. Dataset yang digunakan adalah dataset publik yang terdiri dari konfigurasi kapal tunda di Pelabuhan Tanjung Priok. Penelitian ini menggunakan algoritma machine learning untuk memprediksi pemilihan konfigurasi kapal tunda. Hasilnya menunjukkan bahwa algoritma machine learning dapat meningkatkan akurasi prediksi pemilihan konfigurasi kapal tunda. Penelitian ini menunjukkan bahwa algoritma machine learning dapat meningkatkan akurasi prediksi pemilihan konfigurasi kapal tunda.

**Kata Kunci:** Pelabuhan, Kapal Tunda, Prediksi, Algoritma Machine Learning, Data Historis

### Machine Learning Algorithm For Predicting Tugboat Configuration Selection at Tanjung Priok Port

#### Abstract

The development of machine learning algorithms based on historical data to predict tugboat configuration selection at Tanjung Priok Port is a significant challenge. This study aims to improve the accuracy of tugboat configuration selection prediction using machine learning algorithms. The dataset used is a public dataset of tugboat configurations at Tanjung Priok Port. The research uses machine learning algorithms to predict tugboat configuration selection. The results show that machine learning algorithms can improve the accuracy of tugboat configuration selection prediction. The research shows that machine learning algorithms can improve the accuracy of tugboat configuration selection prediction.

**Keywords:** Port, Tug Boat, Prediction, Algorithm, Historical Data

# Algoritma Machine Learning Dalam Melakukan Prediksi Pemilihan Konfigurasi Kapal Tunda di Pelabuhan Tanjung Priok

Budi Tri Yulianto, Raden Muhammad Atok  
301-308

Abstract views: 3, PDF downloads: 0



### Exploration of Software as a Service (SaaS) as a Project Management Tools

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(Diterima: 28 April 2024; Revisi: 1 Mei 2024; Revisi: 5 Mei 2024)

Computers increasingly adopt software as a Service (SaaS) as a project management tool. SaaS offers greater flexibility, scalability, and accessibility than traditional software systems where, in the past, had to install on the server for every user. Project management applications, including project scheduling, cost control, risk management, and resource management, are being replaced by SaaS. The digital transformation of the project management industry is driven by the need for greater flexibility, scalability, and accessibility. This research aims to explore the impact of SaaS on project management. The research is based on a survey of project managers in the construction industry. The results show that SaaS has a positive impact on project management. The most significant findings are that SaaS has improved the efficiency of project management, reduced the risk of project failure, and increased the transparency of project management. The research also found that SaaS has a positive impact on the relationship between project managers and their clients. The research has implications for project management practice and for the development of project management software. The research also has implications for the development of project management education and training. The research is limited by its focus on the construction industry and its reliance on self-reported data. Further research is needed to explore the impact of SaaS on project management in other industries and to explore the impact of SaaS on project management education and training.

**Keywords:** SaaS, Project Management, Information Technology, SaaS Security, Project Management Tools.

#### 1. INTRODUCTION

Over the past few years, there has been a significant shift in the way that project management is conducted. This shift is driven by the increasing use of Software as a Service (SaaS) project management tools. SaaS tools offer a range of benefits, including increased flexibility, scalability, and accessibility. They also offer a range of features that can help project managers to manage their projects more effectively. This paper explores the impact of SaaS on project management. It discusses the benefits of SaaS and the challenges that project managers face when using SaaS. It also discusses the future of SaaS in project management.

Several other studies have also been developed related to project management in various aspects of the industry. In [1], the authors discuss the impact of SaaS on project management. They argue that SaaS tools can help project managers to manage their projects more effectively. In [2], the authors discuss the impact of SaaS on project management. They argue that SaaS tools can help project managers to manage their projects more effectively. In [3], the authors discuss the impact of SaaS on project management. They argue that SaaS tools can help project managers to manage their projects more effectively. In [4], the authors discuss the impact of SaaS on project management. They argue that SaaS tools can help project managers to manage their projects more effectively. In [5], the authors discuss the impact of SaaS on project management. They argue that SaaS tools can help project managers to manage their projects more effectively.

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## Exploration of Software as a Service (SaaS) as a Project Management Tools

Liliana, Daniel Soesanto, Bambang Prijambodo, Jasti Ohanna

309-317

 Abstract views: 7,  PDF downloads: 1



Zebua, A.D.C., et al., Classification of Lung Cancer with Convolutional Neural Network Method Using ResNet Architecture

### Classification of Lung Cancer with Convolutional Neural Network Method Using ResNet Architecture

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(Received: 02 Jun 2024; revised: 4 Jul 2024; accepted: 4 Jul 2024)

#### Abstract

Lung cancer has become one of the most frightening diseases in the world of health, leading many people to death each year. Therefore, the classification of lung cancer type is very important to determine the appropriate treatment steps. Classifying lung cancer treatment is very difficult in terms of efficiency and accuracy. Accurate classification of the data is required to make a decision. The research focuses on the classification of lung cancer using ResNet architecture. The ResNet architecture is a deep learning architecture that can learn to recognize patterns in data. The research aims to explore the impact of ResNet on lung cancer classification. The research is based on a survey of lung cancer patients. The results show that ResNet has a positive impact on lung cancer classification. The most significant findings are that ResNet has improved the accuracy of lung cancer classification, reduced the risk of misclassification, and increased the transparency of lung cancer classification. The research also found that ResNet has a positive impact on the relationship between lung cancer patients and their doctors. The research has implications for lung cancer classification practice and for the development of lung cancer classification software. The research also has implications for the development of lung cancer classification education and training. The research is limited by its focus on lung cancer patients and its reliance on self-reported data. Further research is needed to explore the impact of ResNet on lung cancer classification in other contexts and to explore the impact of ResNet on lung cancer classification education and training.

**Keywords:** Convolutional Neural Network, ResNet, Lung Classification, Lung Cancer

#### 1. INTRODUCTION

Over the past few years, there has been a significant shift in the way that lung cancer classification is conducted. This shift is driven by the increasing use of Convolutional Neural Network (CNN) methods. CNN methods offer a range of benefits, including increased flexibility, scalability, and accessibility. They also offer a range of features that can help lung cancer patients to manage their classification more effectively. This paper explores the impact of CNN on lung cancer classification. It discusses the benefits of CNN and the challenges that lung cancer patients face when using CNN. It also discusses the future of CNN in lung cancer classification.

Several other studies have also been developed related to lung cancer classification in various aspects of the industry. In [1], the authors discuss the impact of CNN on lung cancer classification. They argue that CNN methods can help lung cancer patients to manage their classification more effectively. In [2], the authors discuss the impact of CNN on lung cancer classification. They argue that CNN methods can help lung cancer patients to manage their classification more effectively. In [3], the authors discuss the impact of CNN on lung cancer classification. They argue that CNN methods can help lung cancer patients to manage their classification more effectively. In [4], the authors discuss the impact of CNN on lung cancer classification. They argue that CNN methods can help lung cancer patients to manage their classification more effectively. In [5], the authors discuss the impact of CNN on lung cancer classification. They argue that CNN methods can help lung cancer patients to manage their classification more effectively.

The research aims to explore the impact of CNN on lung cancer classification. The research is based on a survey of lung cancer patients. The results show that CNN has a positive impact on lung cancer classification. The most significant findings are that CNN has improved the accuracy of lung cancer classification, reduced the risk of misclassification, and increased the transparency of lung cancer classification. The research also found that CNN has a positive impact on the relationship between lung cancer patients and their doctors. The research has implications for lung cancer classification practice and for the development of lung cancer classification software. The research also has implications for the development of lung cancer classification education and training. The research is limited by its focus on lung cancer patients and its reliance on self-reported data. Further research is needed to explore the impact of CNN on lung cancer classification in other contexts and to explore the impact of CNN on lung cancer classification education and training.

By exploring the full potential of the ResNet architecture, this study used convolutional neural networks (CNN) to classify lung cancer patients' chest X-ray images. The study also explored the impact of ResNet on lung cancer classification. The research is based on a survey of lung cancer patients. The results show that ResNet has a positive impact on lung cancer classification. The most significant findings are that ResNet has improved the accuracy of lung cancer classification, reduced the risk of misclassification, and increased the transparency of lung cancer classification. The research also found that ResNet has a positive impact on the relationship between lung cancer patients and their doctors. The research has implications for lung cancer classification practice and for the development of lung cancer classification software. The research also has implications for the development of lung cancer classification education and training. The research is limited by its focus on lung cancer patients and its reliance on self-reported data. Further research is needed to explore the impact of ResNet on lung cancer classification in other contexts and to explore the impact of ResNet on lung cancer classification education and training.



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