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CLASSIFICATION OF MUSLIM USE STUDENTS USING ANN ALGORITHM

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Abstract

Hijab is a female genital covering commonly used by adult women. The number of hijab wearing fashion modes is developing, this makes one of the factors lack of understanding about using the correct hijab. By utilizing image processing using classification techniques can be distinguished between veiled *women and not veiled. Artificial Neural Network (ANN) is an artificial intelligence that presents like a human brain by means of learning. ANN can be embedded into a computer program for the calculation process. One of the uses of ANN is to process the image to be classified. Image processing stages are data acquisition, preprocessing, edge detection, training, testing and classification. Based on the tests* that *have been carried out as many as 20 experiments, the results of image classification using Artificial Neural Network algorithm and backpropagation learning methods show a good level of accuracy.*

Keywords: *Image Processing*, *Artificial Neural Networks*, *Backpropagation*, *Classification*

1. Introduction

Clothing is a daily necessity used by humans to protect from heat and cold. The clothes commonly used are clothes and pants. In Islamic religion, Muslim dress for women must be worn to cover nakedness for adults. By referring to the country of Indonesia as the largest Muslim, women who had not veiled began wearing the hijab based on awareness of the advice of Islam. Hijab is a wide veil worn by Muslim women to cover their heads and neck to chest. The use of headscarves is a form of identity for the wearer in terms of religion. Clothing in hijab that women use today follows a thriving fashion mode and increased production of goods for market needs. This is what makes the factor of wearing the hijab less correct. In this study is to identify the image of two objects, namely the object of the woman using the hijab and not veiling.

By utilizing computer technology, one of them uses image processing by classifying images against objects that will be processed and examined. Objects will go through the stages of the image processing process where the output that has been produced can be useful according to needs. Artificial neural network (ANN) is a processing technique that is designed using the concept of the human brain and its components. ANN has the intelligence to process data and classify, recognize them. An image can be classified using ANN and detect many features that can also be done. Pattern recognition techniques can also be processed by ANN. There are many types of ANN. Feed forward backpropagation is one of the most important types of ANN.

Image processing contains different techniques such as feature extraction, feature selection, and classification. The images are taken from the experimental arrangement and then the feature is extracted. Features are important and relevant information or data obtained from digital imagery. The process of getting a feature is called Feature Extraction.

2. Methodology

ANN Setup

Input Layer	:	1225
Hidden Layer	:	10
Output Layer	:	1
Learning Rate (α)	:	1
Maksimum epoh	:	1000
Target Error	:	0,01

Final Weight

This work do many times training to find the best result. The best result has been found.

$v_{11} = v_{11} + \Delta v_{11}$

$v_{11} = 0.962243 + 0$

$v_{11} = 0.962243$

Table 1 Final weight input to hidden (v)

v	1	2	3	4	5	…	10
1	0.962243	0.107887	0.490041	0.220898	0.357536	⋯	0.349966
2	0.026129	0.926184	0.117249	0.080138	0.202877	⋯	0.075179
3	0.408093	0.748271	0.428748	0.067344	0.534721	⋯	0.23012
4	0.605206	0.243674	0.211702	0.817594	0.295789	⋯	0.10742
5	0.346556	0.578062	0.568223	0.341018	0.593674	⋯	0.449023
…	…	…	…	…	…	…	…
1225	0.215994	0	0.661896	0	0.721264	⋯	0

The hidden end weight to the output (v0)

$v0_1 = v0_1 + \Delta v0_1$

$v0_1 = 0.905606 + -0.34033$

$v0_1 = 0.56528$

Table 2 Hidden end weight to the output (v0)

	v0
1	0.56528
2	0.467933
3	0.76102
4	0.495987

5	0.058437
6	0.298395
7	-0.05883
8	0.729208
9	-0.43026
10	0.05859

The hidden end weight to the output (w)

$w_1 = w_1 + \Delta w_1$

$w_1 = 0.675514 + 1.001171$

$w_1 = -0.32566$

Table 3 Hidden end weight to the output (w)

	w
1	-0.32566
2	-0.20017
3	-0.72845
4	-0.39546
5	-0.30781
6	-0.67139
7	-0.12809
8	-0.63021
9	-0.09146
10	-0.0565

Final weight is biased to output (w0)

$w0 = w0 + \Delta w0$

$w0 = 0.276108 + 1.001171$

$w0 = 1.277278$

Testing

Operation in the hidden layer

$z\_in_1 = v0_1 + (v_{11} * x_{11}) + (v_{21} * x_2) + \ldots\ldots\ldots (v_{12551} * x_{1225})$

$z\_in_1 = 0.56528 + (0.962243 * 0) + (0.026129 * 0) + \ldots\ldots\ldots (0.215994 * 0)$

$z\_in_1 = 35.80833$

Table 4 Operation in the hidden layer

	z_
in_1	35.80833
in_2	26.41698
in_3	87.82369
in_4	49.89141
in_5	43.89472
in_6	86.42099
in_7	9.362222
in_8	72.61345
in_9	5.371874
in_{10}	3.748717

$$z_1 = \frac{1}{1 + e^{-35.80833}}$$

$$z_1 = \frac{1}{1 + 2.71828^{-35.80833}}$$

$z_1 = 1$

Table 5 Operation in the hidden layer

	z
1	1
2	1
3	1
4	1
5	1
6	1
7	1.000086
8	1
9	1.004645
10	1.023548

Operation in the output layer

$y\_in = w_0 + z_1 * w_1 + z_2 * w_2 + \ldots\ldots\ldots Z_{10} * w_{10}$

y_in = 1.277278 + 1 * -0.32566 + 1 * -0.20017 + ….. 1.023548 * -0.0565

y_in = -2.25971

$$z = \frac{1}{1 + e^{-(-2.25971)}}$$

$$z = \frac{1}{1 + 2.71828^{2.25971}}$$

z = 10.58025

Threshold = 0.2

Value 10.58025 ≥ 0.2 the output is 1 then the results are in accordance with the target setting.

3. Results and Discussion

The stages that will be tested using the ANN algorithm as follows:

1. *Preprocessing*
2. Edge Detection
3. *Training* JST
4. *Testing* Data
5. Classification

Preprocessing

Figure 1 Original image that has not been processed preprocessing.

Resize

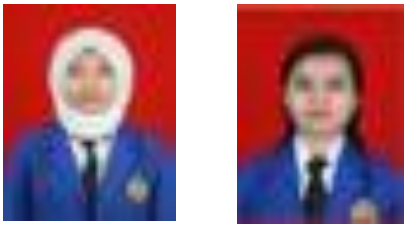

Figure 2 *Resize* with dimensions 35x35.

Grayscale Conversi

Figure 3 Change RGB image to gray.

Histogram Equalization

Figure 4 Increase the brightness of the image.

Edge Detection

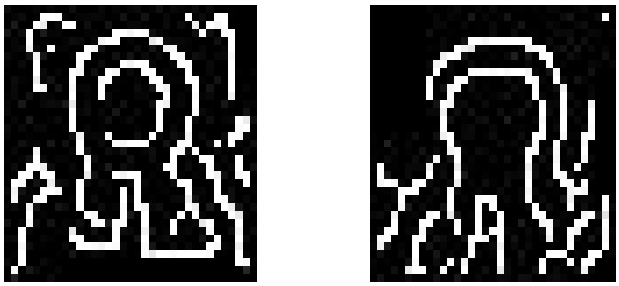

Figure 5 Get the edge of the object.

Vector

Vector results obtained after preprocessing and edge detection are classifying each veiled image with target 1 and the image is not veiled with target 0. The image produced as many as 100 vector with a size of 1225x100 is divided into two parts for training as much as 50 sizes 1225x50 and testing as much as 50 sizes 1225x50. The training is divided into two parts with 25 headscarves from columns 1-25 and not headscarves 25 from columns 51-75 with the name input variable Practice. Testing is divided into two headscarf sections 25 from columns 26-50 and not veiled from column 76-100 with the name input variable Test.

Table 6 Sample of Picture Vector

Picture ID	Vector	Input	Target
1	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 ,0,1,0,0,0,1,1,0,0,0,0,0,0,0,0,1,1,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,1,1,1,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0, 0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,1,0,0,1,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0 ,0,0,1,0,0,1,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,1, 1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,1,1,1,1,0,0,0,0,1,1,0,0,0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,0,1,1,0,0 ,0,1,1,0,0,0,1,1,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,0,1,0,0,0,1,1,0,0,0,0,0,1,1,0,0,0,1,1,0,0,0,0,0,1,0,0,0,0,0, 0,0,0,1,1,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,1,1,0,0,0,1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0 ,0,1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0, 0,0,0,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,1,1,0,0,0 ,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,1,0,0,0,0, 1,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,1,1,1,1,1,0,0,0,0,1,1,0,0,0,1,0,1,0,0,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0 ,0,0,0,0,0,0,0,0,0,1,1,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,1,0,0,0,1,0,0,0,0,0, 0,1,1,1,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,1,0,0,0,1,0,0,0,0,1,1,0,1,1,0,0,0,0,1,0,0,0,1,1,1,1,0,0,0,0,0,1,0,0 ,0,0,1,1,0,0,1,1,0,0,1,1,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,0,0,1,1,0,0,0,1,0,0,0,1,0,0,1,0,0,0,1,1,1,0,0,1,0,0,0,0, 0,0,1,0,1,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,1,0,0,1,1,0,0,0,0,1,0,0,0,0,0,1,0,1,0,0,0,0,0,0,1,0,0,0,1,1,0,0,0,0,0,0,0,0 ,1,0,0,0,0,0,0,1,0,0,0,0,0,1,0,1,1,0,0,0,0,0,1,1,0,0,0,1,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,1,1,0,0,0,1,0,0,1,0,0,0,0,0,1,0, 1,0,0,0,0,1,1,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,1,1,0,1,1,0,0,1,0,0,0,1,0,0,0,1,1,0,0,0,1,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0,0,0,0 ,1,0,0,0,1,0,0,0,1,0,0,0,0,1,0,0,0,1,0,0,0,0,1,0,0,0,0,0,0,1,1,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,0,0,1, 0,0,0,0,0,0,0,1,1,1,1,1,1,0,0,0,1,0,0,0,0,0,0,0,0,1,1,0,0,1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,1,1,1 ,1,1,0,0,0,1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	Training	1
26	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 ,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0,0,0,0,0,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0, 1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0 ,0,1,1,1,1,1,1,1,1,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,1,0,0,0,0,0,0,0,0,0,1,1,0,0,1,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,1,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0 ,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0, 0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,1,0,0,0,0,0 ,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,1,1, 0,0,1,0,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0 ,0,0,0,0,0,0,0,0,1,1,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,1,0,0,0,0,0,0,1, 0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,1,0,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0 ,1,1,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,1,1,0,1,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0,0,1,0,0, 0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,1,1,1,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0,1,1,1,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0 ,0,1,0,0,0,0,0,0,1,0,0,0,1,0,1,0,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,1,0,1,0,0,0,1,0,0,1,0,0,0,0,0,1,1,0, 0,0,0,0,1,1,0,1,0,0,0,0,0,1,0,0,0,1,1,0,0,0,1,0,0,1,0,0,1,0,0,0,0,0,1,1,0,0,0,1,1,0,0,1,0,0,0,1,1,0,0,0,1,0,0,0,0,0,1,0,0 ,1,0,1,1,0,0,0,0,0,0,1,0,0,1,1,0,0,0,1,0,0,1,1,0,0,0,1,1,0,0,0,0,0,0,1,1,1,0,1,0,0,0,0,0,0,1,0,0,1,0,0,0,0,0,1,0,0,1,0, 0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,1,1 ,1,0,0,0,1,1,0,0,0,0,0,0,0,0,1,0,0,0,0,1,0,1,0,0,0,0,1,0,0,0,0,0,1,0,0,0,1,0,1,1,0,0,0,0,0,0,0,0,1,1,1,0,0,1,0,0,1,0, 0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	Training	0

Training **ANN**

Testing the training on the 7th test, the 1-25 image is veiled and 26-50 is not veiled to get accuracy of 94% with a total of 3 errors.

Table 7 ANN Training Test 10 times

Testing	Result
1	100
2	100
3	98
4	98
5	100
6	96
7	94
8	100
9	96
10	98

The average accuracy obtained during the training process was carried out 10 times by testing 98%. Seen in the results of each test get different results, the highest result is 100% at the 1st, 2nd and 8th tests and the lowest is 94% at the 7th test.

Testing **Data**

Testing the training on the 10th test, 1-25 images are veiled and 26-50 do not veil get accuracy of 80% with a total of 10 errors.

Table 8 Data Testing Test 10 times

Testing	Result
1	96
2	94
3	86
4	94
5	94
6	92
7	84
8	98
9	94
10	80

The testing testing process that was carried out 10 times got an average accuracy of 91.2% with the highest value at test 1, which was 96% and the lowest value on the 10th test was 80%.

Classifcation

Based on the results of the overall testing of training / testing using ANN the backpropagtion method of image classification displays the percentage with good value. The average value obtained from training / testing is above 90% with the determination between achievement of output, target and error.

4. Conclusion

This research conclude that Canny edge detection is the best edge detection to get the edges of objects. Classification that has been done using artificial neural networks with backpropagation method shows the achievement between output and target produces good classification accuracy and a small number of errors. The training and testing process consists of 100 images with 10 times testing, an average accuracy of 98% for training and testing 91.2%.

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