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Implementation of Machine Learning Using the Convolution Neural Network Method for Aglaonema Interest Classification

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Abstract

One of the wealth of the Indonesian nation is the many types of ornamental plants. Ornamental plants, for example, the Aglaonema flower, which is much favored by hobbyists of ornamental plants, from homemakers, is a problem to distinguish between types of aglaonema ornamental plants with other ornamental plants. So the authors try to research with the latest technology using a deep learning convolutional neural network method. It is for calcifying aglaonema interest. This research is based on having fascinating leaves and colors. With the study results using the CNN method, the products of aglaonema flowers of Adelia, Legacy, Widuri, RedKochin, Tiara with moderate accuracy value are 56%. In contrast, the aglaonema type Sumatra, RedRuby, has the most accuracy a high of 61%.

Keywords: Aglaonema, Deep learning, Convolutional Neural Network

Abstrak

Salah satu kekayaan bangsa Indonesia adalah banyaknya jenis tanaman hias. Tanaman hias misalnya bunga aglaonema yang banyak digemari oleh para penghobi tanaman hias mulai dari ibu rumah tangga menjadi masalah untuk membedakan jenis tanaman hias aglaonema dengan tanaman hias lainnya. Maka penulis mencoba melakukan penelitian dengan teknologi terkini menggunakan metode deep learning convolutional neural network. Ini untuk mengapur bunga aglaonema. Penelitian ini didasarkan pada memiliki daun dan warna yang menarik. Dengan hasil penelitian menggunakan metode CNN, produk bunga aglaonema Adelia, Legacy, Widuri, RedKochin, Tiara dengan nilai akurasi sedang yaitu 56%. Sebaliknya, aglaonema jenis Sumatra, RedRuby, memiliki akurasi paling tinggi yaitu 61%.

***Kata-kata kunci**: Aglaonema, Pembelajaran Mendalam, Jaringan Saraf Konvolusi*

1. Introduction

In this study, the novelty of the science is to classify the types of ornamental plants Aglaonema by distinguishing the types of leaves and leaf color. Because the leaf and leaf color can be attractive to ornamental plant enthusiasts, this can be seen from the author's experiments **[1]**.

The development of machine learning technology in education and research is increasing, both in implementing a 2D image and 3D machine learning. This study classifies aglaonema flowers currently in demand by lovers with beautiful leaf colors **[2] [3]**.

The classification of Aglaonema flower, this research focuses on research on the types of flowers and colors that can be examined to get a good dataset. One method for researching the Aglaonema flower species method is to detect a suitable object, especially in this study, research on the Aglaonema flower object, which consists of the type of flower and its color.

Study the authors used the Convolution Neural Network (CNN) method CNN was widely used in researching objects, one of which was research on aglaonema flowers **[4]**. Artificial neural network research uses the CNN method by combining several layers by adding several weights so that the measurement of the value of a pattern can be obtained **[5]**.

Convolution network has an input layer, namely the input layer of neurons in the smallest layer of the input layer, that will be inputted multiple times to get maximum results for the layer's input. The layers hidden in that layer will produce one output **[6]**.

Using this CNN method, we can classify the types of aglaonema flowers by identifying the types of leaves and leaf color. These plates and leaf color research the classification of aglaonema types **[7] [8]**.

2. Method

The research design of the research presented in the **Figure 1.**

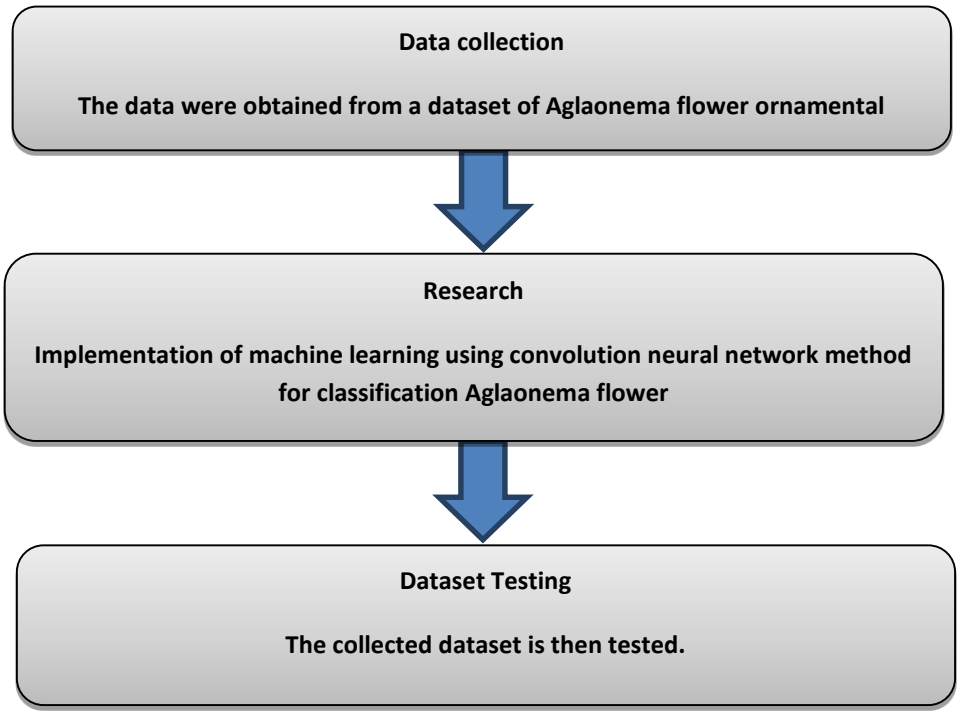


Figure 1. Flow Chart of Method

a. Type of Research

This type of research was carried out starting from collecting the dataset, then making a MatLab application program using the CNN method then conducting experiments on the dataset **[9] [10]**.

b. Data Collection Methods

Data collection used in this study uses data collected via the internet which is then obtained by making the program application using the 2020 Matlab program.

c. Method of completion proposed

In the research, the proposed method is the implementation of machine learning using the convolution neural network method for the classification of flower Aglaonema where the proposed method can be seen in Figure 2 below:

1) Data

The data used in the study came from the internet as many as 12 datasets of aglaonema types of flowers. With the attributes studied, namely the type of leaf and leaf color.

2) Preprocessing

At this preprocessing stage, the data integration process will be carried out. Then the data cleaning process will be carried out to produce a clean dataset at the preprocessing stage.

3) Attribute Selection

Attribute selection (also known as subset selection) is a process used in machine learning. The attributes of the available subset of data are selected for the implementation of the CNN method.

4) Data Training

Training data is used to determine the type of attribute used to determine these attributes' validation.

5) Data Testing

Contains new data that will be classified by the model that has been created, and the classification accuracy is evaluated. In addition, the testing data will be exchanged with one training data to obtain different testing data for each experiment.

6) Analyze

Analyze the data that has been carried out from the process steps above. Data analysis is defined as an effort to process data into information so that the characteristics or characteristics of the data can be easily understood and helpful in answering problems related to research activities.

7) Predictions

It predicts the results of what has been done from the steps above. Prediction is systematically estimating something that is most likely to happen in the future based on past and present information. Thus, the error (the difference between something and the predicted result can be minimized. The proposed solution method present in the **Figure 2**.

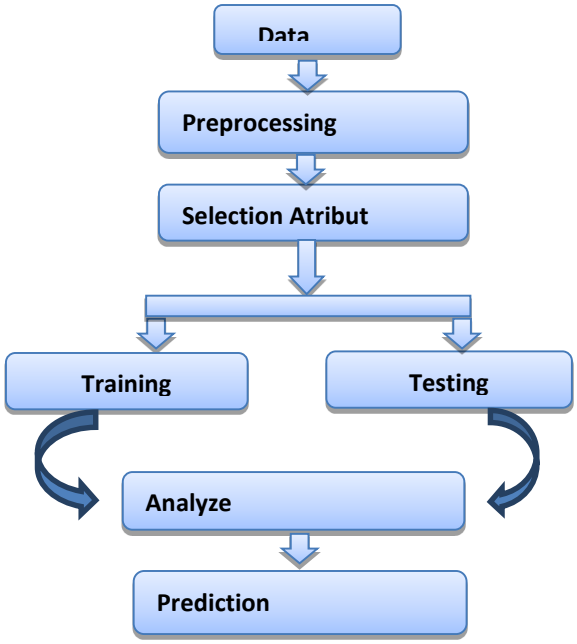


Figure 2. The proposed solution method

The use of the CNN method used in this study aims to spread the network, which is two-dimensional data so that those linear operations can be carried out with different weight parameters. In this study, several dimensions are used, which are convolutional kernels, as seen in the following **Figure 3.**

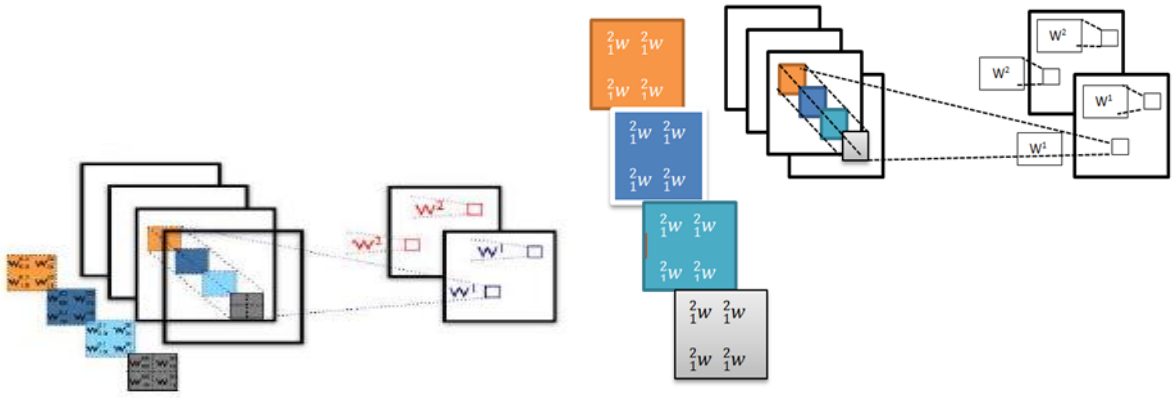


Figure 3. Convolution process on CNN

The convolutional value entered in an image will be extracted and then converted into a binary form transformed linearly based on the input from the appropriate image where the weighting value can determine the kernel value that will be used in the weighting, which is based on the information via CNN, On **Figure 4**.

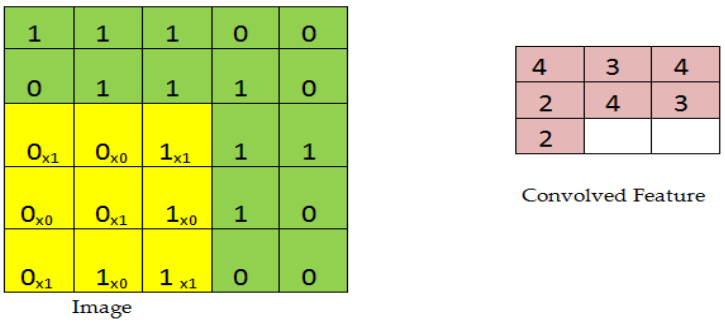


Figure 4. Convolution Operation

3. Results and Discussion

In the results and discussion section, 12 categories of Aglaonema flower types are used, namely Aglaonema Bidadari, Pride Of Sumatra, Moonlight, Adelia, Legacy, Claudia, Lipstick (Siam Aurora), Thistle, Cinta, Red Kochin, Tiara, Red Ruby. one Convolutional Neural Network (CNN) method. By using this CNN method, transformations of the original image can be carried out between one layer and another from the pixel value of the picture by performing the following steps:

a. Convolutional Operation

In this study, we are using a mathematical operation, namely a convolutional operation. The procedure uses two natural argument functions, both in output due to a feature operation and input in the form of an image. The output and input can be seen as an argument that has an outstanding value. Specifics where this convolutional operation can be written using the following formula number:

S (t) = (x * w) (t).....(1)

The function s (t) provides a single output, namely Feature Maps. The first argument is input (input), x, with the second argument being the kernel. the following operation for convolution into more than one-dimensional information can be written as follows formula number (2):

$$S(i,j) = (K * I)(i,j) = \sum_{i=1}^{m} k \sum_{j=1}^{n} I\,(i-m, j-n)K(m.n))i^2 \quad \text{.....(2)}$$

b. Matrix Layer

The layer matrix functions for input and statistical processing based on the closest pixel value so that matrix operations can be performed, as in the following **Figure 5.**

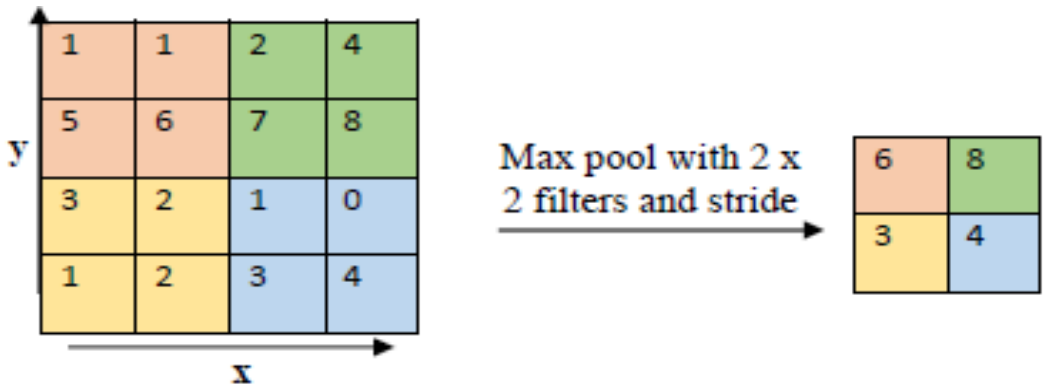
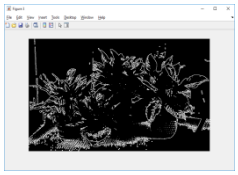
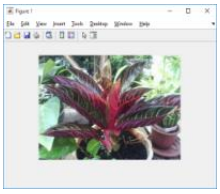
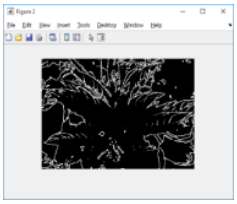
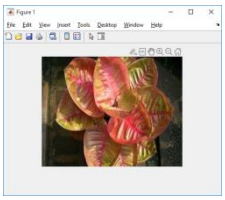
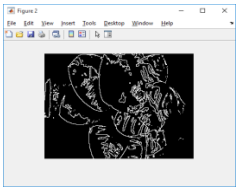
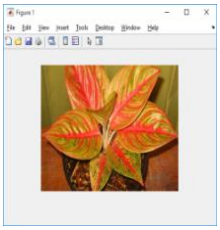
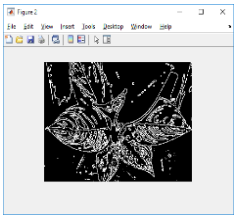
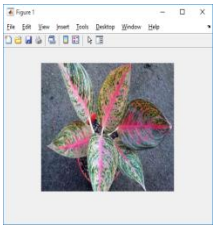
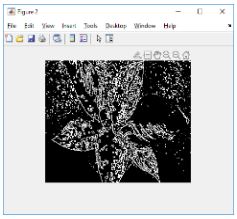
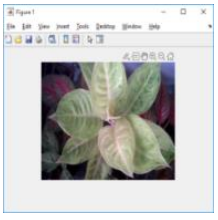
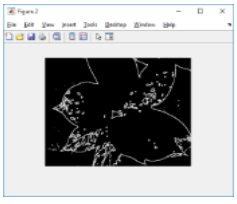


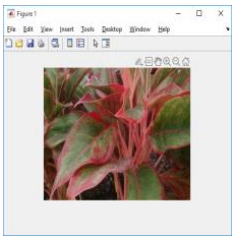
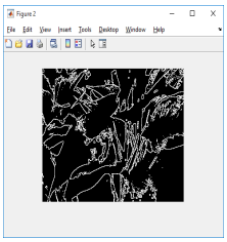
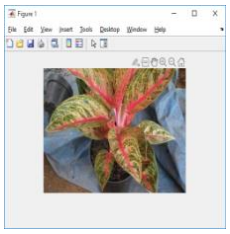
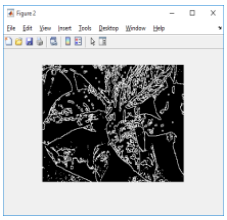
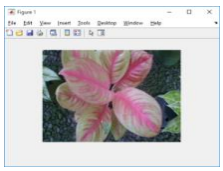
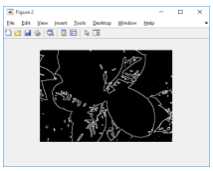
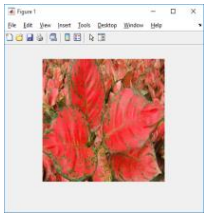
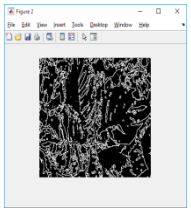
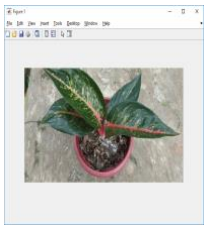
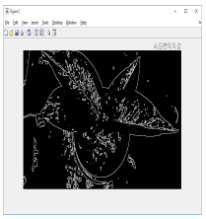
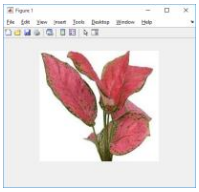
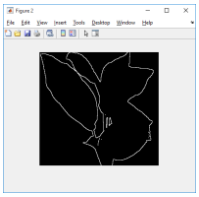
Figure 5. Matrix Layer

c. Dataset Testing

Where testing this dataset is done by testing using the MatLab R2020, an application program by getting results as in the following **Table 1.**

Table 1. Results of Dataset Testing

Original Image	Convolution	Convolutional Result	Convolutional Matrik
 bidadari	 Conv bidadari	0.5765	1 1 1 1 1 1 1 1 1
 Pride of Sumatera	 Conv pride of Sumatera	0.5373	0 0 0 1 1 1 0 0 0
 Moonlight		0.3804	0 0 0 0 0 0 0 0 0
 Adelia		0.4314	0 0 0 0 0 0 0 0 0
 Legacy		0.4863	0 0 0 0 0 0 0 1 0
 Claudia		0.3804	0 0 0 0 0 0 0 0 0

Original Image	Convolution	Convolutional Result	Convolutional Matrik
 Lipstik		0.3490	0 0 1 0 0 1 0 0 1
 Widuri		0.4235	1 1 1 1 1 1 1 0 1
 Cinta		0.3804	1 1 0 1 0 0 0 0 1
 Red Kochin		0.4314	1 1 1 1 1 1 0 0 1
 Tiara		0.4784	0 0 0 0 0 0 0 0 0
 Red Ruby		0.7177	1 1 1 1 1 1 1 1 1

The test results in the table above show that the brighter the leaf color, the smaller the convolution value is 38% conversely, if the leaves are less optimistic, the accuracy value is higher,

and the convolution value is higher 61%. In comparison, the convolution value is 56% in the middle Aglaonema type. Classification results chart presented in the **Figure 6**.

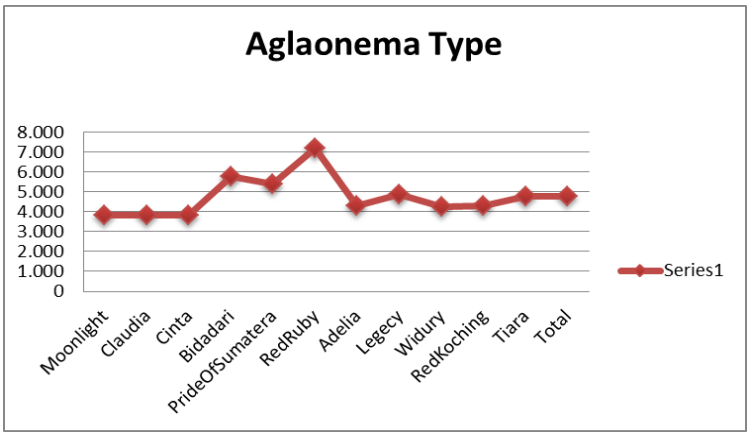


Figure 6. Classification Results Chart

From the graph above, it can be concluded that the type of Aglaomena RedRuby, which can detect through the color and leaves of the Aglaomena RedRuby, is 7.17%. In contrast, the Aglaonema Moonlight, Claudia, and Cinta types are low to be detected through the colors and leaves, which is 3.80%.

From the accuracy value obtained is still very low, it is expected that in further research, other methods can be used, for example, the optimization method or combining these two methods.

4. Conclusion

This study using the Aglaonema flower dataset to calculate the types of flowers and colors. The method used in this study using CNN, where the flower dataset used in the study were 12 types of Aglaonema flowers. The results obtained from the Aglaonema RedRuby type research with the highest level of accuracy of 7.17% are also expected to other researchers to develop analysis using different methods.

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