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Batik Motif Recognition Using Machine Learning Method as Educational Media (Case Study: CV. Titik Batik)

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ABSTRACT

Batik is an Indonesian culture that has been recognized as a world heritage. Indonesian batik has a variety of different motifs in each region. Batik motifs need to be preserved so that they do not become extinct, one way is to introduce the motifs to the public. One of the Community Businesses engaged in the production and sale of batik, namely CV. Titik Batik has a variety of batik products. The diversity of batik types in each region in Indonesia has characteristic batik motifs. These distinctive motifs reflect the batik origin. Many people have not been able to recognize the type and region of origin of batik, let alone distinguish batik motifs. To preserve this Indonesian cultural heritage, the public needs to be educated about several batik motifs so that they can be preserved by the next generation of the Indonesian nation. Knowledge about recognizing types of batik motifs is only possessed by certain people, this is because batik has very varied and almost similar motifs. Based on these problems, one way to recognize batik motifs is with technology. One of the research topics that can be developed in the field of computer science is the Recognition of batik motifs with the Machine Learning Method. The model built using the Convolutional Neural Network machine learning method. The system is developed into a website that can be accessed by the public as an educational media for introducing batik motifs. In addition, for partners, this application can help as a promotional media for CV. Titik Batik.

Keywords: Batik, recognition, machine learning

Introduction

Indonesia is an archipelago that stretches from Sabang to Merauke, making it rich in culture. One of Indonesia's cultural heritage is batik. Batik is an Indonesian cultural heritage recognized by UNESCO. Batik has various unique motifs. Batik motifs are picture patterns that have symbolic meanings and signs behind the motifs (Soeprapto et al., 2021). People still cannot distinguish batik motifs because of the many diverse motifs (Meranggi et al., 2022). Batik motifs have various patterns from various regions. One of the well-known batik motifs is parang batik, Kawung batik, Mega mendung batik. With the advancement of information technology, it is necessary to develop an automatic batik motif recognition system to overcome this problem. Because there are so many types of batik motifs, several studies have been conducted in detecting batik motifs. One of the studies is Automatic Batik Motif Using Combination Classification of SIFT Features Moments and k-Nearest Neighbor, this study classifies the parang, slope, ceplokan, semen and lunglungan batik motifs, and the accuracy results are 31.43% (Setyawan et al., 2015). Another study on detecting batik motifs is Batik Motif Classification using Color-Texture-Based Feature Extraction and Backpropagation Neural Network (Suciati et al., 2014). In this study, the motifs detected are parang, ceplokan, slope, mega mendung, semen, lunglungan and kembangan batik. Research on

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the automation of batik motif classification has also been conducted using machine learning methods such as Gray Level Co-occurrence Matrix (GLCM) (Yuniarno & Purnowo, 2018) and Support Vector Machine (SVM) (Herulambang et al., 2020). The use of deep learning methods has also been widely used using CNN methods (Rasyidi & Bariyah, 2020) and Fuzzy Neural Network (Rangkuti et al., 2018). The use of CNN with different architectures has also been used to automate the classification of batik motifs. Research that has been widely conducted by researchers has provided various results. For example, research using CNN for feature extraction with SoftMax to classify batik motifs with 13 classes produced an accuracy of 56% (Tristanto et al., 2018). There is research using CNN with VGG-16 architecture with five classes produced an accuracy of 89% (Gultom et al., 2018), and using CNN with VGG-19 architecture with five classes produced an accuracy of up to 89.3% (Agastya & Setyanto, 2018). In previous studies, the convolutional neural network (CNN) classification method classified Solo batik motifs. The motifs detected are Ceplok, Kawung, Lereng, Nitik, and Parang. CNN is one of the image recognition and detection methods that has a high level of accuracy compared to other classification methods (Anggoro et al., 2024). The purpose of this study is to create a Batik motif recognition system using the CNN algorithm. This study provides benefits in educating the public about Batik motifs.

Material and Methods

Data collection

The initial stage in this study is data collection. The data collected in this study comes from CV. Titik Batik in ".jpg" format. This dataset will be used as training data in the study to identify Batik motifs. The dataset used is divided into 4 classes. The batik motifs that will be used in this study can be seen in Figure 1. The Parang Batik motif can be seen in Figure 1(a), the Kawung motif can be seen in Figure 1(b), the Nitik motif can be seen in Figure 1(c), and the Mega Mendung motif can be seen in Figure 1(d). The features used in the dataset to recognize batik patterns include geometric and repetitive shapes.

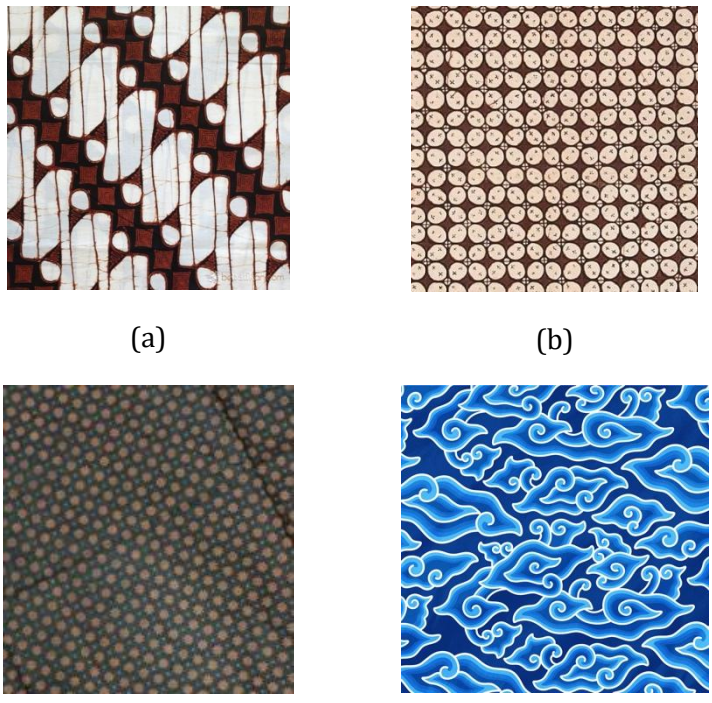

Figure 1. Batik Motif (a) Parang Batik (b) Kawung Bating (c) Nitik Batik (d) Mega Mendung Batik

Data processing

Before data processing is carried out to reduce the system load, the size of the image data must be adjusted. The datasets used have different sizes, so the same size adjustment is required. Therefore, the dataset is resized to 150x150 pixels. After the data is preprocessed, the dataset will be processed using the CNN algorithm to identify and classify Batik motifs. The main purpose of designing and training the model is to optimize the parameters and produce accurate predictions for the input. CNN has several layers that will be used in data processing to filter this research dataset. This layer has several stages, namely convolutional layers, pooling layers, and fully connected layers, as illustrated in Figure 2.

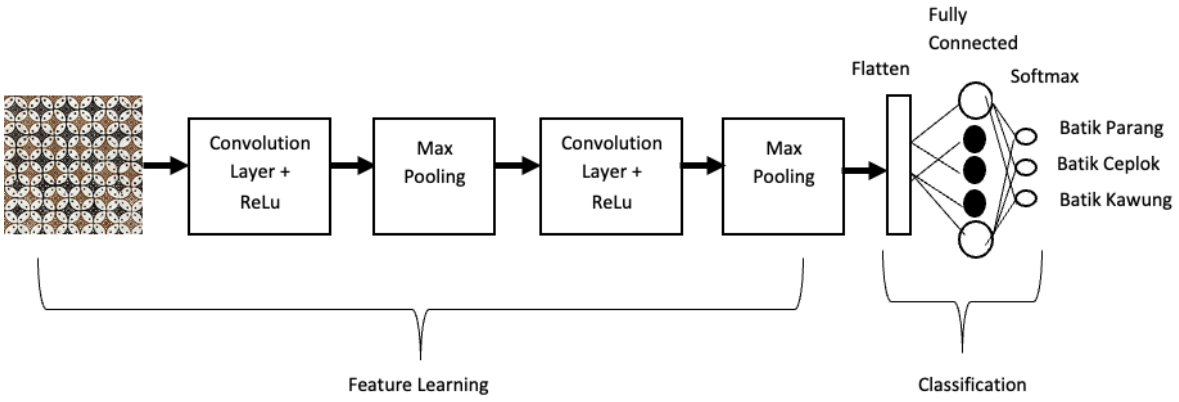

Figure 2. CNN Architecture

Results and Discussion

In this research, the dataset used is 400 batik images with 4 classes, which are divided into 75% training data and 25% test data. Then the dataset that has gone through the preprocessing stage will be processed using the CNN algorithm. The initial stage is the feature extraction phase using the Conv2D algorithm. To get the weight value by entering a convolution layer with different filter sizes depending on the number of layers used and using the ReLU activation function. At the convolution stage, there is also input with image pixels measuring 150 × 150. The next step is the pooling layer by taking the largest value and then continuing with the flattening stage. This stage changes the output of the convolution process in the form of a matrix into a vector. At this stage, the dropout function is also used to reduce overfitting. Furthermore, the classification process is carried out using softmax activation. The softmax layer is used for the number of classes greater than or equal to three.

The next process is to calculate the accuracy value to get the desired model. In calculating the accuracy value, an optimization algorithm is needed, namely Adam. Adam has the advantages of efficient computing easy implementation and small memory requirements. Like the use of Adam, epoch is also used to obtain accuracy values. Epoch is an algorithm cycle that studies the entire training data set, to achieve the maximum weight value that requires repeated data learning. For this study, the number of epochs used was 100 with a batch size value of 128. The test results are shown in Figure 3.

After obtaining a model with an accuracy result of 86%, the model will then be implemented into the H5 model to be deployed to a simple website display so that it can be used by users and consumers of CV Titik Batik. The simple interface website can be seen in Figure 4.

Figure 3. Accuracy result

Figure 4. Interface website

To perform the recognition, the steps that must be taken are to choose the desired document file as shown in Figure 4. After uploading the desired image, for example, to perform recognition on batik data as shown in Figure 5.

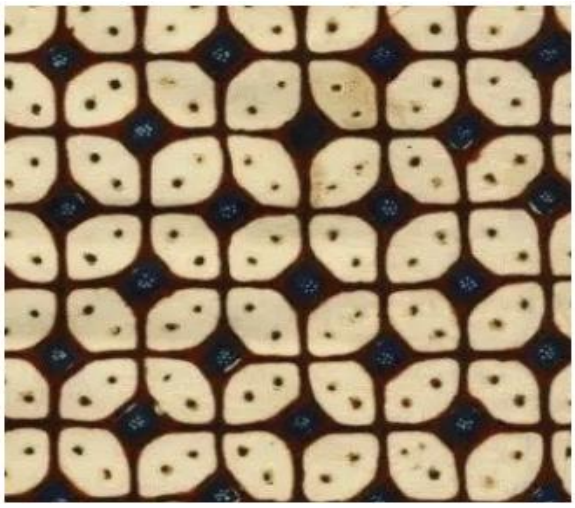

Figure 5. Kawung Batik

After that, the introduction is done by pressing the green Classify button. It will look like Figure 6. The results are shown in red writing, namely Batik Kawung.

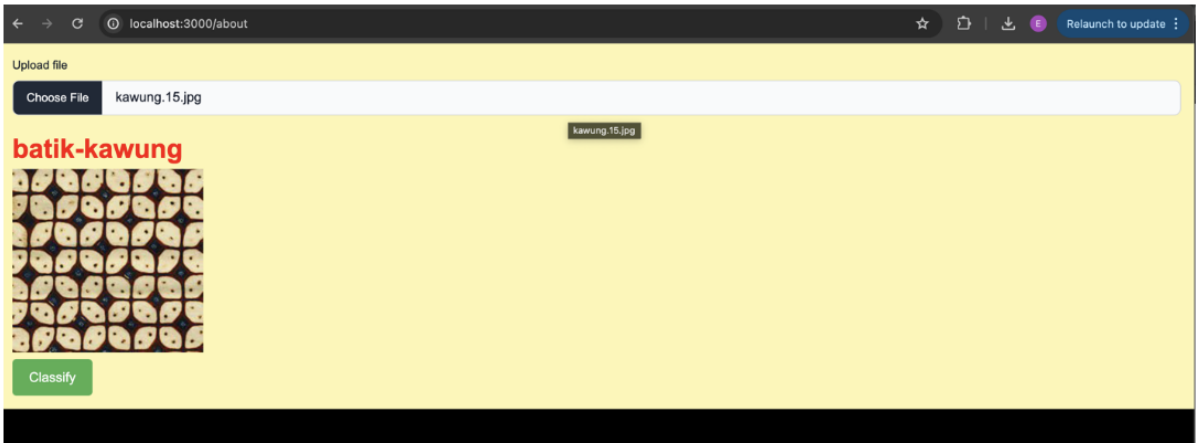

Figure 6. Classification result

Conclusion

The application of Machine Learning to recognize batik motifs automatically provides quite good results, namely accuracy above 80%. With the batik motif recognition system on CV Titik Batik, it can be Educational Media to facilitate learning about batik motifs, both for students, craftsmen, and the general public. This study uses a CV. Titik Batik is a case study, showing how the implementation of machine learning can be applied in the batik industry to increase efficiency in recognizing and teaching batik motifs. By utilizing modern technology, such as machine learning, this study has the potential to help preserve batik culture through the introduction of motifs that are more easily accessible and learned by various groups.

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