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Palembang songket fabric motif image detection with data augmentation based on ResNet using dropout

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ABSTRACT

A good way to spread knowledge about Palembang songket woven cloth patterns is to use information technology, especially artificial intelligence technology. This study's main goal is to develop a ResNet model with dropout regularization methods and find out how dropout regularization affects the ResNet model for detecting Palembang songket fabric motifs with more data. Data was collected in places like Tujuh Saudara Songket, Zainal Songket, Songket PASH, AMS Songket and Batik, Ernawati Songket, Nabilah Collections, Ilham Songket, and Marissa Songket. We used ten class of data for this research. A dataset of 7,680 data for training, 960 data for validation and 960 data for testing is a dataset that has been prepared to be implemented in experiments. In the final results, the experimental results for DResNet demonstrated that accuracy at the training stage was 92.16%, accuracy at the validation stage was 78.60%, and accuracy at the submission stage was 80.3%. The experimental results also show that dropouts are able to increase the accuracy of the ResNet model by adding +1.10% accuracy in the training process, adding +1.80% accuracy in the validation process, and adding +0.40% accuracy in the testing process.

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1. INTRODUCTION

Traditional woven fabrics not only represent the culture of the Indonesian people but also their identity and values [1]. One of Indonesia's national priorities is the preservation of traditional woven fabrics. In collaboration with the Center for Environmental Standardization and Forestry, the Ministry of Environment and Forestry, the SWITCH Asia program on Sustainable Consumption and Production of Traditional Weaving, supports this initiative. The preservation and re-promotion of woven fabrics within the community is one of the measures taken to preserve cultural values so they can be passed on to future generations. In addition, this action can enhance the popularity of woven fabrics, thereby encouraging the local and international growth of the woven fabric industry [2]–[4].

Indonesia is renowned for producing numerous songket woven fabrics, including Palembang songket woven cloth. Typically woven with gold and silver strands, songket fabric from Palembang features an assortment of motifs and hues [5]–[7]. Plant motifs (particularly the distillation form of flowers), geometric motifs, and combined plant and geometric motifs make up the majority of Palembang songket motifs. The dragon besaung motif (*nago besaung*), rose motif (*bungo mawar*) and Chinese floral motif (*bungo cino*) are quite well-known and have existed for a very long time as traditional motifs of Palembang songket woven cloth [8].

The woven fabric of Palembang songket features a variety of patterns or designs. The regular and irregular arrangement of fundamental motifs forms the pattern of woven fabric. The conventional method for identifying motifs on Palembang songket woven fabric focuses on the shape and arrangement of motif elements. However, only a few Palembang people are familiar with the patterns on Palembang songket woven fabric. This is due to a dearth of learning knowledge and the absence of Palembang songket woven fabric motif recognition applications that could assist individuals in identifying the motif's name [9]–[12].

Utilizing information technology, particularly artificial intelligence technology is a viable option for re-promoting motif knowledge on Palembang songket woven fabric. Pattern recognition is one of the artificial intelligence technologies supporting this program [13]–[15]. This technology can be incorporated into applications to aid in recognizing woven fabric motifs without consulting a cultural expert [16]–[25].

The advancement of research in the field of pattern recognition facilitates the advancement of research in the field of motif recognition in woven fabrics. For example, model Deep Neural Network (DNN) was utilized by Boonsirisumpun and Puarungroj (2018) for the recognition of woven fabrics in their research. This investigation utilized 720 fabric image data with four classes. This study's accuracy attained 93.06% [26]. In same research, Boonsirisumpun and Puarungroj (2018) also used the MobileNets model for woven fabric recognition. The data used in this study was fabric image data as much as 4,500 data. The accuracy of this study reached 98.22% [26].

Research by Puarungroj and Boonsirisumpun (2019) using the Inception-v3 method to detect Phasin-woven fabric. The accuracy of this study was 92.08%. The study employed a dataset containing 1,800 data divided into 10 data classes [27]. Moreover, Rizki et al. (2020) investigation on the detection of Malay woven fabrics utilized the Faster R-CNN method. This study did not optimize Faster R-CNN, so this method's performance was only 82.14% [28].

Research by Iqbal Hussain et al. (2020) used ResNet-50 for fabric recognition of woven fabric patterns. The accuracy of this study reached 99.3%. The dataset used in the study amounted to 3,540 data [29]. To detect Ulos woven fabrics, Siregar and Mauritsius (2021) employ the Convolutional Neural Network (CNN) technique. The accuracy of this study was 87.27% [30].

Based on previous research, the ResNet model performs better than other methods. However, in the case of fabric pattern recognition using transfer learning models, there are often cases of overfitting. This is due to a very deep and complex network model [31]. Overfitting cases will cause too good motive recognition results during training but not optimally during testing. If a model is overfitting, then the model cannot generalize well. This causes testing using different data to reduce the accuracy results [32].

However, these cases of overfitting can be reduced by using the dropout technique. In some other cases, dropout techniques are widely used to reduce overfitting cases [29], [33]–[36]. The dropout regularization technique can be implemented avoiding overfitting by stopping hidden units from depending on a particular unit from the previous layer [37]. Based on the background above, the main objective of this study is to propose a ResNet model with dropout regularization techniques and find out the effect of dropout regularization on the ResNet model for Palembang songket fabric motif image detection with data augmentation.

2. METHOD

The experimental phase of this research is structured and well-planned so that the research can be conducted properly following the research objectives: propose a ResNet model with dropout regularization techniques to detect Palembang songket motifs. Data collection was carried out in various locations of Palembang songket woven fabric centres, including lain Tujuh Saudara Songket, Zainal Songket, Songket PASH, AMS Songket and Batik, Ernawati Songket, Nabilah Collections, Ilham Songket and Marissa Songket.

The process of acquiring images of Palembang songket fabric motifs is carried out by photographing fabric motifs with different positions and light levels. After the shooting is complete, crop the image using the help of the Adobe Photoshop CS3 application as needed. Cropping techniques are performed to change the pixel size of the image with a size of 512x512 pixels for each image. In the meantime, the research phases are depicted in **Figure 1**.

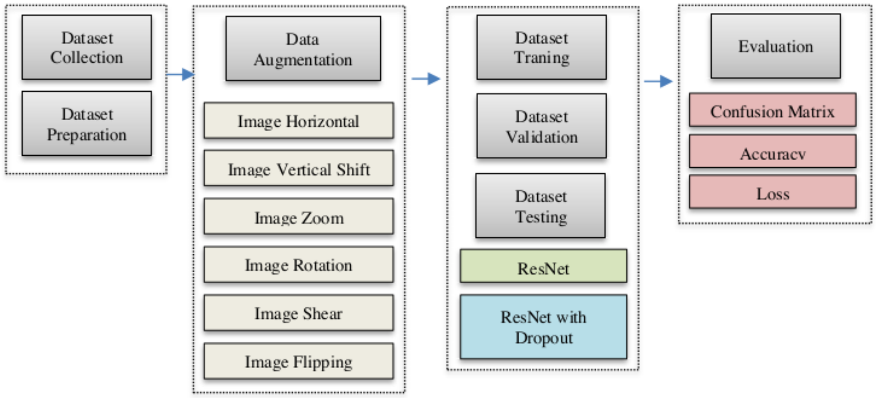


Figure 1. Research methodology

We used ten class of motifs for this research. The class of motifs used is a traditional motif typical of Palembang songket woven fabric, not derivative motifs and creation motifs. The types of woven fabric motifs tested are *bintang melati*, *bunga bintang*, *bunga mawar*, *kucing tidur*, *naga besaung*, *pucuk rebung balai anak*, *pucuk rebung penuh* and *tampuk manggis* as seen in **Figure 2 (a-h)**.

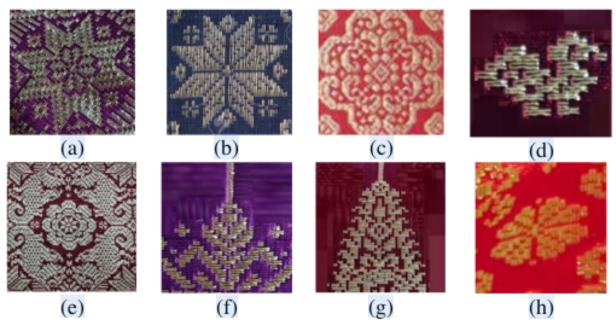


Figure 2. Dataset example, motif example of (a) bintang melati, (b) bunga bintang, (c) bunga mawar, (d) kucing tidur, (e) naga besaung, (f) pucuk rebung balai anak, (g) pucuk rebung penuh, (h) tampuk manggis

Data preprocessing involves the application of data augmentation using six techniques. We used image horizontal shift, image vertical shift, image magnification, image rotation, image shear, and image flipping for data augmentation. The datasets are distributed with a proportion of 90% train-validation data and 10% test data. Complete data is divided into multiple containers for the labelling procedure, with the following information in **Table 1.**

Table 1. Detail of research dataset

Dataset	Original Data (x)	Number of Class (N)	Augmentation Technique (a)	Number of Final Data $\mu = a\,x\,4\,N$
Train	40			7,680
Validate	5	8	6	960
Test	5			960
Total	50	8	6	9,600

The next stage is an experiment using the ResNet model and ResNet with dropout (DResNet). Based on previous research, the Resnet model produces better performance than other methods. However, pattern recognition using transfer learning models often cases of overfitting. This is due to the very deep and complex network model. Overfitting cases will cause too good motive recognition results during the training process, but not optimally during the testing process. If a model is overfitting, then the model cannot generalize well. These overfitting cases can be reduced by using the dropout technique. In some other cases, dropout techniques are widely used to reduce cases of overfitting Dropout regularization techniques can be implemented to avoid overfitting by stopping hidden units from depending on a particular unit from the previous layer [29], [34]–[37].

This study used confusion matrix, accuracy, and loss evaluation methods. The confusion matrix is one of the accuracy calculation methods widely used in deep learning models. This method is a matrix of predictions that will be tested in estimating true and false objects to calculate the accuracy, precision, and recall value. The confusion matrix represents the predictions and actual conditions of the data generated by ResNet and DResNet at the time of the experiment. Next is the accuracy model, which describes how accurately the model can classify correctly. In other words, accuracy is the degree of proximity of the predicted value to the actual value. The accuracy value can be obtained by **Equation 1**.

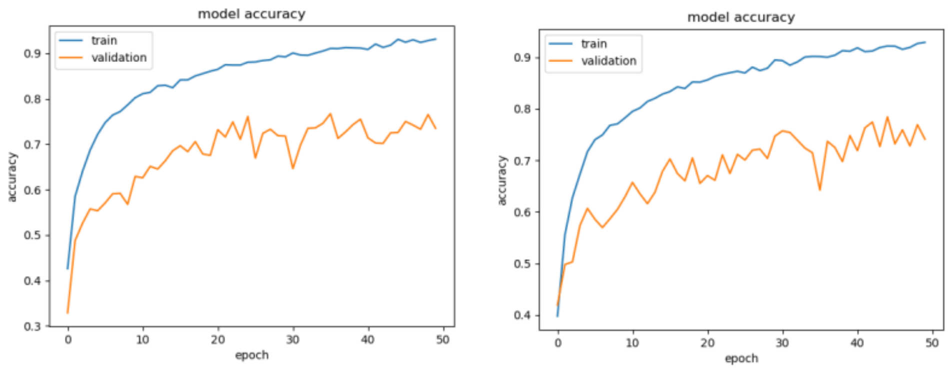
$$Accuracy = \frac{TP+TN}{TP+FP+FN+TN} \times 100\% \tag{1}$$

Furthermore, the evaluation method used is the loss model. This model measures values that represent the sum of errors in ResNet at the time of the experiment. The loss model measures how well (or badly) the ResNet and DResNet models detect Palembang songket woven fabric motifs. The lower the loss value, the better the ResNet and DResNet models work.

3. RESULTS AND DISCUSSION

The implementation of the ResNet and ResNet algorithms with dropout or namely DResNet is intended to be able to determine the accuracy results in the detection of Palembang woven fabric motifs. Through the analysis of experimental results, it can be known about the role of dropouts in improving ResNet accuracy results. Experiments on the ResNet algorithm will be carried out in two stages. The first stage of the experiment is an experiment on the ResNet algorithm without the application of dropout regularization and the second experiment is an experiment on the ResNet algorithm with the application of dropout regularization (DResNet). The results of this study will be analyzed and discussed based on the evaluation results of the confusion matrix model, accuracy model and loss model.

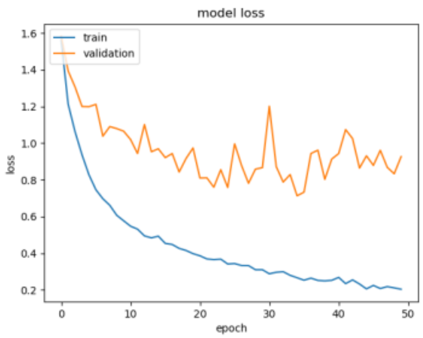
At this stage, what is done is to analyze the experimental results, namely testing the model using an accuracy model against ResNet without dropouts and ResNet with dropouts. A dataset of 7,680 data for training, 960 data for validation and 960 data for testing is a dataset that has been prepared to be implemented in experiments. A graph of the results of the accuracy per epoch evaluation for ResNet can be seen in the **Figure 3 (a)** and accuracy for DResnet can be seen in **Figure 3 (b)**.



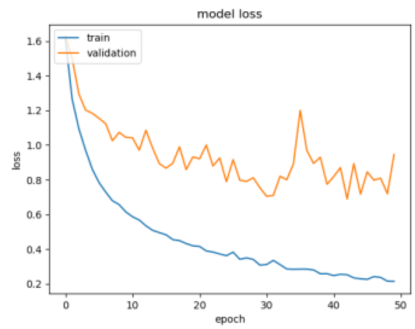
(a) (b)

Figure 3. Model accuracy of (a) ResNet (b) DResNet

The next step is to analyze the results of the experimental evaluation using a loss model against ResNet without dropouts and ResNet with dropouts. The dataset was 7,680 data for training, 960 data for validation and 960 data to find out how the loss results trend in the ResNet and DResNet models for each epoch. From the experimental results, the loss value in both the ResNet and DResNet models showed that the results decreased at each epoch. The ResNet and DResNet models detect Palembang songket woven fabric motifs well. The results of the loss value trend chart for ResNet can be seen in the **Figure 4 (a)** and loss value chart for DResNet can be seen in the **Figure 4 (b)**.



(a)



(b)

Figure 4. Model loss of (a) ResNet (b) DResNet

The next step is to analyze the results of the confusion matrix for the ResNet model. From the experimental results for the ResNet model, the *bintang melati* motif got an accuracy of 73%, the *bunga bintang* motif got an accuracy of 94%, the *bunga mawar* motif got an accuracy of 70%, the *kucing tidur* motif got an accuracy of 98%, the *naga besaung* motif got an accuracy of 62%, the *pucuk rebung balai anak* motif got an accuracy of 72%, the *pucuk rebung penuh* got an accuracy of 86%, and the *tampuk manggis* motif gets an accuracy of 84%. For details of the results of the confusion matrix of the ResNet model, see **Figure 5**.

Bintang Melati	91	8	6	3	13	1	2	1
Bunga Bintang	0	118	0	0	2	0	0	5
Bunga Mawar	17	1	88	3	5	11	0	0
Kucing Tidur	3	0	0	122	0	0	0	0
Naga Besaung	15	17	1	8	77	0	7	0
Pucuk Rebung Balai Anak	22	0	1	4	0	90	8	0
Pucuk Rebung Penuh	3	2	3	4	1	4	108	0
Tampuk Manggis	3	15	0	2	0	0	0	105
	Bintang Melati	Bunga Bintang	Bunga Mawar	Kucing Tidur	Naga Besaung	Pucuk Rebung Balai Anak	Pucuk Rebung Penuh	Tampuk Manggis

Figure 5. Confusion matrix of ResNet model

The next step is to analyze the results of the confusion matrix for the DResNet model. From the experimental results for the DResNet model, the *bintang melati* motif got an accuracy of 61%, the *bunga bintang* motif got an accuracy of 87%, the *bunga mawar* motif got an accuracy of 66%, the *kucing tidur* motif got an accuracy of 100%, the *naga besaung* motif got an accuracy of 61%, the *pucuk rebung balai anak* motif got an accuracy of 82%, the *pucuk rebung penuh* got an accuracy of 95% and the *tampuk manggis* motif gets an accuracy of 90%. For details of the results of the confusion matrix of the ResNet model, see **Figure 6**.

	Bintang Melati	Bunga Bintang	Bunga Mawar	Kucing Tidur	Naga Besaung	Pucuk Rebung Balai Anak	Pucuk Rebung Penuh	Tampuk Manggis
Bintang Melati	76	1	9	4	24	5	5	1
Bunga Bintang	0	109	0	2	6	3	0	5
Bunga Mawar	1	0	82	7	5	28	2	0
Kucing Tidur	0	0	0	125	0	0	0	0
Naga Besaung	8	6	9	15	76	2	9	0
Pucuk Rebung Balai Anak	5	0	0	4	1	103	12	0
Pucuk Rebung Penuh	0	0	0	3	0	3	119	0
Tampuk Manggis	3	7	0	2	0	0	0	113

Figure 6. Confusion matrix of DResNet model

The test accuracy can be calculated based on the confusion matrix results from the testing phase. The accuracy calculation describes how well the ResNet and DResNet models can correctly classify or describe the proportion of correct predictions (positive and negative) relative to the entire data set. In other terms, precision is the degree to which the predicted value closely matches the actual value. In the testing phase, ResNet and DResNet effectively predicted the true and false values in the **Table 2**.

Table 2. The percentage of true value based on motif class

No	Class Name	ResNet			DResNet		
		True	False	% True	True	False	% True
1	*Bintang melati* motif	91	34	73%	76	49	61%
2	*Bunga bintang* motif	118	7	94%	109	16	87%
3	*Bunga mawar* motif	88	37	70%	82	43	66%
4	*Kucing tidur* motif	122	3	98%	125	0	100%
5	*Naga besau*ng motif	77	48	62%	76	49	61%
6	*Pucuk rebung balai anak* motif	90	35	72%	103	22	82%
7	*Pucuk rebung penuh* motif	108	17	86%	119	6	95%
8	*Tampuk manggis* motif	105	20	84%	113	12	90%

Based on experiments, the results of ResNet and DResNet show an increasing trend of accuracy at each epoch. However, as a final result, ResNet obtained accuracy results of 91.06% at the traning stage, 76.80% at the validation stage and 79.90% at the testing stage. For DResNet, the experimental results showed that accuracy at the traning stage got results of 92.16%, accuracy at the validation stage was 78.60% and accuracy at the submission stage got results of 80.30% as depicted in **Figure 7**.

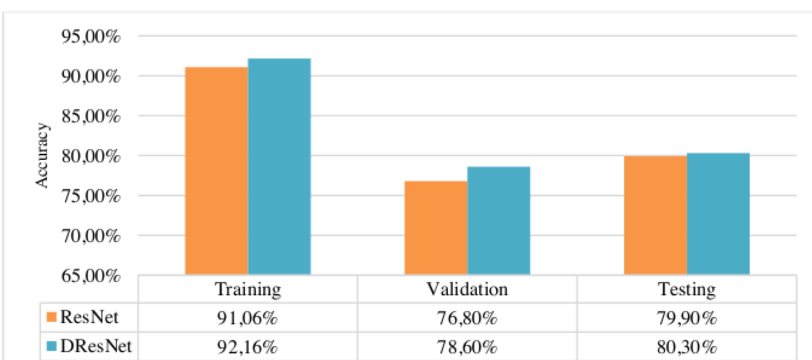


Figure 7. Experiment result of accuracy

Based on the experiment result, ResNet with dropout or namely DResNet (dropout rate less than a certain small value), accuracy will gradually increase, and loss will gradually decrease. The model can no longer be correctly fitted when dropout exceeds a certain threshold. The experimental results also show that dropouts are able to increase the accuracy of the ResNet model by adding +1.10% accuracy in the training process, adding +1.80% accuracy in the validation process, and adding +0.40% accuracy in the testing process as shown in **Figure 8**.

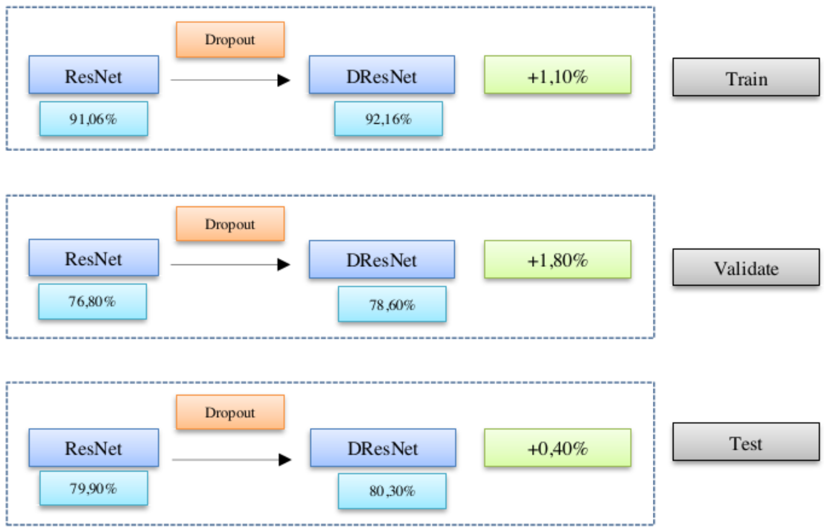


Figure 8. Effect dropout to model ResNet based on accuracy

The experimental results obtained are based on the results using the DResNet model with several parameter value settings. The basic DResNet model is ResNet50 with the addition of a global average pooling layer, flatten layer, dense layer and dropout layer. The details of the layers and parameters used can be seen in **Figure 9**.

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 resnet50 (Functional)       (None, 7, 7, 2048)        23587712

 global_average_pooling2d (G  (None, 2048)             0
 lobalAveragePooling2D)

 flatten (Flatten)           (None, 2048)              0

 dense (Dense)               (None, 4096)              8392704

 dense_1 (Dense)             (None, 1072)              4391984

 dropout (Dropout)           (None, 1072)              0

 dense_2 (Dense)             (None, 8)                 8584

=================================================================
Total params: 36,380,984
Trainable params: 12,793,272
Non-trainable params: 23,587,712
```

Figure 9. Parameter of model DResNet

4. CONCLUSION

The primary objective of this study is to construct a ResNet model with dropout regularization techniques and determine how dropout regularization affects the ResNet model's ability to detect Palembang songket fabric motifs with more data. A dataset consisting of 7,680 data for training, 960 data for validation, and 960 data for testing is prepared for use in experiments. ResNet achieved 91.06% accuracy during the training phase, 76.60% during the validation phase, and 79.90% during the testing phase. In addition, the experimental results for DResNet showed that accuracy at the training stage was 92.16%, accuracy at the validation stage was 78.5 per cent and accuracy at the submission stage was 80.3%. The experimental results also indicate that dropouts can enhance the accuracy of the ResNet model by +1.10 percentage points in the training process, 1.80 percentage points in the validation process, and 0.40 percentage points in the testing process.

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REFERENCES

[1] M. W. Swekan, S. Kanto, D. Wisadirana, and E. Susilo, "Symbolic Meaning, Social Culture, and Benefit on Economic Tanimbar Woven Fabric," *Tech. Soc. Sci. J.*, vol. 39, pp. 538–545, 2023.

[2] L. Zhang *et al.*, "All-textile triboelectric generator compatible with traditional textile process," *Adv. Mater. Technol.*, vol. 1, no. 9, p. 1600147, 2016.

[3] D. Chudasri and N. Sukantamala, "Design research with the use of visual and symmetry analysis in indigenous woven textiles," *J. Appl. Crystallogr.*, vol. 56, no. 1, 2023.

[4] H. Noprisson, E. Ermatita, A. Abdiansah, V. Ayumi, M. Purba, and M. Utami, "Hand-Woven Fabric Motif Recognition Methods: A Systematic Literature Review," in *2021 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS*, 2021, pp. 90–95.

[5] K. Sedyastuti, E. Suwarni, D. R. Rahadi, and M. A. Handayani, "Human Resources Competency at Micro, Small and Medium Enterprises in Palembang Songket Industry," in *2nd Annual Conference on Social Science and Humanities (ANCOSH 2020)*, 2021, pp. 248–251.

[6] D. Indra Sensuse *et al.*, "Lessons from Integrated Biodiversity Information System Implementation Initiatives," *Int. J. Adv. Sci. Eng. Inf. Technol.*, vol. 12, no. 4, p. 1657, Aug. 2022.

[7] Y. Jumaryadi, D. Firdaus, B. Priambodo, and Z. P. Putra, "Determining the Best Graduation Using Fuzzy AHP," in *2020 2nd International Conference on Broadband Communications, Wireless Sensors and Powering (BCWSP)*, 2020, pp. 59–63.

[8] M. Uchino, "Socio-cultural history of Palembang Songket," *Indones. Malay World*, vol. 33, no. 96, pp. 205–223, 2005.

[9] M. Purba, E. Ermatita, A. Abdiansah, V. Ayumi, H. Noprisson, and A. Ratnasari, "A Systematic Literature Review of Knowledge Sharing Practices in Academic Institutions," in *2021 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS*, 2021, pp. 337–342.

[10] H. Noprisson, E. Ermatita, A. Abdiansah, V. Ayumi, M. Purba, and H. Setiawan, "Fine-Tuning Transfer Learning Model in Woven Fabric Pattern Classification," *Int. J. Innov. Comput. Inf. Control*, vol. 18, no. 06, p. 1885, 2022.

[11] F. Wijayanti, T. R. Rohidi, and T. Triyanto, "Palembang Songket Fabric Visual Motif," *Catharsis*, vol. 8, no. 4, pp. 429–436, 2019.

[12] D. Djumrianti, R. Martini, I. Mekogga, and A. Alfitriani, "Digital Branding Model for Jumputan and Songket Fabrics: As a Continuity Strategy for Marketing Palembang Local Products," in *5th FIRST T3 2021 International Conference (FIRST-T3 2021)*, 2022, pp. 56–65.

[13] M. A. Rasyidi, R. Handayani, and F. Aziz, "Identification of batik making method from images using convolutional neural network with limited amount of data," *Bull. Electr. Eng. Informatics*, vol. 10, no. 3, pp. 1300–1307, 2021.

[14] A. E. Minarno, F. D. S. Sumadi, H. Wibowo, and Y. Munarko, "Classification of batik patterns using K-Nearest neighbor and support vector machine," *Bull. Electr. Eng. Informatics*, vol. 9, no. 3, 2020.

[15] M. A. Rasyidi and T. Bariyah, "Batik pattern recognition using convolutional neural network," *Bull. Electr. Eng. Informatics*, vol. 9, no. 4, pp. 1430–1437, 2020.

[16] R. M. Jasim and T. S. Atia, "An evolutionary- convolutional neural network for fake image detection," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 29, no. 3, p. 1657, Mar. 2023.

[17] A. S. S. M. N. Arefin, S. M. I. A. K. Ishti, M. M. Akter, and N. Jahan, "Deep learning approach for detecting and localizing brain tumor from magnetic resonance imaging images," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 29, no. 3, pp. 1729–1737, 2023.

[18] C. X. Ge, M. A. As'ari, and N. A. J. Sufri, "Multiple face mask wearer detection based on YOLOv3 approach," *IAES Int. J. Artif. Intell.*, vol. 12, no. 1, p. 384, 2023.

[19] R. Y. Patil, S. Gulvani, V. B. Waghmare, and I. K. Mujawar, "Image based anthracnose and red-rust leaf disease detection using deep learning," *TELKOMNIKA (Telecommunication Comput. Electron. Control.*, vol. 20, no. 6, pp. 1256–1263, 2022.

[20] Y. S. Devi and S. P. Kumar, "A deep transfer learning approach for identification of diabetic retinopathy using data augmentation," *IAES Int. J. Artif. Intell.*, vol. 11, no. 4, p. 1287, 2022.

[21] N. F. B. A. Halim, R. A. Bin Ramlee, M. Z. Bin Mas'ud, and A. Jamaludin, "Enhancement of automatic classification of arcus senilis-nonarcus senilis using convolutional neural network," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 28, no. 1, pp. 210–220, 2022.

[22] A. Musha, A. Al Mamun, A. Tahabilder, M. J. Hossen, B. Jahan, and S. Ranjbari, "A deep learning approach for COVID-19 and pneumonia detection from chest X-ray images.," *Int. J. Electr. Comput. Eng.*, vol. 12, no. 4, 2022.

[23] Z. T. Omer and A. H. Abbas, "Image anomalies detection using transfer learning of ResNet-50 convolutional neural network," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 27, no. 1, p. 198, Jul. 2022.

[24] I. Nasri, M. Karrouchi, H. Snoussi, K. Kassmi, and A. Messaoudi, "DistractNet: a deep convolutional neural network architecture for distracted driver classification," *IAES Int. J. Artif. Intell.*, vol. 11, no. 2, p. 494, 2022.

[25] A. G. Diab, N. Fayez, and M. M. El-Seddek, "Accurate skin cancer diagnosis based on convolutional neural networks," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 25, no. 3, pp. 1429–1441, 2022.
[26] N. Boonsirisumpun and W. Puarungroj, "Loei fabric weaving pattern recognition using deep neural network," in *2018 15th International joint conference on computer science and software engineering (JCSSE)*, 2018, pp. 1–6.
[27] W. Puarungroj and N. Boonsirisumpun, "Recognizing hand-woven fabric pattern designs based on deep learning," in *Advances in Computer Communication and Computational Sciences*, Springer, 2019, pp. 325–336.
[28] Y. Rizki, R. M. Taufiq, H. Mukhtar, F. A. Wenando, and J. Al Amien, "Comparison Between Faster R-CNN and CNN in Recognizing Weaving Patterns," in *2020 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS)*, 2020, pp. 81–86.
[29] M. A. Iqbal Hussain, B. Khan, Z. Wang, and S. Ding, "Woven fabric pattern recognition and classification based on deep convolutional neural networks," *Electronics*, vol. 9, no. 6, p. 1048, 2020.
[30] A. F. Siregar and T. Mauritsius, "Ulos fabric classification using android-based convolutional neural network," *Int. J. Innov. Comput. Inf. Control*, vol. 17, no. 3, pp. 753–766, 2021.
[31] U. Choden and P. Riyamongkol, "Bhutanese Textile Recognition Using Artificial Deep Neural Network," in *2022 4th Asia Pacific Information Technology Conference*, 2022, pp. 1–8.
[32] L. Rice, E. Wong, and Z. Kolter, "Overfitting in adversarially robust deep learning," in *International Conference on Machine Learning*, 2020, pp. 8093–8104.
[33] R. K. Samala, H. Chan, L. Hadjiiski, M. A. Helvie, J. Wei, and K. Cha, "Mass detection in digital breast tomosynthesis: Deep convolutional neural network with transfer learning from mammography," *Med. Phys.*, vol. 43, no. 12, pp. 6654–6666, 2016.
[34] W. Puarungroj, P. Kulna, T. Soontarawirat, and N. Boonsirisumpun, "Recognition of Thai Noi characters in palm leaf manuscripts using convolutional neural network," in *Asia-Pacific Conference on Library & Information Education and Practice (A-LIEP)*, 2019, pp. 408–415.
[35] Y. Gultom, A. M. Arymurthy, and R. J. Masikome, "Batik Classification using Deep Convolutional Network Transfer Learning," *J. Ilmu Komput. dan Inf.*, vol. 11, no. 2, p. 59, 2018.
[36] J. Hu, B. Weng, T. Huang, J. Gao, F. Ye, and L. You, "Deep Residual Convolutional Neural Network Combining Dropout and Transfer Learning for ENSO Forecasting," *Geophys. Res. Lett.*, vol. 48, no. 24, p. e2021GL093531, 2021.
[37] P. Chhikara, P. Singh, P. Gupta, and T. Bhatia, "Deep convolutional neural network with transfer learning for detecting pneumonia on chest X-rays," in *Advances in Bioinformatics, Multimedia, and Electronics Circuits and Signals*, Springer, 2020, pp. 155–168.

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