

CHAPTER I

INTRODUCTION

1.1. Research Background

Puppet is a form of art, culture, and traditional performance presented by a puppeteer (*dalang*) that originated in rural communities in the Bali region. Therefore, puppet can be considered a type of traditional local cultural identity that possesses high artistic value (Krishna & Suadnyana, 2020). Shadow puppet is a cultural heritage passed down from the past, internationally recognized and acknowledged by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2003 (Prabowo et al., 2021). In fact, UNESCO designated shadow puppet as a "Masterpiece of the Oral and Intangible Heritage of Humanity" (Wibawa et al., 2021).

One of the epics originating from India, the Ramayana, is an important literary work in Hindu tradition. The Ramayana is not only a historical narrative but also a work that provides guidance in ethics, spirituality, and morality (Kustiari, 2024). This epic has been preserved across generations and has been visually transformed into the form of Balinese shadow puppet theater (Bratanatyam, 2018). However, beyond the profound meanings contained in the Ramayana epic presented through Balinese shadow puppets, there exists a challenge modern society. The younger generation tends to be drawn toward modernization, making it increasingly difficult for them to appreciate traditional arts such as shadow puppetry. Therefore, the advancement of the times and the demand for modernization present a significant

challenge to the existence of traditional arts, particularly shadow puppet (Fauziah et al., 2020).

This is evidenced by a preliminary study conducted on teenagers in the Special Region of Yogyakarta (DIY) aged 12 to 19, which found that the younger generation's interest in puppet including watching or attending shadow puppet performances was categorized as low (Wibowo et al., 2024). This challenge is further compounded by the visual similarities among the shadow puppet characters themselves, especially those in the Ramayana shadow puppets. One traditional puppet craftsman, who has inherited the craft through generations, stated that these visual similarities are difficult to distinguish for those who are not deeply familiar with puppet. Unlike characters with low visual similarity such as Rama, Shinta, Lakshmana, and Rahwana who are easier to recognize the monkey characters in the Ramayana story are much harder to distinguish. According to the puppet craftsman, characters like Hanuman, Sugriwa, Anggada, Jembawan, Anila, Anala Gini, Kesari, Sampati, Sarpa Muka, Mong Muka, Indra Janur, Asti Muka, and Gawaksa share a high degree of visual similarity.

Observing this phenomenon, a digital innovation is needed to support the introduction of Balinese shadow puppet culture, particularly the monkey characters in the Ramayana story. Therefore, a model was developed to detect monkey characters in puppet using the Convolutional Neural Network (CNN) method. CNN is a neural network method used to process image data and to detect and recognize objects within an image (Yanda et al., 2023). CNN is an image processing method that operates using kernels and extracts features from input data through convolution operations (Radikto et al., 2022). This model was created by applying

learning to shadow puppet images using the CNN algorithm with ResNet-50 and VGG-16 architectures.

Several studies have demonstrated the performance of these two CNN architectures. A study by Miranda et al. (2020) on fingerprint classification using ResNet-50 was conducted on 8-bit grayscale fingerprint images with a size of 512x512 pixels and a dataset of 2,100 images. The results of this study showed that the automatic fingerprint pattern classification system using the ResNet-50 architecture achieved a training accuracy of 99.52%, validation accuracy of 95.05%, training loss of 0.016, and validation loss of 0.229. Another study by Noorizki and Kusumawati (2023) compared the performance of the VGG-16 and VGG-19 algorithms using the CNN method to classify rice varieties. This study resulted in a performance comparison between the VGG-16 and VGG-19 algorithms in classifying five rice variety classes. The result showed that VGG-16 outperformed VGG-19, with an accuracy of 98% for VGG-16 and 97% for VGG-19.

Based on the aforementioned studies, this model was developed using the ResNet-50 and VGG-16 architectures. The training process was carried out under specific conditions, both in terms of parameter usage and data preprocessing before training. This was done with the aim of determining the level of accuracy achieved using ResNet-50 and VGG-16. The dataset was built from 14 classes, representing 14 monkey characters from the Ramayana shadow puppet story, consisting of Hanuman, Sugriwa, Anggada, Jembawan, Anila, Anala Gini, Kesari, Sampati, Sarpa Muka, Mong Muka, Indra Janur, Asti Muka, Gawaksa, and Menda. The

dataset was collected by taking photos of the characters from a source using a camera.

1.2. Problems Identification

Based on the background of the identified problems, there are several issues addressed in this study, including.

- a. The decline in the continuity of Balinese shadow puppet art due to the lack of interest from the younger generation, who are increasingly influenced by modern developments and changes, leading them to abandon traditional Balinese shadow puppetry.
- b. The lack of awareness among the public, especially the younger generation, regarding the monkey characters in the Ramayana puppet, which contributes to the loss of traditional arts and cultural identity within their community.
- c. Identification of the monkey character in the Ramayana puppet show is difficult to do even under direct observation conditions, because of the visual similarities between the characters such as facial shape, color, and other attributes.
- d. The need for a technology based innovation to introduce and preserve Balinese puppet art, especially in recognizing monkey characters in the Ramayana puppet.

1.3. Research Questions

The following are the research questions that form the focus of this study.

- a. How is the process of collecting and processing the dataset of monkey characters in the Ramayana wayang?
- b. How is the implementation of CNN with ResNet-50 and VGG-16 architectures for the classification of monkey characters in the Ramayana shadow puppets?
- c. How is the accuracy of the monkey character classification model using the CNN algorithm with ResNet-50 and VGG-16 architectures?

1.4. Research Limitations

This study has several limitations as follows.

- a. The classification of monkey characters in the Balinese Ramayana shadow puppets focuses on puppet originating from Nagasepaha Village, Buleleng District, Bali.
- b. The dataset used in this research consists of only 14 monkey characters from the Ramayana wayang, namely Hanuman, Sugriwa, Anggada, Jembawan, Anila, Anala Gini, Kesari, Sampati, Sarpa Muka, Mong Muka, Indra Janur, Asti Muka, Gawaksa, and Menda. Out of the 17 available characters, 3 were excluded from the dataset. Two of them, Subali and Sugriwa, are twin characters with highly similar visual features, which may lead to class overlap and decrease the model's performance; therefore, only one of them was selected to avoid classification bias. In addition, the character Anjani was excluded because her monkey features appear only on the facial area, making her visual characteristics inconsistent with the

other monkey characters, which generally display a full-body monkey form.

1.5. Research Objectives

The objectives of this study are as follows.

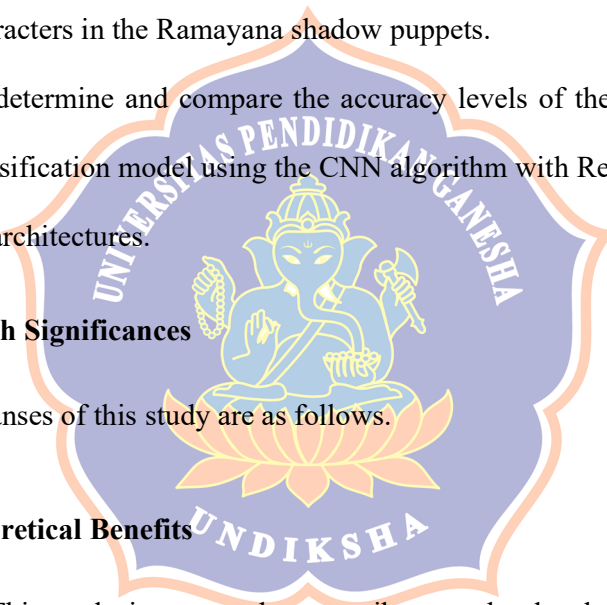
- a. To collecting and processing the dataset of monkey characters.
- b. To implement the Convolutional Neural Network (CNN) algorithm with ResNet-50 and VGG-16 architectures in classifying images of monkey characters in the Ramayana shadow puppets.
- c. To determine and compare the accuracy levels of the monkey character classification model using the CNN algorithm with ResNet-50 and VGG-16 architectures.

1.6. Research Significances

The significances of this study are as follows.

1.6.1. Theoretical Benefits

- a. This study is expected to contribute to the development of scientific knowledge, particularly in the fields of computer vision and deep learning, through the application of the Convolutional Neural Network (CNN) algorithm with ResNet-50 and VGG-16 architectures for classifying images of Ramayana shadow puppets.



1.6.2. Benefits for the Author

- a. To provide the author with hands-on experience in applying the Convolutional Neural Network (CNN) method to classify images of Ramayana shadow puppets.
- b. To deepen the author's understanding of the image classification process of Ramayana shadow puppets.

1.6.3. Practical Benefits

- a. To provide a reference for developers of cultural education applications in building an automatic classification system to introduce puppet characters to younger generations.
- b. To facilitate the public, especially enthusiasts of traditional culture and arts, in accurately identifying and distinguishing monkey characters in Balinese Ramayana shadow puppets.
- c. To support the preservation of traditional culture through the integration of artificial intelligence technology, ensuring that local cultural values continue to be recognized and passed down in digital form.