CHAPTER I
INTRODUCTION

This section outlines the core elements underpinning the research, beginning with the background to highlight the study's urgency and a general overview of the methodology. Subsequently, the research questions are presented to specify the issues under investigation, followed by the research objectives and significance, which demonstrate the value of the outcomes. Furthermore, the scope of the study is defined to ensure a clear and well-directed research focus.

1.1. Background of the Study

Indonesia is the fourth largest archipelagic country in the world. According to the Statistical Yearbook of Indonesia 2023 published by Statistics Indonesia (BPS), the Indonesian population in mid-2023 was estimated to reach approximately 278.7 million people [1]. The demographic diversity of Indonesia generates a vast cultural heritage, encompassing languages, traditions, arts, and orthographic writing systems. Among hundreds of indigenous languages, several possess unique scripts utilized for vernacular writing. One of the most prominent is the Javanese script, locally known as *Hanacaraka*, which is widely utilized in Central and East Java, particularly within the regions of Central Java, Yogyakarta, and parts of East Java [2]. This script is employed to write both classical and modern Javanese, and is documented in various ancient manuscripts, inscriptions, royal documents, and traditional literary works.

However, along with modern advancements, the daily utilization of the Javanese script has severely declined. Currently, the script is predominantly taught only within Javanese language courses in schools across Central Java, Yogyakarta, and parts of East Java, whereas its application outside academic settings is virtually nonexistent. In daily practice, society favors the Latin alphabet, which is considered more practical, versatile, and aligned with modern communication demands. A study by Iskandar (2023) indicates that the diminishing use of the Javanese script is influenced by its minimal role in daily life and social interactions, causing younger generations to increasingly lack mastery over it [3]. This condition has marginalized the Javanese script, thereby necessitating alternative preservation efforts through

technological approaches, one of which is the development of automated script recognition methods.

In the field of computer science, specifically in image processing, the problem of Javanese script recognition presents an intriguing yet challenging topic. The Javanese script exhibits complex character shapes characterized by distinctive curves and visual details. The challenge is further compounded in handwritten text, where individual writing styles yield exceptionally high variations in character forms. Consequently, research in this domain is directed toward identifying more effective and efficient Javanese script recognition methods. Several prior studies indicate that traditional feature extraction methods, such as Local Binary Pattern (LBP) combined with Multi-SVM, achieved an accuracy of 90%, yet remained constrained in capturing complex patterns [4]. Approaches utilizing Histogram of Oriented Gradients (HOG) and Random Forest attained a higher accuracy of 97.7%, but required intricate preprocessing steps, such as thinning and cropping, which hinder practical implementation [5]. Furthermore, previous literature demonstrates that Multiclass SVM yields an accuracy of approximately 81.3% in Javanese script document recognition; however, other studies note that this performance is susceptible to noise and image variations, thus demanding precise preprocessing [6].

Based on these prior studies, several research gaps can be identified. First, traditional methods still exhibit limitations when handling real-world data variations. Second, although high accuracy can be achieved by certain methods, the results heavily depend on complex preprocessing pipelines. Third, there remains a paucity of research exploring the combination of modern transfer learning with classical algorithms to overcome dataset limitations and enhance generalization capabilities.

A potential solution to address these challenges is the utilization of MobileNetV3 for feature extraction, given that it is a lightweight and efficient Convolutional Neural Network (CNN) architecture frequently employed as a transfer learning backbone [7][8]. MobileNetV3 offers two variants, namely Large and Small, where MobileNetV3-Small is more lightweight, faster, and requires lower computational resources than the Large variant, making it highly suitable for constrained yet complex datasets such as handwritten Javanese script. Empirical research demonstrates that MobileNetV3 is capable of generating robust feature representations for specialized domain classification [9][10]. In this study, features extracted from MobileNetV3-

Small are combined with Support Vector Machine (SVM), which is renowned for its effectiveness in classifying high-dimensional data [11]. This approach is supported by the study titled *"Wildfire Identification Based on an Improved MobileNetV3-Small Model,"* which successfully achieved an accuracy of 98.75% through the combination of MobileNetV3-Small and SVM [11], thereby demonstrating that this method can efficiently enhance classification performance compared to pure CNNs and is highly relevant for application in Javanese script recognition.

In addition to developing the classification model, this study is also projected to be implemented as a simple Flask-based website. Flask is a lightweight and flexible Python micro-framework extensively utilized in research to deploy Machine Learning (ML) models into simple web interfaces, as demonstrated in the iMedBot application which integrates Flask as a backend for Deep Learning (DL)-based prediction services [12]. By leveraging Flask, users can upload images of Javanese script and view the classification results instantaneously. This implementation not only demonstrates the practical performance of the model but also enhances the utilitarian value of the research.

In conclusion, this study is paramount due to the demands from both the public and academia for more effective Javanese script recognition methods, the unresolved research gaps in prior literature, the relevance of combining MobileNetV3 and SVM within the context of limited datasets, and the practical value of the research through a Flask-based implementation that supports the preservation of Javanese culture through a modern technological approach. Ultimately, this research is expected to provide significant theoretical contributions to the field of computer vision while offering a viable digital solution for cultural heritage preservation.

1.2. Problem Formulation

Based on the background outlined above, the research questions formulated for this study are as follows:

1. How is the MobileNetV3 method implemented for feature extraction of the Javanese script?
2. How does the Support Vector Machine (SVM) method perform in recognizing the Javanese script based on the features extracted by MobileNetV3?
3. How is the SVM model implemented into a Flask-based web platform?

1.3. Research Objectives

Based on the research questions presented above, the objectives to be achieved in this study are as follows:

1. To implement the MobileNetV3 method for extracting features of the Javanese script.
2. To evaluate the performance of the Support Vector Machine (SVM) method in recognizing the Javanese script based on MobileNetV3 features.
3. To deploy the SVM model into a Flask-based web platform.

1.4. Significance of the Study

Based on the research objectives outlined above, the significance of this study is formulated as follows:

1. This study is expected to contribute to the field of image processing, particularly in the domain of script recognition.
2. This research is anticipated to provide a methodological contribution to Javanese script identification by leveraging the Support Vector Machine (SVM) for classification and MobileNetV3 for feature extraction.
3. The developed model can be deployed directly onto a website, thereby facilitating user accessibility and enabling real-time, interactive, and practical applications.

1.5. Scope and Limitations

To maintain the focus of the research, the boundaries of this study are established as follows:

1. The dataset utilized exclusively comprises handwritten characters encompassing the 20 core characters of the Javanese script.
2. This study strictly focuses on the MobileNetV3 method for feature extraction and the Support Vector Machine (SVM) method for classification.
3. The scope of this research is limited to the recognition of individual characters.