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Misidentifications in Ayurvedic Medicinal Plants: Convolutional Neural Network (CNN) to Overcome Identification Confusions

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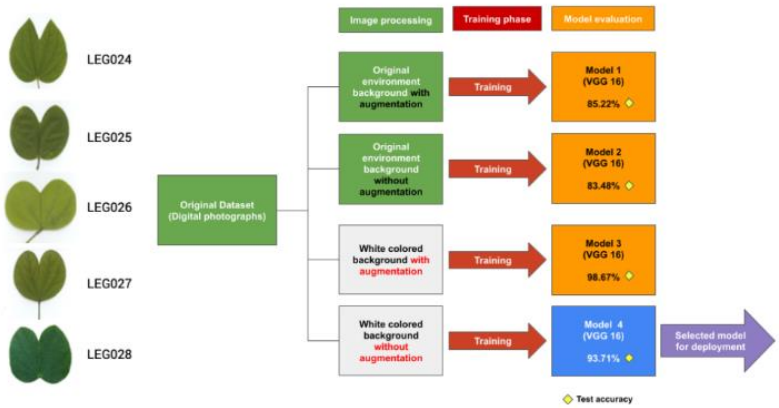

Abstract

Plants are a vital ingredient of traditional medicine in Sri Lanka, and the number of medicinal plants used differs in the literature. Field identification of plants is carried out based on various plant characteristics. Conventional identification keys are available for plant identification, but it is a complex and time-consuming process for an ordinary amateur person. This could cause confusion in the identification of plants due to a lack of professional training, the morphological similarity of leaves and other plant parts, and nomenclatural confusion of plants. Such confusion may result in misidentifying another plant(s) as the intended medicinal plant(s), which may cause unsafe consequences. The objectives of the research were to list the flowering plants used for medicinal purposes in Sri Lanka using multiple detailed botanical literature, identify medicinal plants that are confused with other medicinal or non-medicinal plants using literature and a questionnaire survey, and develop artificial intelligence (AI) based technology to distinguish confusing plants. The study prepared a list of 1377 flowering plants cultivated and used in Sri Lanka as medicinal plants. Fifty-three medicinal plants that are confused with 63 medicinal and non-medicinal plant species were identified by two surveys. The convolutional neural network (CNN) solution experimented with five species of the *Bauhinia* genus with close morphologically similar leaves with a high misidentification possibility. Using CNN Visual Geometry Group 16 (VGG16) for classification, four models were tested, and Model 4, which was trained using the augmented dataset with white-coloured background, resulted in a training accuracy of 99.68% and a validation accuracy of 93.71%. Therefore, this model was selected as the best model due to its generalized performance. The study suggests the potential of using image processing technology with selected leaf characteristics for the identification of medicinal plants from morphologically similar confusion.

Keywords: ayurvedic medicinal plants, convolutional neural networks, morphologically similar plants, plant misidentification, VGG16