UNDERGRADUATE THESIS

HANDWRITTEN KATAKANA CHARACTER RECOGNITION USING RESNET-18 WITH CLAHE-BASED IMAGE ENHANCEMENT

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Hereby declares that this undergraduate thesis contains no part of any other scientific work that has been submitted to obtain an academic degree at any higher education institution. Furthermore, it does not contain any work or opinions previously written or published by others, except for those which are explicitly cited in this thesis and listed completely in references.

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ABSTRACT

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Handwritten Katakana characters exhibit substantial variations in writing styles and high inter-character similarity, making their classification a challenging task. This study aims to analyze the performance of a transfer learning-based ResNet-18 model for handwritten Katakana character classification, evaluate the effect of applying Contrast Limited Adaptive Histogram Equalization (CLAHE), and compare the model performance before and after CLAHE enhancement. The research process consists of dataset collection, image preprocessing, dataset splitting, model training, hyperparameter tuning, and model evaluation using accuracy, precision, recall, and F1-score metrics. The best configuration was obtained using a dataset split ratio of 70:15:15, a learning rate of 0.001, a batch size of 16, the Adam optimizer, 50 epochs, a clip limit of 2.0, and a tile grid size of 8 × 8. The ResNet-18 model with CLAHE achieved an accuracy of 95.10%, precision of 95.43%, recall of 95.10%, and F1-score of 95.09%, whereas the model without CLAHE achieved an accuracy of 89.75%, precision of 91.19%, recall of 89.85%, and F1-score of 89.94%. These results demonstrate that CLAHE enhances image quality and improves the ability of the ResNet-18 model to classify handwritten Katakana characters. Therefore, the combination of CLAHE and ResNet-18 is effective in improving classification performance.

Keywords: Handwritten Katakana Characters, Katakana, ResNet-18, Transfer Learning, CLAHE

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The author realizes that this thesis still has limitations. Therefore, constructive criticism and suggestions are highly appreciated for future improvements. The author hopes that this thesis will be beneficial and serve as a reference for future studies.

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Author

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