



UNDERGRADUATE THESIS

COMPARING U-NET-RESNET34 AND MODIFIED DEEP SEMANTIC BINARIZATION NETWORK FOR INDONESIAN ANCIENT DOCUMENT SEGMENTATION

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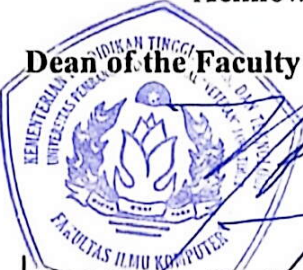
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ABSTRACT

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Thesis Title: Comparing U-Net-ResNet34 and Modified Deep Semantic Binarization Network for Indonesian Ancient Document Segmentation.
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Indonesian ancient documents and manuscripts possess high historical value, but they often suffer from degradation that complicates the digitization process, particularly in the text and background binarization stage. This study aims to compare the performance of U-Net-ResNet34 and the Modified Deep Semantic Binarization Network (MDSBN) for Indonesian ancient document segmentation, while also using U-Net and ResNet34 as baseline models. The research stages include image preprocessing using grayscale conversion, median filtering, and CLAHE, image patch extraction, model training, performance evaluation, and computational requirement testing. The models were trained using BCEWithLogitsLoss and evaluated using Dice, IoU, precision, recall, RMSE, number of parameters, training time, inference time, and memory usage. The testing results based on micro average show that MDSBN slightly outperformed U-Net-ResNet34, achieving a Dice performance of 0.8545, IoU of 0.7459, precision value reaching 0.8600, recall performance 0.8490, and RMSE of 0.1529, while U-Net-ResNet34 achieved a Dice performance of 0.8535, IoU of 0.7445, precision value reaching 0.8581, recall performance 0.8490, and RMSE of 0.1535. Among the baseline models, U-Net achieved the highest Dice and IoU scores of 0.8559 and 0.7480, respectively, whereas ResNet34 achieved the lowest performance with a Dice performance of 0.3156 and an IoU value 0.1874. In terms of computational requirements, MDSBN has fewer parameters, totaling 15,327,681 compared to 24,349,441 for U-Net-ResNet34, but U-Net-ResNet34 has a faster inference time of 2.38 ms per image compared to 9.08 ms per image for MDSBN. Based on these results, MDSBN can serve as a competitive alternative with a smaller number of parameters, while U-Net-ResNet34 is superior in terms of inference efficiency.

Keywords: Document binarization, Indonesian ancient manuscripts, U-Net-ResNet34, MDSBN, image segmentation.

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The author acknowledges that this thesis may still contain limitations and areas for improvement. Therefore, constructive comments and suggestions are sincerely welcomed to enhance the quality of this work. It is hoped that this thesis will provide valuable insights and contribute to future studies in the related field, while also serving as a useful reference for readers and researchers.

Surabaya, July 15, 2026

Author

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