UNDERGRADUATE THESIS

THE U-NET AND PIX2PIX GAN APPROACHES FOR IMAGE COLOR CORRECTION IN PEOPLE WITH COLOR BLINDNESS

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THE U-NET AND PIX2PIX GAN APPROACHES FOR IMAGE COLOR CORRECTION IN PEOPLE WITH COLOR BLINDNESS

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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

Student Name / NPM	:	Milen Juventus Dappa Deke / 22081010259
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Color perception disorders limit an individual's ability to distinguish colors and accurately recognize objects. This study aims to develop a deep learning-based image color correction system to improve the visual quality of people with color blindness. The research stages include data processing such as data validation, resizing images to 256×256 pixels, converting RGB color space to LMS, and simulating CVD types before splitting the training and test data. The evaluated models include U-Net, Pix2Pix, and a combination of both. Performance was measured using PSNR, SSIM, Delta E metrics, and a user test involving 15 respondents. Experimental results showed that the U-Net model with a learning rate of 0.0003 delivered the best performance with a PSNR of 22.30, SSIM of 0.8405, and Delta E of 10.65. Specifically, the highest model effectiveness was found in the deuteranopia category, while protanopia recorded the lowest performance. Although U-Net was technically superior, user testing showed that accuracy on the original RGB images was still higher than on the corrected images, with a maximum accuracy of 76.51% for deuteranopia. This system has been implemented in a Flask-based web application for interactive accessibility. The study concludes that the U-Net model is most effective at preserving image quality, but further optimization is needed to improve the consistency of correction results across all user categories.

Keywords : Color Vision Deficiency, U-Net, Pix2Pix, Color Correction, Deep Learning.

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Surabaya, June 04, 2026

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