PROJECT REPORT

AUTOMATIC VISUAL MANIPULATION IDENTIFICATION: USING CONVOLUTIONAL NEURAL NETWORK ALGORITHMS TO DETECT ORIGINAL VERSUS EDITED FACE PICTURE

DEVI MELIA SARWONO
21.K1.0033

FACULTY OF COMPUTER SCIENCE
SOEGIJAPRANATA CATHOLIC UNIVERSITY
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ABSTRACT

The rapid development of digital editing technologies has made distinguishing between authentic and manipulated facial images increasingly challenging. This poses significant risks in fields requiring image authenticity, such as security, law enforcement, and journalism. This study aims to develop a Convolutional Neural Network (CNN)-based model for detecting manipulated facial images and evaluate its effectiveness across various scenarios.

Three architectures were tested: VGG16, CNN+LSTM, and GoogleNet, using a dataset of 2,041 images (1,081 real and 960 fake). Data augmentation techniques were applied to enhance variability, and hyperparameter tuning was performed to optimize model performance. Results showed that VGG16 achieved the highest accuracy (69.85%) after applying augmentation and tuning, outperforming CNN+LSTM and GoogleNet. Evaluation metrics such as precision, recall, and F1-score further confirmed VGG16's superiority in detecting spatial patterns and identifying manipulations effectively.

While the study demonstrated the feasibility of CNN architectures for manipulation detection, challenges remain, including dataset limitations, difficulty in generalizing models, and the absence of real-time detection capabilities. Future research should focus on expanding datasets, integrating advanced architectures, and developing real-time systems to enhance the robustness and applicability of manipulation detection models.

Keywords: Convolutional Neural Network, facial image manipulation detection, VGG16, CNN+LSTM, GoogleNet