

# SobelMNet: A Lightweight CNN based Approach for Median Filtering Detection in compressed images

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**Abstract**—Digital image forgery is the process of manipulating an image to deceive or mislead observers with real or manipulated content. Median filtering is widely used to smooth images and obscure traces of tampering, making its detection critical for image forensics. However, identifying median filtering becomes more complex when additional operations, such as compression, resampling, or noise addition, are applied. To address this issue, we propose a lightweight convolutional neural network (CNN) model named SobelMNet, specifically designed for detecting median filtering in compressed images. The proposed model utilises a Sobel filter-based preprocessing step to enhance the residual differences between the original and manipulated images. These residuals, which capture subtle features indicative of median filtering, are analysed by CNN for classification. Further, the proposed model is evaluated on grayscale low-resolution images generated from the Dresden dataset for both binary and multiclass classification tasks. The model achieved a remarkable detection accuracy of 99.43% in median filter detection and outperformed state-of-the-art methods in various scenarios, including combinations of median filtering with Gaussian blur, resampling, and additive white Gaussian noise (AWGN) with an average accuracy of 98.32%. Finally, its lightweight architecture ensures computational efficiency, making it practical for realworld forensic applications.

**Keyword**— Median Filter, CNN, Sobel Filter, Operation Chain



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