ISSN 2395-1621

Adversarial Learning for Constrained Image Splicing Detection

#1Prof. Nilesh Thorat, #2Nisha Tapkir, #3Harshada Pasalkar, #4Bhagyshri Ingle, #5Rutuja Pansare

nileshthorat4694@gmail.com
nishatapkir8425@gmail.com
harshadapasalkar96@gmail.com
bhagyashriingle@gmail.com
shwetapansare60@gmail.com

#1Department of Information Technology, BSIOTR, Pune, Maharashtra, India
#2345BE Student, Department of Information Technology, University of Pune, BSIOTR,Pune, Maharashtra, India.

ABSTRACT

With the rise of digital technology, digital image has gradually taken the place of the original analog photograph, and the forgery of digital image has become more and more easy and indiscoverable. Image splicing is a commonly used technique in image tampering. Digital images have become a dominant source of information and means of communication in our society. However, they can easily be altered using readily available image editing tools. In this paper, we propose a new blind image forgery detection technique which employs a new backbone architecture for deep learning which is called ResNet-conv. ResNet-conv is obtained by replacing the feature pyramid network in ResNet-FPN with a set of convolutional layers. This new backbone is used to generate the initial feature map which is then to train the Mask-RCNN to generate masks for spliced regions in forged images. The proposed network is specifically designed to learn discriminative artifacts from tampered regions. Two different ResNet architectures are considered, namely ResNet-50 and ResNet-101. The ImageNet, He_normal, and Xavier_normal initialization techniques are employed and compared based on convergence. To train a robust model for this architecture, several post-processing techniques are applied to the input images. The proposed network is trained and evaluated using a computer-generated image splicing dataset and found to be more efficient than other techniques.

ARTICLE INFO

Article History

Received: 23rd June 2021

Received in revised form : 23rd June 2021

Accepted: 25th June 2021

Published online : 26th June 2021

Keywords: Image Process, Splice Detection, ResNet

I. INTRODUCTION

Image Splicing is a process of making a composite picture by cutting some object from image and adding it to the some other image. Image Splicing is comparatively harder to detect than copy move forgery because it is easy to detect similar contours of object in the same image as they will have the same texture, transitions(curves and lines),size, etc whereas in case of image splicing different objects are introduced with different texture and image feature complexity, hence making it difficult to detect.

The advent of the internet along with the plethora of social media and other applications has made digital images a dominant source of information. They are used to document evidence for legal purposes as well as in medical imaging for diagnostic purposes, sports, and many other fields [1– 3]. While digital imaging provides numerous possibilities for creation, it can also be used to produce forged documents. Image forgery is almost as old as photography itself and started as early as 1865 when photographer Mathew Brady added General Francis P. Blair to an original photograph to make it appear that he was present as shown in Fig.

II. LITERATURE SURVEY

[1] Wei Wang, Jing Dong and Tieniu Tan proposed an EFFECTIVE IMAGE SPLICING DETECTION BASED ON IMAGE CHROMA. A color image splicing detection method based on gray level cooccurrence matrix (GLCM) of thresholded edge image of image chroma is proposed in this paper. Edge images are generated by subtracting horizontal, vertical, main and minor diagonal pixel values from current pixel values respectively and then thresholded with a predefined threshold T. The GLCMs of edge images along the four directions serve as features for image splicing detection. Boosting feature selection is applied to select optimal features and Support Vector Machine (SVM) is utilized as classifier in our approach. The effectiveness of the proposed method has been demonstrated by our experimental results.

This paper has proposed a passive color image splicing detection method based on the analysis of image chroma component. The experimental results have proved that the proposed features of Cb (or Cr) component are more effective than that of Y component. After feature extracting, feature selection (boosting feature selection) has been carried out in order to reduce feature dimensions. The detection accuracies using feature reducing were no worse than not using

[2] Can Chen, Scott McCloskey, Jingyi Yu proposed Image Splicing Detection via Camera Response Function Analysis. In this paper, we present a new technique based on the analysis of the camera response functions (CRF) for efficient and robust splicing and copy-move forgery detection and localization. In this paper, we present a novel forensic based on the Camera Response Function (CRF), which enables a more reliable detection of a wider range of manipulation processes. We specifically target splicing manipulations, where contents are extracted from one image and then copied into a new image. These usually involve a segmentation operation to delimit the content in the original image, the use of which leads to harsh boundaries between it and the background. Because existing forensic methods for splicing detection use properties of different image regions for detection, they are prone to false positives when parts of an authentic image have spatially-varying properties.

[3] Tae Hee Park, Jong Goo Han, Yong Ho Moon & Il Kyu Eom published a paper on Image splicing detection based on inter-scale 2D joint characteristic function moments in wavelet domain .In this paper, we propose an image splicing detecting method using the characteristic function moments for the inter-scale co-occurrence matrix in the wavelet domain. We construct the co-occurrence matrices by using a pair of wavelet difference values across inter-scale wavelet subbands. In this process, we do not adopt the thresholding operation to prevent information loss. We extract the high-order characteristic function moments of the two-dimensional joint density function generated by the inter-scale co-concurrent matrices in order to detect image splicing forgery. Our method can be applied regardless of the color or gray image dataset using only luminance component of an image. By performing experimental simulations, we demonstrate that the proposed method achieves good performance in splicing detection. Our results show that the detection accuracy was greater than 95 % on average with well-known four splicing detection image datasets.

III. PROPOSED SYSTEM

The dataset we get is through CASIA version 2.0. Inside there are 7491 original images and 5123 tampered images. The size of the dataset is changed to 224x224 pixels. In this experiment, we divide the dataset into two namely training set and test set. In the range 50-90% for the training set and the rest is used for test data. In compiling the dataset, we divide the data train and test data each of which there are 2 categories, namely the category of fake images and the original image. The first step we took was to divide the dataset from Casia V.2 into 2 categories: original and fake images. We normalize the image by processing the image to a size of 224x224 pixels. Then our next step is to perform analysis on the level of compression error image, from the compression result then we use the VGG 16 architecture for CNN in recognizing the original image and fake images according to the ELA. Our next step is to summarize the results of the training.

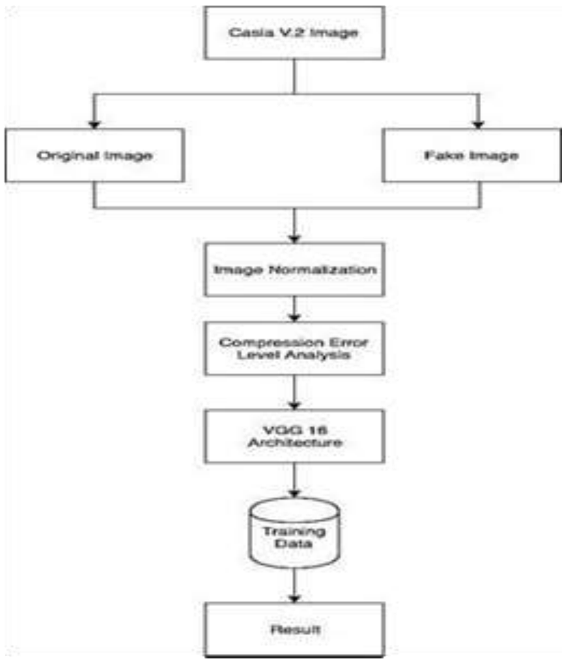

Fig 2. System architecture

IV. CONCLUSION

The resolution of forgery localization is becoming more challenging for digital image forensics. Thus, relying on

CNN, we presented an RFM-based detector for authenticating a forged image and localizing tampering region. Specifically, in order to improve the accuracy of both tampering detection and localization resolution, we focused on the design of high-pass filter, the establishment of CNN architecture, and the construction of reliability fusion map, which mainly relies on patch texture, CNN confidence, and density distribution. Extensive evaluation results empirically demonstrated that our proposed RFM-based detector outperforms the prior arts in the resolution of localization.

V. REFERENCES

[1]Dun-Yu Hsiao, Soo-Chang Pei , “Detecting Digital Tampering by Blur Estimation,” in Proc. IEEE Conf. Comput. Vis. Pattern Recognit, pp. 539–546

[2] Junwen Wang Guangjie Liu Bo Xu Hongyuan Li Yuewei Dai Zhiquan Wang, “Image Forgery Forensics Based on Manual Blurred Edge Detection ,” IEEE Transactions On Information Forensics And Security, vol. 10, no. 5, May 2015.

[3] Pravin Kakar, Student Member, "Exposing Digital Image Forgeries by Detecting Discrepancies in Motion Blur,"IEEE TRANSACTIONS ON MULTIMEDIA.

[4] IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY , "Adversarial Learning for Constrained Image Splicing Detection and Localization based on Atrous Convolution," International Conference on Social Computing IEEE, pp. 886-891, 2013.

