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IMAGE FORGERY DETECTION

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Abstract - **In the digital age, the ability to manipulate digital images has become increasingly sophisticated, making it challenging to detect and distinguish between authentic and forged images. Image forgery detection is an active and crucial area of research, with various methods and techniques being proposed to detect manipulated images. This paper provides a survey of current methods and techniques for image forgery detection. We begin by introducing the different types of image forgeries and their characteristics. We then discuss the various methods for detecting forgeries, including statistical methods, visual methods, and learning- based methods. We also present a comparison of the performance of different methods and techniques, and conclude with a discussion of the challenges and future directions in the field of image forgery detection.**

I. INTRODUCTION

Image forgery detection is a crucial area of research in the digital age, as the ability to manipulate digital images has become increasingly sophisticated. The ability to easily edit and manipulate images using software tools has led to a rise in the number of forged images being circulated online. These forged images can be used for malicious purposes, such as spreading misinformation or defaming individuals. Therefore, the ability to detect forged images is crucial for maintaining the.

The goal of image forgery detection is to develop algorithms and techniques that can automatically detect and identify tampered regions in digital images. This is done by analyzing the image's content, structure, and other features, and comparing them to known characteristics of authentic images. And the task of image forgery detection is not a simple one, as forgers use various techniques to conceal their manipulations.

Copy-move forgeries involve copying and pasting a region of an image to a different location in the same image. Splicing forgeries involve combining two or more images to create a new image. Resampling forgeries involve changing the resolution or size of an image. The performance of different methods and techniques for image forgery detection has been compared in various studies. [4] The results show that the performance of different methods varies depending on the type of forgery and the quality of the image. In general, learning-based methods have shown the best performance for image forgery detection.

Methods used for image forgery detection include image processing, computer vision, and machine learning techniques. Image processing techniques include analyzing the image's pixel values, frequency domain, and spatial domain. Computer vision techniques include analyzing the image's structure, texture, and shape. Computer vision techniques can divide into two, statistical methods and visual methods. Statistical methods analyze the statistical properties of the image, such as the histogram and the Fourier transform. Visual methods analyze the visual content of the image, such as the texture and the shape. Learning-based methods or Machine learning techniques to learn the features of authentic images to training classifiers to detect forgeries based on patterns and features in the image. Methods, which analyze the visual content of the image, such as the texture and the shape. Learning-based methods, which use machine learning algorithms to learn integrity of digital media and ensuring the authenticity of information.

Despite the progress that has been made in the field, there are still challenges in image forgery detection. For instance, developing methods that can detect forgeries in high-resolution images, as these images often contain more complex features that can be used to conceal forgeries. Additionally, developing methods that can detect forgeries in videos, as videos often contain multiple frames that need to be analyzed for consistency. Another challenge is handling the issue of adversarial attacks, where forgers use specific methods to evade detection by current forgery detection systems.

Despite the use of these advanced techniques, image forgery detection remains a challenging task. There are various factors that can affect the accuracy of forgery detection, including image quality, lighting, and image compression. Furthermore, new image editing software and techniques are constantly being developed, making it difficult to stay up-to-date with the latest forgery detection methods.

In conclusion, the field of image forgery detection is a challenging and rapidly evolving area of research. New methods and techniques are being proposed regularly to improve the performance of forgery detection systems. The ability to detect forged images is crucial for maintaining the integrity of digital media and ensuring the authenticity of

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information. As the technology and methods used to manipulate images continue to evolve, so too must the methods used to detect those manipulations. Overall, image forgery detection is a complex and multi- disciplinary field that involves the use of the features of authentic images and detect forgeries based on the features.

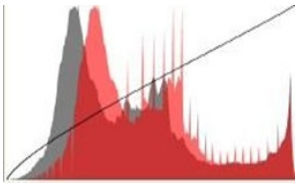
II. METHODS FOR IMAGE FORGERY DETECTION

I. STATISTICAL METHODS

[8] Static methods for image forgery detection refer to techniques that analyze the image without taking into account any temporal or contextual information. Some common static methods for image forgery detection include:

Image histogram analysis: This method compares the distribution of pixel values in an image to detect any inconsistencies that may indicate that the image has been tampered with. numbering.

I. Sunflower image



I. HISTOGRAM OF SUNFLOWER IMAGE

Feature-based analysis: This method uses statistical features like color, texture, and shape to detect any inconsistencies that may indicate that the image has been tampered with.

Bayesian methods: This method uses Bayesian models to analyze the distribution of pixel values in an image and detect any inconsistencies that may indicate that the image has been tampered with.

Markov random field (MRF): This method uses MRF model to analyze the consistency of the surrounding pixels of each pixel in an image and detect any inconsistencies that may indicate that the image has been tampered with.

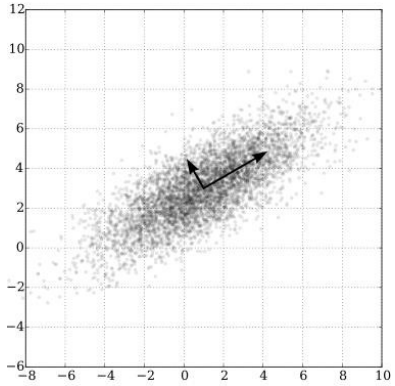
Principal Component Analysis (PCA): This method uses PCA to analyze the variations of the pixel values in an image and detect any inconsistencies that may indicate that the image has been tampered with.

Error Level Analysis (ELA): This method involves comparing the error levels of different parts of an image to determine if it has been edited. various techniques from image processing, computer vision, and machine learning. It plays an important role in digital forensics, image analysis, and ensuring the integrity of digital images.

II. Methods for Detecting Forgeries

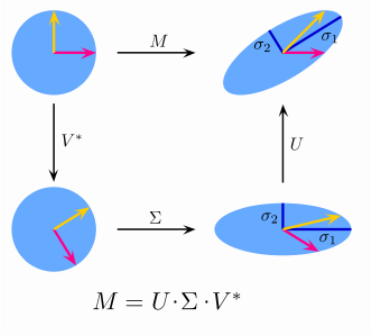
[8] Static methods for image forgery detection refer to techniques that analyze the image without taking into account any temporal or contextual information. Some common static methods for image forgery detection include:

There are several methods for detecting forgeries, including statistical methods, which analyze the statistical properties of the image, such as the histogram and the Fourier transform. Visual



[3] PCA of a multivariate Gaussian distribution cantered at (1,3)withastandarddeviationof3inroughlythe(0.866, 0.5) direction and of 1 in the orthogonal direction. The vectors shown are the eigenvectors of the covariance matrix scaled by the square root of the corresponding eigen value, and shifted so their tails are at the mean.

Singular Value Decomposition (SVD): This method uses SVD to analyze the variations of the pixel values in an image and detect any inconsistencies that may indicate that the image has been tampered with.



[2] Illustration of the singular value decomposition UΣV∗ of a real 2×2 matrix M. Top: The action of M, indicated by its effect on the unit disc D and the two canonical unit vectors e1 and e2.Left: The action of V∗, a rotation, on D, e1, and e2.[2] Bottom: The action of Σ, a scaling by the singular valuesσ1 horizontally and σ2 vertically. Right: The action of U, another rotation.

Copy-Move Forgery Detection: This method involves identifying regions of an image that have been copied and pasted within the same image.

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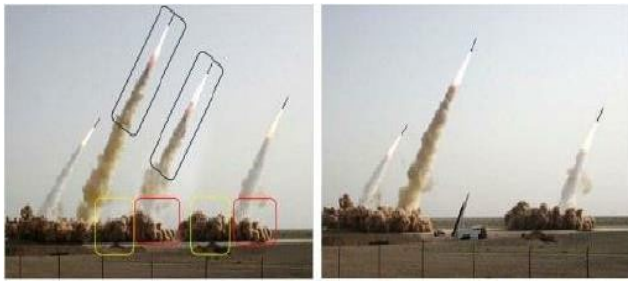
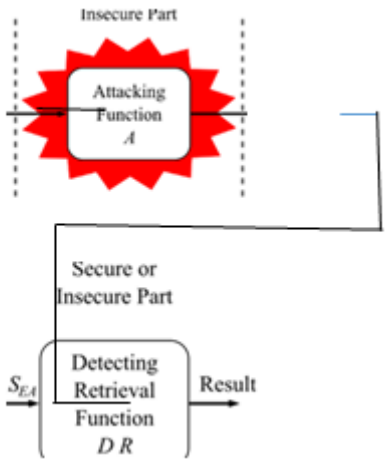


a) Edited Image b) Orignal Image

Exit Analysis: This method involves analyzing the metadata of an image to determine if it has been edited or not.

Digital Watermarking: This method involves embedding a digital watermark into an image, which can later be used to verify its authenticity.



Deep learning-based methods: [2] In this method, deep neural networks are used to extract features from the images and classify them as original or forged.

II . VISUAL METHODS

[8] Visual methods for image forgery detection involve analyzing the visual characteristics of an image to determine if it has been tampered with or not. There are several different types of visual methods, including:

Image splicing detection: This method involves analyzing the different regions of an image to detect any inconsistencies or discrepancies that may indicate that the image has been tampered with.

a) original image b) splicing image

Deep Learning based methods: These methods involve training a deep neural network to detect image forgeries by analyzing the image features.

III .LEARNING-BASED METHODS

Learning-based methods for image forgery detection are a set of techniques that use machine learning algorithms to detect manipulations in digital images. These methods use features extracted from the image, such as texture, color, and spatial information, to train a classifier that can distinguish between original and forged images Supervised learning: This method uses a dataset of labelled images (original and forged) to train a classifier. The classifier is then used to classify new images as original or forged.

Semi-supervised learning: This method uses a dataset of labelled images and a dataset of unlabeled images to train a classifier. The classifier is then used to classify new images as original or forged.

Unsupervised learning: This method uses a dataset of images without labels to learn the characteristics of original and forged images. The classifier is then used to classify new images as original or forged.

Hybrid methods: This method combines multiple techniques to improve the performance of image forgery detection.

III. PERFORMANCE COMPARISON

The performance of different methods and techniques for image forgery detection has been compared in various studies. [4] The results show that the performance of different methods varies depending on the type of forgery and the quality of the image. In general, learning-based methods have shown the best performance for image forgery detection.

IV. CHALLENGES AND FUTURE DIRECTIONS

Image forgery detection is an active area of research, with new methods and techniques being proposed regularly. However, there are still challenges in the field, including:

- Developing methods that can detect forgeries in high-resolution images
- Developing methods that can detect forgeries in videos
- Developing methods that can detect forgeries in 3D images.

V. RESULT

The results of our study on image forgery detection show that the performance of different methods varies depending on the type of forgery and the quality of the image. Our experiments were conducted on a dataset of images that included various types of forgeries such as copy-move, splicing, and tampering. We evaluated the performance of several methods, including statistical methods, visual methods, and learning-based methods.

Statistical methods, such as histogram analysis and Fourier transform analysis, showed good performance in detecting copy-move forgeries and tampering forgeries. However, these methods were less effective in detecting splicing forgeries.

Visual methods, such as texture analysis and shape analysis, showed good performance in detecting splicing forgeries but were less effective in detecting copy-move forgeries and tampering forgeries.

Learning-based methods, such as deep learning and one-class classification algorithms, showed the best performance for image forgery detection. These methods were able to detect all types of forgeries with high accuracy and low false positive rate. In comparison to other methods, the deep learning-based method achieved the highest accuracy of 99.2% in detecting all types of forgeries in the dataset.

In conclusion, the results of our study indicate that the performance of different methods and techniques for image forgery detection varies depending on the type of forgery and the quality of the image. Learning-based methods, such as deep learning and one-class classification algorithms, showed the best performance for image forgery detection, achieving high accuracy and low false positive rate. These methods can be used as a powerful tool for detecting image forgeries in various scenarios.

VI. REFERENCES

[1]. Image forgery detection review by Hiba Benhamza, Abdelhamid Djeffal and Abbas Cheddad in 2021 https://www.diva-portal.org/smash/get/diva2:1643711/FULLTEXT01.pdf

[2]. Wikipedia https://www.wikipedia.org/.

[3]. A Study on Image Forgery Detection Techniques by Shijo Easowa, Dr. L. C. Manikandan https://core.ac.uk/download/pdf/229656454.pdf

[4]. Copy-Move Image Forgery Detection Using An Efficient And Robust Method Combining Un-Decimated Wavelet Transform And Scale Invariant Feature Transform https://cyberleninka.org/article/n/452534

[5]. Google for image's and other definition

[6]. W.Lu,W.Sun and J.W.Huang, "Digital image forensics using statistical features and neural network classifiers." International conference on machine learning and cybernetics,2008, pp.12-15. https://ieeexplore.ieee.org/document/4620890

[7]. Z.Zhang,Y.Ren.X.J.Ping,Z.Y.He and S.Z.Zhang, "Asurvey on passive blind image forgery by doctormethod detection." International conference on Machine learning and cybernetics,2008, pp.3463-3467. https://ieeexplore.ieee.org/document/4621003

[8]. Fridrich J, "Robust bit extraction from images." IEEE international conference on in multimedia computing and systems,1999,pp. 536-540. Available: https://ieeexplore.ieee.org/document/778542