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Detection of Duplicate Medical Image using Convolution Neural Network

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ABSTRACT

New features are introduced in the realm of healthcare as new technologies are developed. The additional features and capabilities allow consumers to easily access medical records and receive accurate and real-time healthcare services. We must exercise extreme caution and security when it comes to our health. Because image counterfeiting is a big concern in the world of healthcare these days, image counterfeit detection has become critical. More attention is needed in the domain of medical image counterfeit detection to gain patients' trust and avoid shame. . If an image counterfeit appears in a healthcare database, it must be discovered before a condition may be diagnosed. A new method based on the Modified Convolutional Neural Network (CNN) algorithm is proposed for detecting counterfeit photographs. With this suggested method, counterfeit images are recognised with high accuracy, and efficiency is increased, allowing clients to receive highly secure smart healthcare.

Keyword – counterfeit detection, Modified Convolutional Neural Network, smart healthcare

I. INTRODUCTION

Because of the ubiquity of image editing software, changing the content of an image has become more common. When two data from the same image do not match, the image is considered counterfeit or forgery. If the image content is modified or not, two ways are used. These can be both obtrusive and non-intrusive. Some watermarking information is blended with the data in the intrusive manner. The received image's watermark did not match the aboriginal watermark on the same image. There is no watermarking in the data for non-intrusive purposes. There is no need for a watermark of the same image to validate if the received image content has changed or not. Image counterfeiting techniques are now widely employed. The following are some of the most common image faking techniques. Copy move attack, image splicing, and image retouching are examples.

Copy Move attack:

A section of a picture was copied and pasted in the same image in the copy move assault. Enlarge the region of a specific one using copy move forgery. This was necessary in order to keep some essential image information hidden.

Image Splicing:

Image splicing involves copying and pasting a single or many parts of one image into another image. The society considered picture splicing to be libellous.

Image Retouching:

It was the process of elevating picture features by attaching or subtracting something from the image. Forgery detection is critical, especially in the medical industry.

MACHINE LEARING:

Machine learning is an application of artificial intelligence (AI) that allows systems to learn and improve on their own without having to be explicitly programmed. Machine learning is concerned with the creation of computer programmes that can access data and learn on their own.

Building algorithms that can collect input data and utilise statistical analysis to anticipate an output while updating output as new data becomes available is what machine learning is all about.

DEEP LEARNING

Deep learning is an AI function that mimics the human brain's processing of data and pattern creation in order to make decisions. Deep learning is a type of machine learning in artificial intelligence (AI) that uses neural networks to learn unsupervised from unstructured or unlabeled data.

Machine learning, a self-adaptive algorithm that improves its analysis and patterns with experience or fresh data, is one of the most common AI approaches used for processing massive data.

Deep learning, a subset of machine learning, performs machine learning using a hierarchical level of artificial neural networks.

MODIFIED CONVOLUTIONAL NEURAL NETWORK

A Convolutional Neural Network (CNN) is a Deep Learning method that can take an image as input, assign importance (learnable weights and biases) to distinct aspects/objects in the image, and distinguish one from the other.

II. EXISTING METHOD

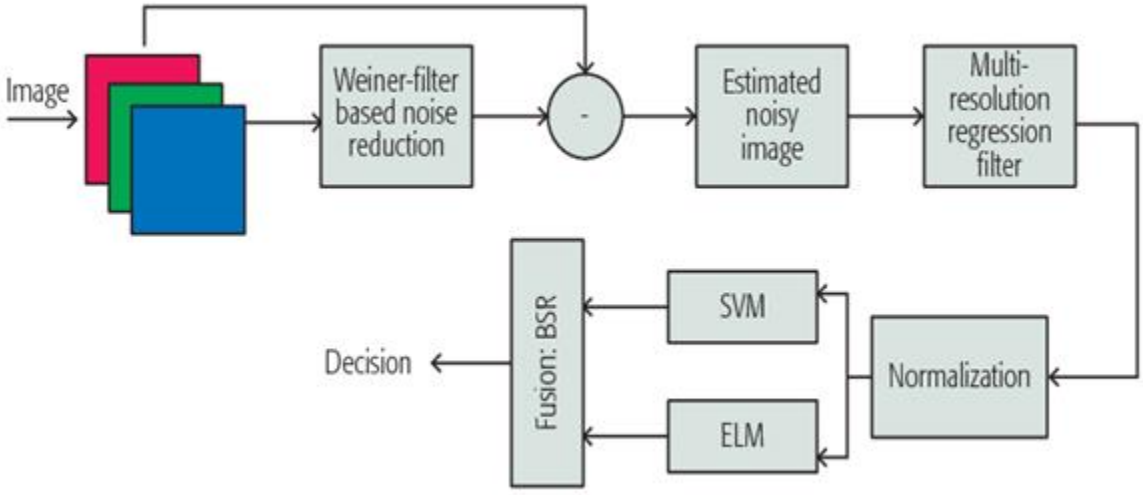

Fig 1. Proposed Methodology

The healthcare framework's medical picture forgery detection system verifies that photographs connected to healthcare have not been edited or manipulated. Decompose the image into Red, Green, and Blue channels if it's a colour image. Each component of the colour or monochrome image is subjected to the Wiener – filter. The original image is subtracted from the noise-free image to provide an estimated noise pattern. The image's fingerprint is regarded the noise pattern. This fingerprint is altered if it is forged.

The system uses an image's noise map to apply a multi-resolution regression filter, then feeds the output to support-vector-machine and extreme-learning-based classifiers. The noise map is built in an edge computing resource, while filtering and classification are performed in a core cloud computing resource. As a result, the system runs smoothly and in real time. Using the data base, the system obtained an 84.3 percent success rate.

III. PROPOSED SYSTEM

There are various components to the suggested smart healthcare architecture. Patients (clients) and doctors are represented by one component, edge computing by another, and cloud computing by yet another. Patients could live in smart homes in a smart city, while doctors and caregivers could work in any of the designated hospitals and clinics. They don't have to interact face to face; instead, they can use web or mobile apps. Any smart gadget or IoT can gather photographs or data from patients and upload them to a web app or a mobile app.

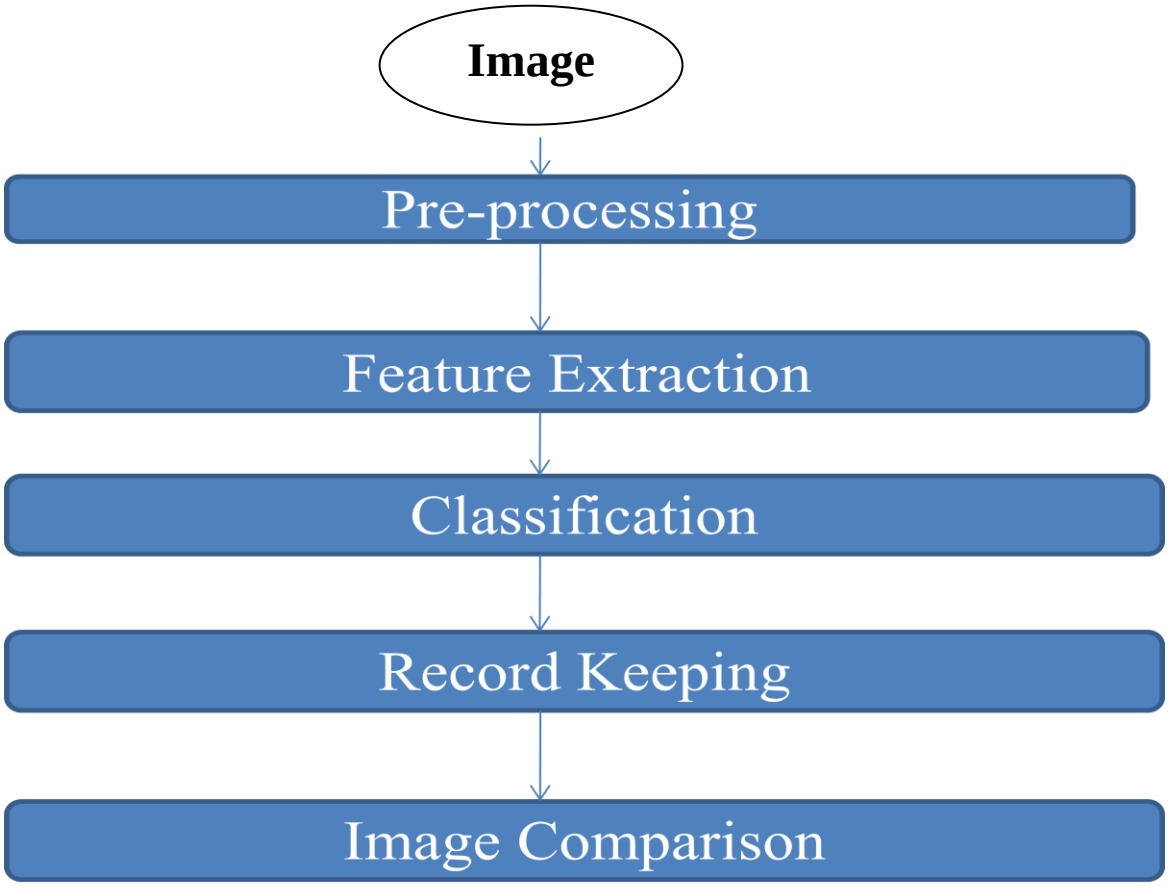

Fig 2. Flow diagram

IV. PREPROCESSING

Pre-processing is used to improve image data by suppressing undesired distortions or enhancing certain visual qualities that are relevant for later processing. Image pre-processing techniques take advantage of image redundancy. In a true image, adjacent pixels pertaining to the same item have roughly the same or similar brightness values. As a result, a deformed pixel can frequently be recovered as the average value of nearby pixels.

FEATURE EXTRACTION

Feature extraction is the process of detecting and representing specific aspects of interest inside an image for subsequent processing. It denotes the transition from visual to non-pictorial (typically quantitative) data representation. The resulting representation can then be fed into a variety of pattern recognition and classification algorithms to label, categorise, or recognise the semantic contents of the image or its objects.

CLASSIFICATION

The numerical qualities of numerous image features are analysed in image classification. CNNs are employed for picture classification and recognition because of their excellent accuracy, e.g. Mean, Euclidean distance, and so on. The CNN uses a hierarchical model that builds a network in the shape of a funnel and then outputs a fully-connected layer in which all neurons are connected to one another and output is processed.

RECORD KEEPING

To guarantee that records are easily accessible and that security needs are met. Not to be considered a diversion from patient care. By assuring high standards and continuity of care, it aids in the protection of patients' welfare. There is a desire to increase communication among healthcare professionals.

IMAGE COMPARISON

Finding differences or similarities between two photos is referred to as comparing two photographs. There may be quantitative or qualitative differences. Compare the two numerical value images and determine if they are the same or not.

The clustering algorithm K Means is used. Clustering algorithms are unsupervised algorithms, meaning they don't use labelled data. It is used to distinguish between different classes or clusters of data based on how similar the data is. Data points from the same group are more similar to each other than data points from other groups.

One of the most widely used clustering methods is K-means clustering. The number of clusters is represented by k.

Let's have a look at how K-means clustering works.

- Select k as the number of clusters you want to find.
- Assign the data points to one of the k clusters at random.
- Then figure out where the clusters' centres are.
- Calculate the distance between the data points and the cluster centres.
- Reassign the data points to the clusters closest to them, based on their distance from the cluster.
- Calculate the new cluster centre once more.
- Repeat steps 4,5 and 6 until the data points do not affect the clusters or the number of iterations is reached.

We utilize the K-Means clustering and ELM classifiers in the system since they are both excellent binary classifiers and complementary in nature. The K-Means clustering and ELM classifiers have both been successful in numerous image processing applications; however, their combination in the image forgery detection challenge has never been investigated. We explored the usage of the K-Means clustering and the ELM independently and in combination in the studies.

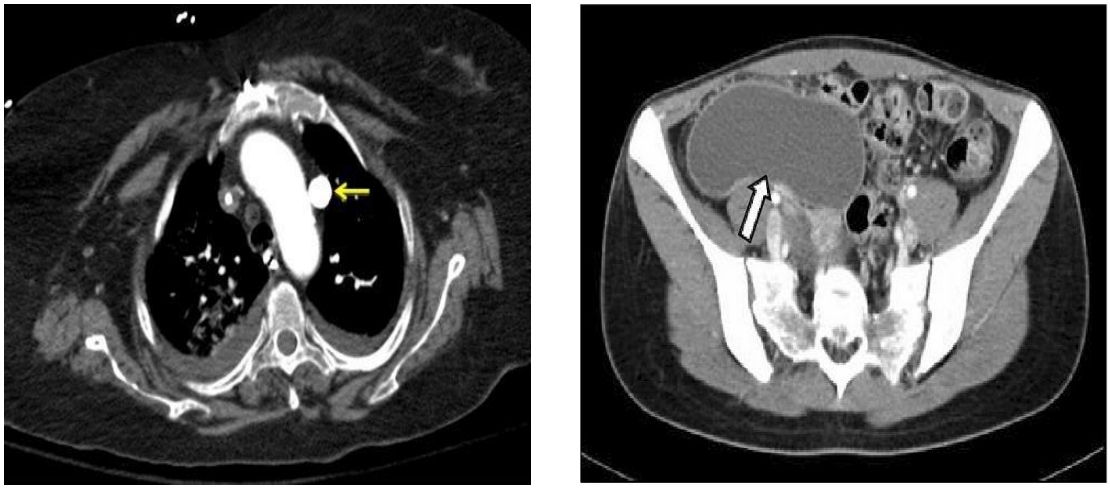

Fig 3. Duplicate Images

V. RESULT

For the two databases, the system using the ELM as the classifier achieved 97.4 and 98.2 percent accuracy, respectively. The system that used the BSR on the SVM and the ELM had the best accuracy: 98.8% and 98.9% for the two databases, respectively. The results show that the suggested system performed best when the two classifiers were combined. We can conclude from the data that the suggested method was successful in determining whether a picture was fabricated or not.

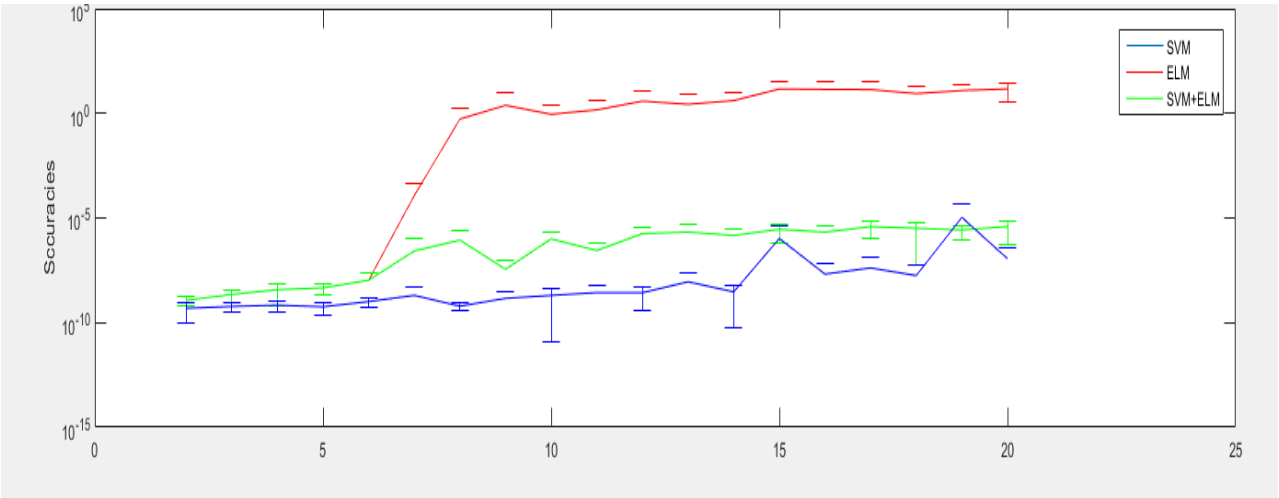

Fig 4. Result comparision

Based on the foregoing findings, we may conclude that the suggested method was successful in determining whether or not an image was fabricated. Using the database, the proposed technique achieved great accuracy. It is more accurate than other methods.

VI. ADVANTAGES

The proposed system's bandwidth need is likewise fair. We focus on non-intrusive strategies for detecting image forgery in this paper.

VII. CONCLUSION

This document is used to accurately detect the fake image. To earn patients' trust and avoid embarrassment, the field of medical image forgery detection requires further attention. CNN correctly detects the copy move photographs with an accuracy of more than 90%, while the spliced images have an accuracy of 99 percent. The proposed model will be tested on a difficult dataset in the future to ensure that it is better than the current model.

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