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10. Artificial Intelligence in Curing Skin Diseases

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Definition

1. "AI is defined as "the scientific understanding of the mechanisms underlying thought and intelligent behavior and their embodiment in machines" by the association for the advancement of artificial intelligence."[1]
2. "AI is a computer science that involves creating programs that aim to reproduce human cognition and processes involved in the analysis of complex data."[2]

1. Introduction

The largest and most delicate portion of the human body, skin protects our interior important organs and parts from the outside environment, preventing bacteria and viruses from entering. The skin also aids in the regulation of body temperature. Cells, pigments, blood vessels, and other components make up the skin. The epidermis, dermis, and hypodermis are the three primary layers that make up the epidermis.[3]

Medicine has long used computer-aided diagnoses. Deep learning, a type of machine learning algorithm, is what's different now. The system learns and improves on its own. Deep learning, like a radiologist, dermatologist, or pathologist, is able to learn from all photos in a specific database library, across hospitals, cities, or even internationally, just like a radiologist, dermatologist, or pathologist. One interesting fact about how doctors recognise disease is that it is still a mystery as to which features of a certain image are responsible for making a diagnosis.

In clinical imaging, deep learning has already demonstrated its ability to recognise and analyse patterns. Using retinal fundus pictures, a research demonstrated that its accuracy in detecting diabetic retinopathy and macular edoema was on par with board-certified ophthalmologists'. In a separate study, deep learning was found to be as accurate as dermatologists in identifying and classifying skin malignancies.

For example, IBM Watson can detect pulmonary embolisms in CT scans, and Google DeepMind can analyse retinal scans. Existing machine learning systems can be utilised. In addition to improving diagnostic accuracy, the benefits are enormous. AI is faster and more cost-effective than humans, allowing screening to be extended to nearly any site with cellular connectivity throughout the world. Preventing and treating diseases more effectively can lower healthcare expenses, as well as improving the health of individuals.

Artificial intelligence (AI) has the potential to revolutionise the way healthcare is delivered in the future. Think of a person who uses their smartphone's voice interface to interact with a virtual doctor, who prompts them to take photos of a suspicious mole or skin rash, tracks it over time, suggests possible treatments, and ultimately asks for an in-person visit to the clinic only if it becomes necessary. New uses are expected where AI may be able to objectively quantify pain from facial recognition through video, which has been challenging to date, providing additional insights to support diagnosis. Health care practitioners will continue to be the driving force behind medical treatment in this way. Their diagnostic abilities will be augmented by AI, which will save time formerly spent in tiresome image screening. Artificial Intelligence (AI) may be able to alleviate the lack of primary-care doctors and save healthcare costs. It's possible, but there are a number of roadblocks in the way of widespread adoption. In order to train a deep learning system, it is necessary to collect a large number of photos that have been verified as accurate by a variety of medical experts. We may expect that digitization of medical records will speed up this process. Clinical trials with reproducible results and diagnostic comparisons from other experts will be needed to determine whether or not deep learning is a useful diagnostic tool. For this revolution to be a success, future health care providers should be taught the fundamentals of machine learning as well, paving the way for their eventual integration into clinical practise.

However, doctors will not be replaced by AI anytime soon. The lack of explanatory power in medical AI is a major issue that has yet to be addressed. It's impossible to look for the origins of what's being observed. Skin lesions can be reliably identified and classified by this tool but it does not explain what causes them or what can be done to prevent them from occurring in the first place. For diagnosis support, the practical efficacy attained by deep learning in machine learning is considerably superior to the probabilistic graphical models created to date. While this may not be the case for some time, AI has the potential to become a vital part of the

medical team in the future, freeing up doctors to devote more time to treating their patients' unique medical conditions.

2. Skin Disease Detection System

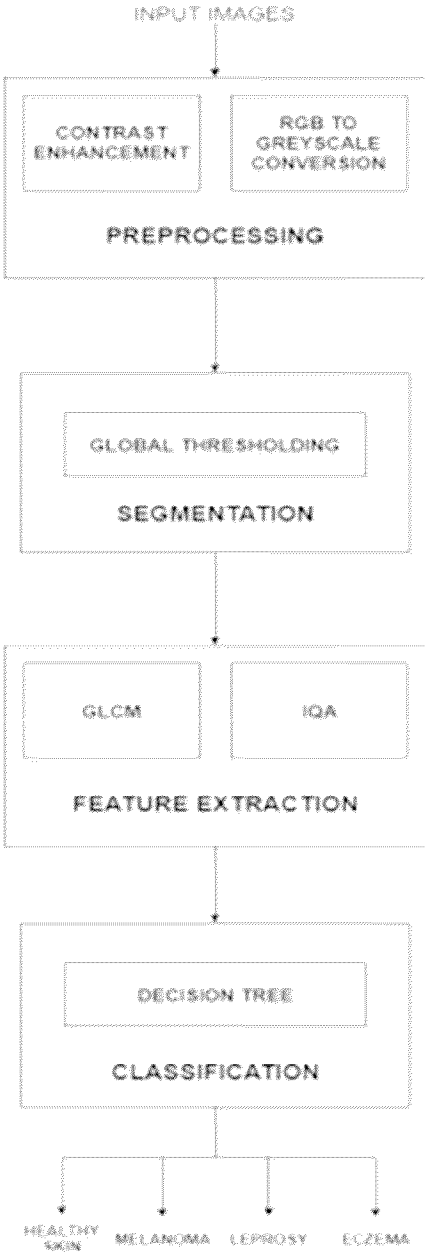
Skin illnesses are primarily diagnosed visually, beginning with a clinical screening and then possibly dermoscopic investigation. A dermatologist must be consulted to determine what type of skin illness a person has. Following this, the dermatologist uses a variety of tests, such as:

1. Patch test: A small patch of skin is exposed to allergens that have been well-documented and then removed. Tests are carried out to see if the skin reacts.
2. Biopsy: Scalpel, blade, or biposy tool are used to remove the skin, which is then sent to a lab for testing.
3. Culture: The microbe that is causing the infection can be determined by culturing the affected area's skin, hair, or nails. In order to implement such a system, a large number of experts are needed. This method is susceptible to human error because there are individuals involved. In addition to being pricey, this system requires a lot of laboratory testing, which costs a lot of money.

It is possible to detect and categorise skin diseases using a skin disease detection and classification system. Decisions based on features acquired using feature extraction methods are used to classify the data. The system must be educated to recognise normal conditions of system activity in order to detect the presence or absence of sickness[4]. There are two main phases for this purpose: training phase (constructing a profile based on data from a specific ailment) and testing phase (comparing the current image data with the trained image data).

As a result of this approach, eczema could be diagnosed more quickly and easily, as well as the severity of the condition if it was. In order to be more accurate, a huge number of calibrated photos have to be stored in the system's database. [5].

3. System Design



4. System Flow

4.1 In order to improve the clarity and contrast of the image, the system uses pre-processing techniques such as Contrast Enhancement, followed by RGB to Grayscale conversion. The image is segmented after it has been processed in order to tell apart the impacted

area (foreground) from the rest of the image (background). Feature extraction is carried out next on the segmented image. In turn, these characteristics will serve as input for classifying the ailment to which the photograph refers..

4.1.1. Image Pre-Processing

There are two steps in image pre-processing: Contrast Enhancement and Grayscale Conversion. The RGB (red/green/blue) Matrix representation of a raw binary picture is converted. In order to differentiate each pixel from its neighbour, the RGB Matrix is first processed for Contrast Enhancement and converted to a contrast enhanced RGB Matrix. Histogram equalisation is used to boost contrast. It is turned into a grayscale matrix from the contrast enhanced RGB matrix [6].

4.1.2. Segmentation

- *Thresholding :* Thresholding is the term used to describe the process of selecting candidates. Image Using thresholding, you may separate a picture into two parts: foreground and background. Image segmentation by intensity is one of the most straightforward methods. Implementing threshold at the local or global level is possible.
- *Global Thresholding :* Using global thresholding, an image may be divided into its components: the foreground and the background. This is the most basic thresholding method. Then, each pixel is scanned and labelled as either background or foreground based on its grey level.

4.2. Feature Extraction

An image's raw data will be reduced to aid in the discovery of patterns or classifications using this feature extraction procedure. To reduce the number of resources needed to describe something in larger data sets, this approach is used. In machine learning, this is a common technique for learning new things. This is a general description of the approaches used to solve these challenges by creating combinations of variables that can accurately describe the data. For this reason, the system divides this process into two parts:

4.2.1 GLCM (Grey Level Co-occurrence Matrix) Here, the image's surface texture is examined in-depth. Co-occurrence matrices for grey levels are constructed by counting the occurrences in the image of each specific pair of values in a specified spatial relationship. Using the co-occurrence matrix for grey levels, we can derive the energy, entropy, contrast, IDM, correlation, and ASM of the texture in the image in question.

4.2.2. Image Quality Assessment. It is one of the ways used to evaluate image quality. The Full reference method is used to define these terms. Features for Assessing Image Quality Two metrics, MSE and PSNR, are retrieved from the pixel-by-pixel picture segmentation.

4.3. Classification

Input data is classified after it has been determined to which category it belongs. In a decision tree, decisions and the possible outcomes of those decisions are represented as branches of the tree. The root node of a decision tree is further divided into child nodes. Chance nodes, decision nodes, and end nodes are all sorts of nodes in a decision tree. The likelihood of a particular outcome is represented by a chance node, which is depicted by a circle. There is a decision node, which is represented by a square, and an end node, which represents the final result of a decision path.

5. Conclusion

A Skin Disease Detection System is being proposed. Melanoma, Eczema, and Leprosy can all be diagnosed using this system's camera-captured photos of the skin. Images and machine learning are used in the system's design. To begin, an image is pre-processed by enhancing contrast and converting it to grayscale. Images are segmented using the Global Value Thresholding approach, which is utilised to identify the real afflicted area. Grey Level Co-occurrence Matrix is used to extract features such as Energy, Entropy, Contrast, IDM, Correlation, and ASM from the segmented picture. MSE and PSNR, both of which aid in the evaluation of image quality, are also extracted. After analysing these qualities, the image will be classified into one of three categories: healthy, eczemic or leprotic. Dermatologists can utilise this approach to better diagnose and treat their patients. Skin problems can be diagnosed at a lesser cost with the technique. More diseases and severity can be detected and classified by this approach in the future.

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