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PNEUMONIA, TUBERCULOSIS, COVID-19 DISEASE DIAGNOSIS IN X-RAY IMAGE USING DEEP LEARNING

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ABSTRACT: Deep learning methods have been quite effective at diagnosing diseases and analyzing medical images [1]. This work focuses on using deep learning algorithms to automatically identify and categorize three crucial. X-ray [2-4] pictures are used to diagnose respiratory disorders, such as COVID-19, TB, and pneumonia. Significant worldwide health challenges include COVID-19, TB, and pneumonia. Prompt and precise diagnosis is essential for efficient patient care and disease control. Conventional techniques for diagnosing these conditions frequently depend on skilled radiologists, which can be laborious and prone to interobserver variability. Convolutional neural networks (CNNs), a subclass of deep learning models, are used in this study to interpret X-ray pictures. The training and assessment dataset include hundreds of X-ray and CT scan [5-6] pictures from individuals who have been diagnosed with tuberculosis, pneumonia, Convolutional neural networks (CNNs), a type of deep learning models, are utilized in this study to interpret X-ray pictures. Thousands of X-ray pictures from patients with verified diagnoses of COVID19, TB, and pneumonia make up the training and evaluation dataset. CNNs can distinguish between normal and abnormal cases and further classify the anomalies into distinct illness groups since they are built to learn pertinent patterns and features from these images. The experimental findings show how well deep learning models diagnose COVID-19, TB, and pneumonia using X-ray pictures. The models surpass conventional techniques in terms of speed and consistency, and they attain excellent accuracy rates. Moreover, transfer learning methods are used to improve the generalization and flexibility of the model to various datasets and clinical contexts. The outcomes of this study could completely change the way that respiratory disease diagnostic and radiography are done. Deep learning-powered automated systems can help radiologists by delivering quick and accurate first evaluations, supporting early illness diagnosis, and enhancing patient outcomes. Furthermore, these models' adaptability and scalability make them useful resources for healthcare systems around the globe, particularly in settings with limited resources.

Keywords: *X-ray, COVID-19, TB, Pneumonia, Convolutional neural networks, Diagnosis*

1. INTRODUCTION

A chest X-ray is frequently used to diagnose medical conditions, particularly lung infections. Nevertheless, X-ray picture interpretation by hand can be laborious and error-prone. Image processing applications in medicine enhances the accuracy of the diagnostic procedure and helps to overcome these obstacles by automating it. In the

US alone, one million adults are hospitalized for pneumonia and 50,000 pass away from tuberculosis each year.more individuals worldwide are being affected by it. Pneumonia is the primary cause of death in low-income nations where access to diagnostic and treatment facilities is restricted. The burden of this disease is higher in these countries.

2. BLOCK DIAGRAM

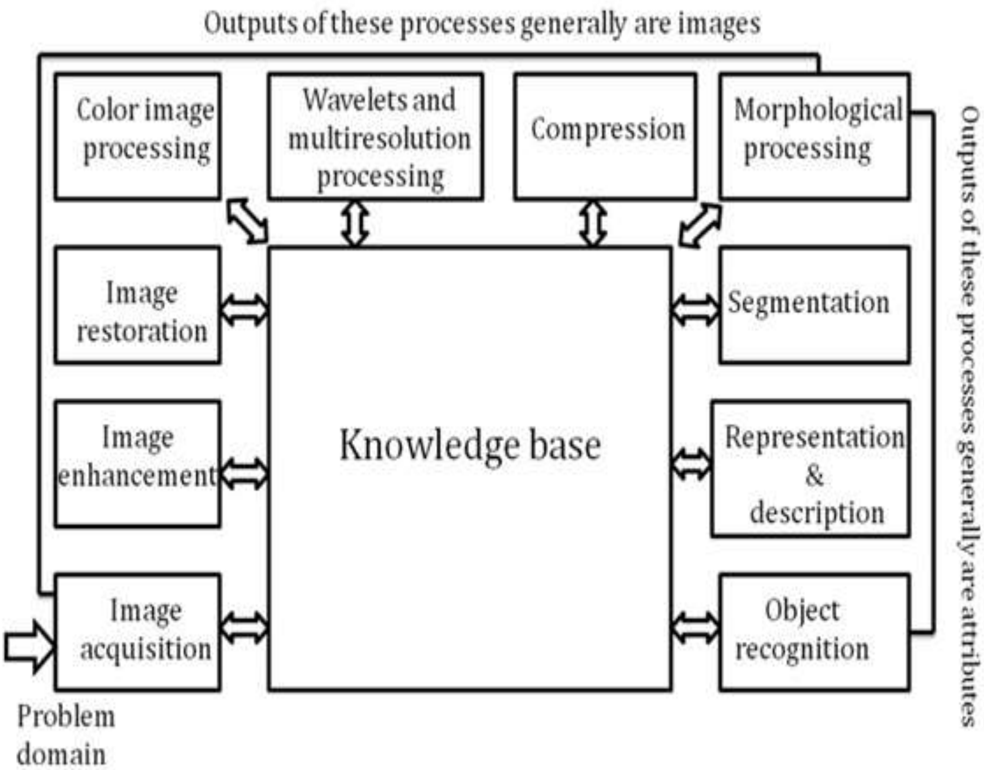

Figure 1: Image Processing System

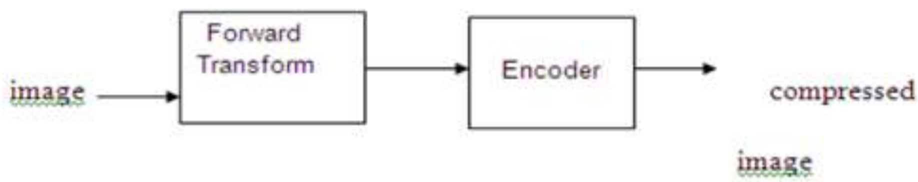

Figure 1.1.a) Block Diagram of Image compression

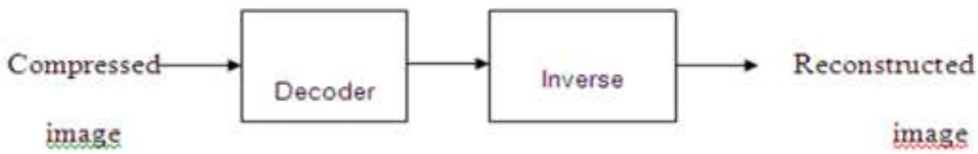

Figure 2: Image Compression model

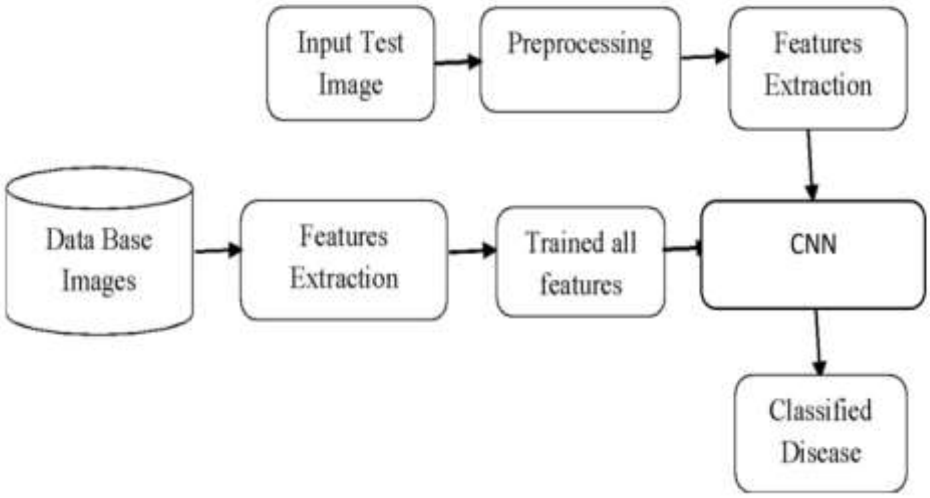

Figure 3: Block Diagram

A two-dimensional image is a picture that resembles a subject—typically a person or a physical object. A photograph, a screen display, and other two-dimensional objects are examples of images. In addition to anything three-dimensional like a statue. In addition to natural objects and phenomena like the human eye or water surfaces, they can be recorded by optical instruments like cameras, mirrors, lenses, telescopes, microscopes, and so on.

A two-dimensional figure, such as a map, graph, pie chart, or abstract artwork, can also be referred to as an image in a larger meaning. In this broader meaning, pictures can also be generated automatically using printing or computer graphics technology, handled manually through sketching, painting, or carving, or created through a combination of techniques, particularly in a fictitious photo.

A rectangular grid of pixels makes up an image. Its height and breadth, measured in pixels, are both fixed. On a certain display, every pixel is square and has a fixed size. Nonetheless, different computer monitors could employ pixels of varying sizes.

The individual pixels that make up an image are arranged in a grid consisting of rows and columns. The numbers in each pixel indicate the brightness and color magnitudes.

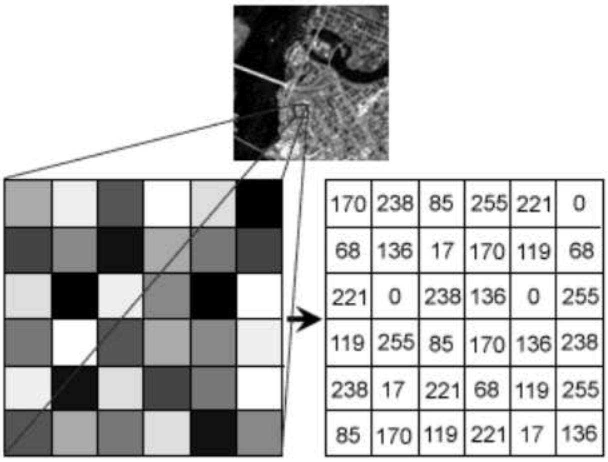

Figure 4: Gray Scale Image Pixel Value Analysis

Colors exist for every pixel. 32 bits make up the color. The redness, greenness, blueness, and transparency of a pixel are determined by the first eight bits, followed by the greenness, blueness, and transparency by the next eight bits.

Figure 5: BIT Transferred for Red, Green and Blue plane (24bit=8bit red;8-bit green;8bit blue)

The amount of bytes that rises in proportion to the number of pixels and color depth in a picture is known as the image file size. The image resolution increases with the number of rows and columns, and the larger the store. Additionally, the size of each pixel in an image grows as the color depth does. For example, an 8-bit pixel (1 byte) can store 256 colors, while a 24-bit pixel (3 bytes) may store 16 million colors—the latter of which is referred to as true color. Algorithms are used in image compression to reduce file size. Depending on the resolution and the capacity of the image-storage format, high resolution cameras generate big image files that can be hundreds of kilobytes to megabytes in size. Digital cameras with high resolution capture 12 megapixel images (1 MP = 1,000,000 pixels). pictures—or more—in authentic color.

For instance, a 12 MP camera would capture a picture that would require 36,000,000 bytes to be uncompressed because each pixel records true color using three bytes.

Memory is a large quantity of digital storage for a single image, since cameras need to record and store a large number of images in order to be useful. Image file formats were created to handle such enormous photos because of the large file sizes that could be found in cameras and on storage discs.

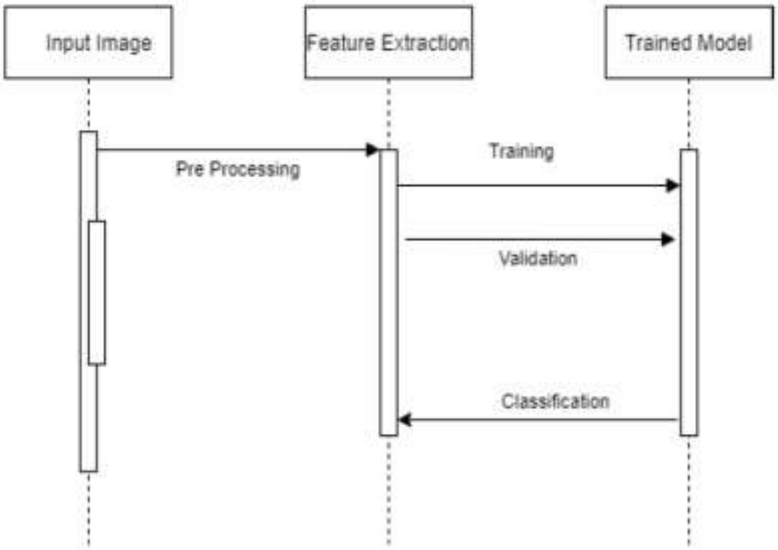

Figure 6: Sequence Diagram for pneumonia detection

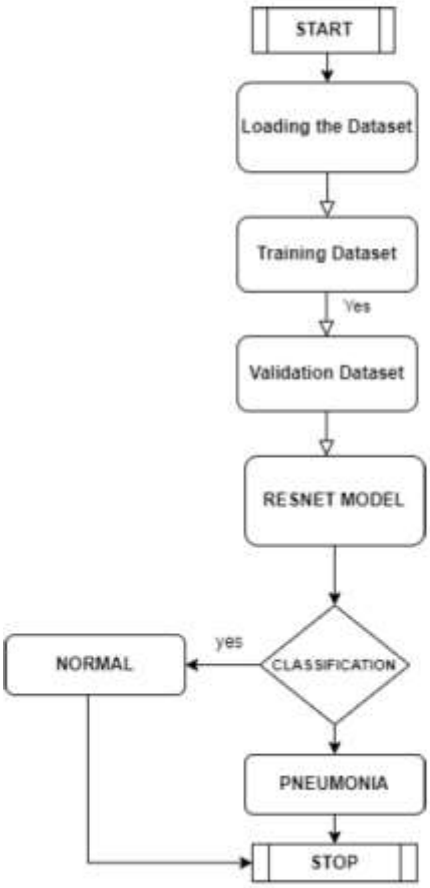

Figure 7: Flow Chart for Pneumonia Detection

3. RESULTS

The class diagram is the main building block of object-oriented modeling. It is used for general conceptual modeling of the systematic of the application, and for detailed modeling translating the models into programming code. Class diagrams can also be used for data modeling. The classes in a class diagram represent both the main elements, interactions in the application, and the classes to be programmed.

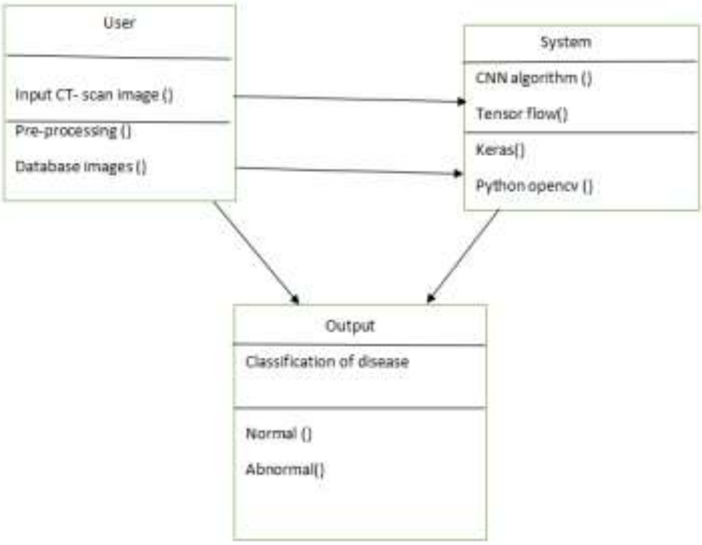

Figure 8: Class Diagram

4. CONCLUSION

This model was created to detect pneumonia from X-ray images; it is a comprehensive investigation into the process of detecting pneumonia from images. This involves the system separating positive and negative pneumonia data from an X-ray image collection. Developed originally, the model sets itself apart from other approaches that mainly rely on the process of transfer learning. Considering the amount of data used, the accuracy that the model is able to attain is really good. Only ten epochs were used in the training process, and we used photographs. Although more epochs may result in higher training accuracy, this does not guarantee that the model will predict new data well; in fact, it frequently makes things worse. Consequently, despite the role of professionals in a particular field cannot always be fully replaced by even the most advanced computers and technology. The advent of AI technology has made the presence of expert radiologists inevitable, even though the presence of mobile medical professionals is still necessary. Pneumonia that is detected early on can reduce mortality and the burden on our healthcare system. A model that recognizes every positive and negative pneumonia result from a collection of X-ray images has been made available. Medical personnel will benefit from this technology's real-time decision-making support.

5. REFERENCES

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