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Lung Disease Detection Using Machine Learning

Prof. S. S. Patil[1], Animesh Kumar[2], Atharva Allewar[3], Prathamesh Shinde[4]
Students, Department of Electronics and Telecommunication Engineering[1,2,3,4]
Sinhgad Institute of Technology, Lonavala, Pune, India
spatil.sit@sinhgad.edu[1], animeshkumar.sitentc@gmail.com[2], atharvaallewar@gmail.com[3], prashinde678@gmail.com[4]

Abstract: *The application of contemporarytechnologies is important to medical progress. To create accurate and specialized treatment choices for a range of ailments, extensive study performed in partnership with researchers, health care professionals, and patients is important and to spread awareness. This study aims to identify the degree of accuracy that is acceptable in the medical sector by using machine learning on publicly available data and give safety precautions. First, we extracted spectrogram features and labels from annotatedlung sound recordings to feed into our 2D Convolutional Neural Network (CNN) model. In this paper, we solve the problem of medical data scarcity by identifying pulmonarydiseases from chest X-Ray pictures using small volume datasets with less than a thousand samples. Several studieshave been conducted on the application of machine learning to identify lung disease have been published in theliterature. A review of various typical machine learning network topologies used in medical image processing is alsoprovided. Trend analysis, on the other hand, gives an overview of the research direction of the area of interest that has been emphasized in previous work.*

Keywords: Lung Disease Detection, Machine Learning, Pneumonia Detection Using Machine Learnings, ESP 8266NODE MCU, 0.96 OLED

I. INTRODUCTION

The effect of disease on health is rapidly increasing because of alterations to the environment, climate change, lifestyle, and other factors. This has increased the risk of ill health. Pneumonia causes approximately 2.5 million deaths per year in which one third were children under 5years of age. Globally there are 1400 cases of pneumonia per 10000 children or 1 per 71 children. The COVID-19 epidemic wreaked havoc throughout the world, infecting millions of people and putting a burden on healthcare systems. The COVID-19 epidemic wreaked havoc throughout the world, infecting millions of people and putting a burden on healthcare systems. Lung diseases are unquestionably one ofthe world's leading causes of death an. Early diagnosis is essential for increasing long-term survival rates and enhancing recovery chances. Lung disease has previously been detected via skin testing, blood tests, sputum sample tests, chest X-ray exams, and computed tomography (CT) scan tests. Machine learning has lately shown great potential when used to medical images for identifying illnesses, particularly lung disease. Lung diseases are a danger, especially in low- and middle-income countries, where millions of people live in poverty and are exposed to pollution. According to WHO estimates, million people die prematurely each year because of illnesses including tb, pneumonia caused by home air pollution. Machine learning is an area of artificial intelligence (AI) with a concept that a computer program can learn and adapt to new data without human intervention. The research goes into the history of machine learning and its applications in pulmonary imaging. Machine learning algorithms are utilized to treat pneumonia. A complex algorithm or source code is built into a computer that allows for the machine to identify data and build predictions around the data that it identifies. Machine learningis useful in parsing the immense amount of information that isconsistently and readily available in the world to assist in decision making. Machine learning techniques for predicting diagnostic information from X-ray pictures have been studiedby several researchers. Now is a key time to address this problem, as the public has unrestricted access to computers and a large collection of papers. This method, with the rise of computer science for health and medical research initiatives, has the potential to lower medical costs. The implementation uses the NIH chest X-ray image dataset from the Kaggle repository, and the technique is entirely open source. Machinelearning algorithms are utilized to treat lung diseases like pneumonia.

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II. LITERATURE SURVEY

In [I] - The recent developments of machine learning support the identification and classification of lung diseases in chest x-rays. Hence, numerous works on the detection of lung diseaseusing machine learning can be found in the literature. This paper presents a survey of machine learning for lung disease detection in chest x rays. The objectives of this paper are to present a taxonomy of the state-of-the-art machine learning- based lung disease detection systems, visualize the trends of recent work on the domain and identify the remaining issues and potential future directions in this domain. Ninety-eight articles published from 2016 to 2020 were considered in this survey. The taxonomy consists of seven attributes that are common in the surveyed articles: image types, features, data augmentation, types of deep learning algorithms, transfer learning, the ensemble of classifiers and types of lung diseases.In addition, the Chest X- ray database has been upgraded to allow for multi- classification of lung diseases. The authors used Chest X-ray datasets. A collection of chest X-rays isalso used. According to DenseNet121 and VGG 16, the discovery of consolidation requires extensive investigation. This methodis based on deep learning-based computer aided diagnostics. Adeep learning-based CAD system is used to detect clinically significant lung nodules on chest X-ray images. Displaying safety precautions on OLED (organic light emitting diode) screen is a step to spread awareness i.e., a part of diagnostics.

III. METHODOLOGY AND BLOCK DIAGRAM

As shown in the figure (2) the block diagram of lungs diseasedetection using machine learning. The first stage is the image acquisition. In this phase, image is uploaded from the image of the lung dataset. Then second stage the Preprocessing on image is performed using different techniques. The third phase, segmentation is performed to discover the actual segments of the lungs in the image. Later on, feature extraction for the infected parts of the lungs is completed based on specific properties among pixels in theimage of their texture. Finally, classification result shows the identified lungs disease.

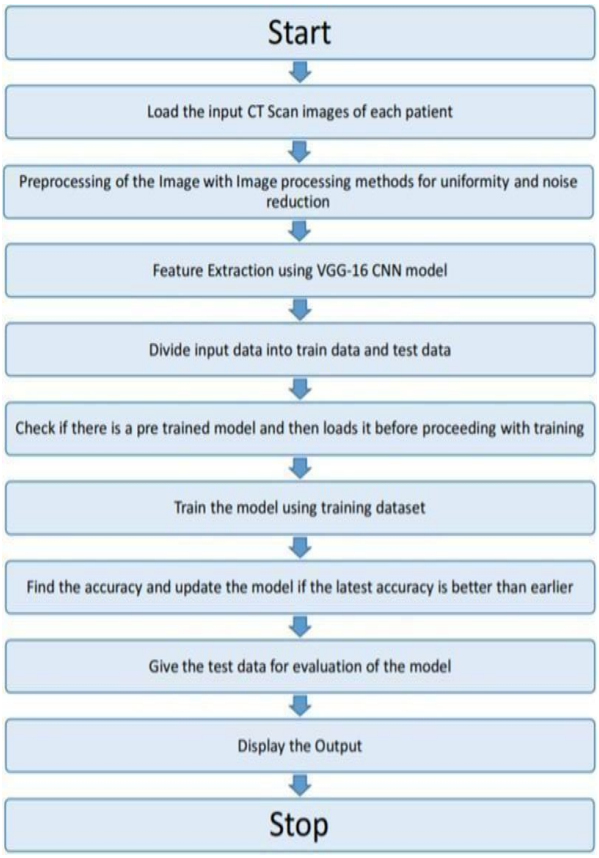

Figure 1: Flow Diagram

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Transfer Learning Is a ResearchProblem in ML that focuses mainly on storing knowledge gained and applying it to a different but related problem. It is basically some of the convolution neural network that aredesigned which is actually giving the art of algorithm whichis classified as state of images. In Transfer learning we are using state of art algorithm because it has better accuracy. Changing the output layer and using the algorithm for our problem statement. We are using VGG16 using keras. We are using images in RGB format that of 224,224 and then we will give path for training and Validation. VGG 16 is neural network architecture with 138 million parameters proposed by Karen Simonyan and Andrew Zisserman.

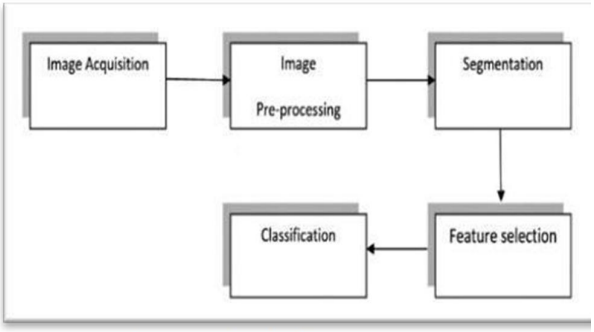

Figure 2: Block Diagram

IV. HARDWARE

ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability. It contains a built-in 32-bit low-power CPU, ROM and RAM. It is a complete and self- contained Wi- Fi network solution that can carry software applications as a stand-alone device or connected with a microcontroller (MCU). Fitted with a L106 32-bit RISC microprocessor core based on the Tensilica Xtensa Diamond Standard 106Micro running at 80 MHz, it has 16 GPIO pins. On the memory front, it has 32 KiB instruction RAM, 32 KiB instruction cache RAM, 80 KiB user-data RAM and 16 KiB ETS system-data RAM. Other features include WEP or WPA/WPA2 authentication.

An OLED display that has an integrated electronic backplane as its substrate. Active-matrix OLED displays use at least two thin-film transistors (TFTs) to control the on-current at each OLED cell or pixel. The transistor circuits retain the state (on/off) and level (intensity) information programmed by the display electronics. Therefore, the light output of every pixel is controlled continuously, rather than being pulsed with high currents just once per refresh cycle, as in passive-matrix OLED displays. In fig 3, an interfacing of esp8266 node much and 0.96 OLED display is shown.

Figure 3: Inter Facing of OLED and ESP8266

V. SOFTWARE

Collaboratory, or “Collab” for short, is a product from Google Research. Colab allows anybody to write and execute arbitrary python code through the browser, and is especially well suited to machine learning, data analysis and education. More technically, Colab is a hosted Jupyter notebook service that requires no setup to use, while providing free access to computing resources including GPUs.

Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control. It aims to provide just the tools a developer needs for a quick code-build-debug cycle and leaves

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more complex workflows to fuller featured IDEs, such as Visual Studio IDE. Visual Studio Code is a free coding editor that helps you start coding quickly. Use it to code in any programming language, without switching editors. Visual Studio Code has support for many languages, including Python, Java, C++, JavaScript, and more.

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

The program or code written in the Arduino IDE is often called as sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '.ino.

VI. CONCLUSION

It is fairly easy for any developer with decent programming skills to create a Machine Learning models which could be useful to millions of people. Much better results have been achieved by professionals out there. As a beginner, I was able to achieve an accuracy of 89%, which is clearly not bad. But in order to be used in the real world, by millions of people, 89% accuracy means it will misdiagnose roughly 1,00,000 cases. With help of advance analytics, artificial intelligence and machine learning a higher accuracy be achieved.

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