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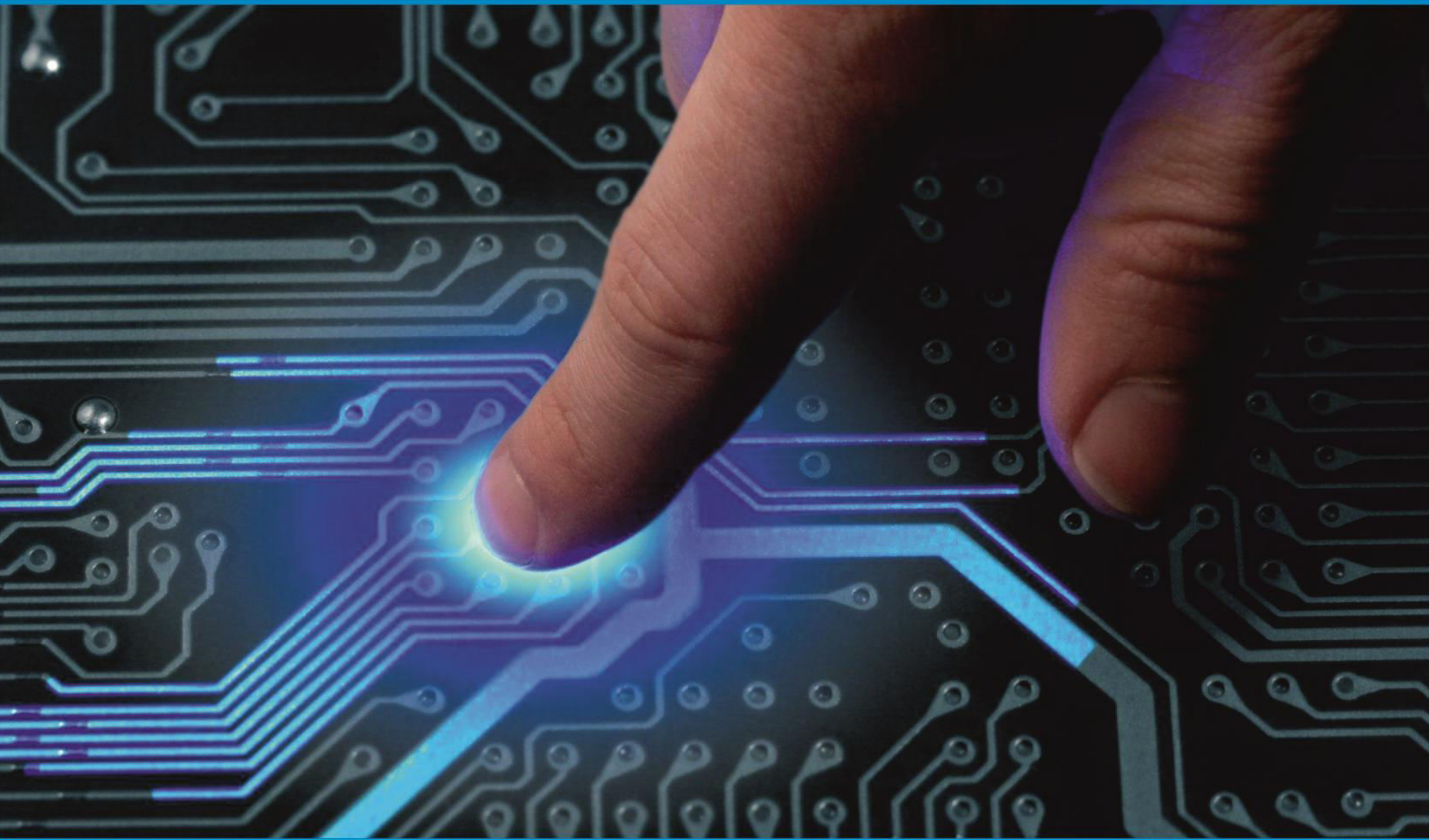

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Pneumonia Lesions from CT Images Using Deep Learning Framework

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ABSTRACT*:* The 2019 corona virus pandemic is expanding worldwide (COVID-19). Medical imaging such as Radiation and CT. The new development in technology of artificial intelligence (AI) further enhance the potential of imagery software and support medical specialists plays an important role in the international war against pneumonia. In this section, we analyse the fast responses to pneumonia in the medical imaging community (enhanced by AI). For example, AI-enabling image acquisition may make a major contribution to automating the scan process, and also to reshape the workflow with low patient interaction so that imaging technicians are better protected.The precise delineation of pathogens in X-rays and CT images, thereby allowing AI to increase work performance, encouraging subsequent quantification. In addition, radiologists make clinical assessments, i.e. diagnosis, monitoring and prognosis, using computer assisted platforms. This study paper therefore covers the whole medical imaging pipeline, including image processing, segmentation, diagnostics and follow-up.

KEYWORDS: COVID-19, deep Learning, , noisy label, segmentation, pneumonia

I. INTRODUCTION

The American Lung Association state that- the COVID-19 pandemic has resulted in one of the highest rates of lung infections and deaths in recent history. CT scan can also detect early pneumonia in patients without symptoms or before symptoms develop or after symptoms resolve. Due to the rapid increase in number of new and suspected COVID-19 cases, there may be a role for artificial intelligence (AI) approaches for the detection or characterization of pneumonia on imaging. CT provides a clear and expeditious window into this process, and deep learning of large multinational CT data could provide automated and reproducible biomarkers for classification and quantification of pneumonia. People with suspected pneumonia need to know quickly whether they are infected, so that they can self-isolate, receive treatment, and inform close contacts. Currently, formal diagnosis of pneumonia infection requires laboratory analysis of blood or nose and throat samples. The laboratory test, called RT-PCR, requires specialist equipment and takes at least 24 hours to produce a result. Further, RT-PCR is not completely accurate and a second RT-PCR or a different test may be required to confirm the diagnosis. pneumonia is a respiratory infection: people with pneumonia may have a cough, may have difficulty breathing and in severe cases may have COVID-19 . Clinicians use chest imaging tests to diagnose pneumonia disease, when awaiting RT-PCR test results, for example, or when RT-PCR results are negative, and the person has pneumonia symptoms.

II. LITERATURE SURVEY

The purpose of this study[1] was to assess a quantitative CT Image Parameter,defined as the percentage of lung pacification(QCT-PLO), calculated automatically using a deep learning tool. We evaluated QCT-PLO in covid -19 patients at baseline and on follow up scans,focusing on cross-sectional and longitudinal differences in patients with different degrees of clinical severity.

On the basis[2] of epidemiologic characteristics, clinical manifestations, chest images, and laboratory findings, the diagnosis of 2019-nCoV pneumonia was made. After receiving 3 days of treatment, combined with interferon inhalation, the patient was clinically worse with progressive pulmonary opacities found at repeat chest CT.

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In December 2019[3], a cluster of patients with pneumonia of unknown cause was linked to a seafood wholesale market in Wuhan, China. A previously unknown betacoronavirus was discovered through the use of unbiased sequencing in samples from patients with pneumonia. Human airway epithelial cells were used to isolate a novel coronavirus, named 2019-nCoV, which formed another clade within the subgenus sarbecovirus,Orthocoronavirinae subfamily. Different from both MERS-CoV and SARS-CoV, 2019-nCoV is the seventh member of the family of coronaviruses that infect humans.

This study[4] describes the same population genetic dynamic underlying the SARS 2003 epidemic, and suggests the urgent need for the development of effective molecular surveillance strategies of Betacoronavirus among animals and Rhinolophus of the bat family.

This paper[5] discusses how AI provides safe, accurate and efficient imaging solutions in COVID-19 applications. The intelligent imaging platforms, clinical diagnosis, and pioneering research are reviewed in detail, which covers the entire pipeline of AI-empowered imaging applications in COVID-19. Two imaging modalities, i.e., X-ray and CT, are used to demonstrates the effectiveness of AI-empowered medical imaging for COVID-19.

III. PROPOSED METHODOLOGY

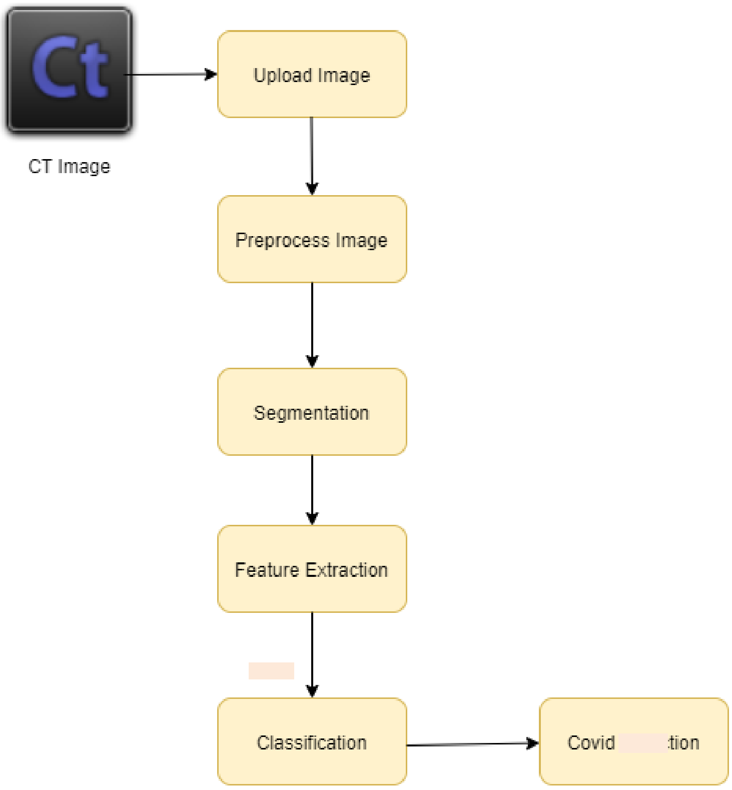

Fig 1: System Architecture

Algorithm:

1. **Feature Extraction image content identification.**

Steps:

1. **Color feature** is one of the most widely used visual features in image retrieval, for its invariance with respect to image scaling, rotation, translation. In this work, an image is divided into four equal sized blocks and a centralized image with equal-size. For each block, a 9-D color moment is computed, thus the dimension of color comment for each image is 45. The 9-D color moment of an image segment is utilized, which contains values of mean, standard deviation and skewness of each channel in HSV color space.

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2. **Edge Detection:** Most of the shape information of an image is enclosed in edges. So first we detect these edges in an image and by using these filters and then by enhancing those areas of image which contains edges, sharpness of the image will increase and image will become clearer.

Canny Edge Detection:
Canny edge detection is a technique to extract useful structural information from different vision objects and dramatically

reduce the amount of data to be processed. It has been widely applied in various computer vision systems. Canny has found that the requirements for the application of edge detection on diverse vision systems are relatively similar. Thus, an edge detection solution to address these requirements can be implemented in a wide range of situations. The general criteria for edge detection include:

1. Detection of edge with low error rate, which means that the detection should accurately catch as many edges shown in the image as possible
2. The edge point detected from the operator should accurately localize on the center of the edge.
3. A given edge in the image should only be marked once, and where possible, image noise should not create false edges.

The Process of Canny edge detection algorithm can be broken down to 5 different steps:

1. Apply filter to smooth the image in order to remove the noise
2. Find the intensity gradients of the image
3. Apply non-maximum suppression to get rid of spurious response to edge detection
4. Apply double threshold to determine potential edges
5. Track edge by hysteresis: Finalize the detection of edges by suppressing all the other edges that are weak and not connected to strong edges.

3. **Texture feature** describes the structure arrangement of surfaces and their relationship to the environment, such as fruit skin, clouds, trees, and fabric. The texture feature in our method is described by hierarchical wavelet packet descriptor (HWVP). A 170- D HWVP descriptor is utilized by setting the decomposition level to be 3 and the wavelet packet basis to be DB2.

2. Kmeans for Segmentation:

A. K-means clustering

K-Means is the one of the unsupervised learning algorithm for clusters. Clustering the image is grouping the pixels according to the same characteristics. In the k-means algorithm initially we have to define the number of clusters k. Then k-cluster center are chosen randomly. The distance between the each pixel to each cluster centers are calculated. The distance may be of simple Euclidean function. Single pixel is compared to all cluster centers using the distance formula. The pixel is moved to particular cluster which has shortest distance among all. Then the centroid is re-estimated. Again each pixel is compared to all centroids. The process continuous until the center converges.

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Flowchart of k-means algorithm

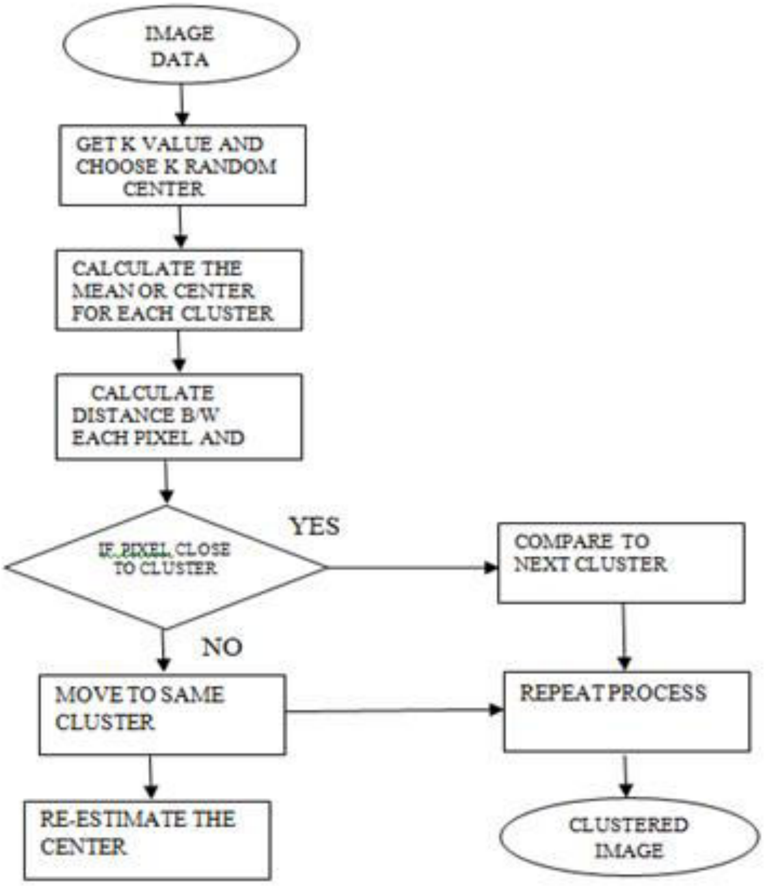

Fig 2: K-means flow chart

1. Give the no of cluster value as k.
2. Randomly choose the k cluster centers
3. Calculate mean or center of the cluster
4. Calculate the distance b/w each pixel to each cluster center
5. If the distance is near to the center then move to that cluster.
6. Otherwise move to next cluster.
7. Re-estimate the center.
8. Repeat the process until the center doesn't move.

3. RNN Classification algorithm

1. Step1: Select the dataset.
2. Step2: Feature selection using information gain and ranking
3. Step3: Classification algorithm
4. Step4: Each Feature calculate fx value of input layer
5. Step5: bias class of each feature calculate
6. Step6: Next produce the feature map it goes to forward pass input layer
7. Step7: Calculate the convolution cores in a feature pattern
8. Step8: Produce sub sample layer and feature value.

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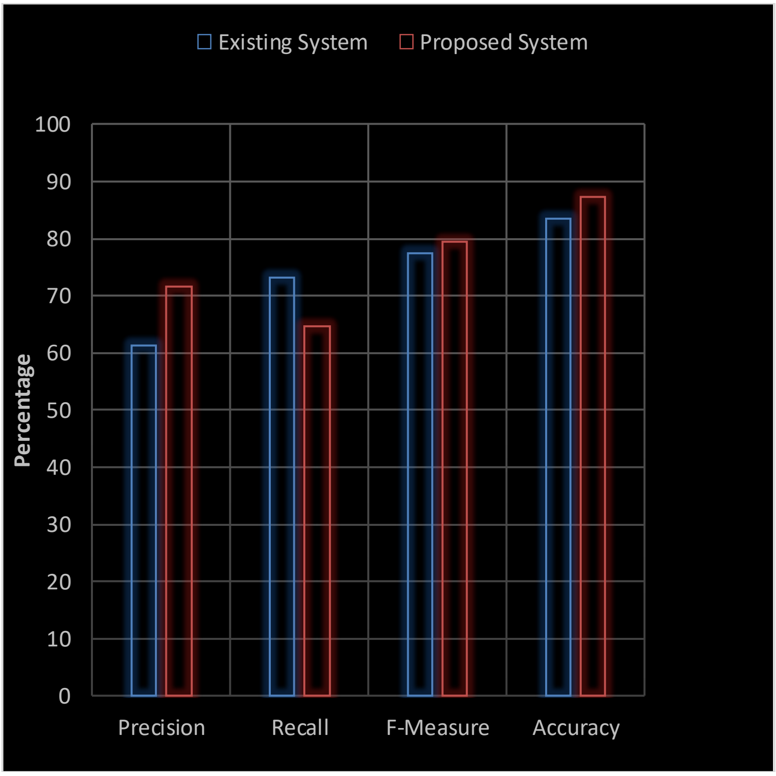
9. Step9: Back propagation input deviation of the k^{th} neuron in output layer.
10. Step10: Finally give the selected feature and classification results.

IV. RESULTS AND DISCUSSION

Experiments are done by a personal computer with a configuration: Intel (R) Core (TM) i3-2120 CPU @ 3.30GHz, 4GB memory, Windows 7, MySQL 5.1 backend database and Jdk 1.8. The application is web application used tool for design code in Eclipse and execute on Tomcat server.



	Existing System	Proposed System
Precision	68.45	78.70
Recall	79.44	65.64
F-Measure	72.11	74.31
Accuracy	80.29	86.26

IV. CONCLUSION

The pneumonia is a disease that has spread all over the world. Intelligent medical imaging has played an important role in fighting against pneumonia. This paper discusses how AI provides safe, accurate and efficient imaging solutions in pneumonia applications. The intelligent imaging platforms, clinical diagnosis, and pioneering research are reviewed in detail, which covers the entire pipeline of AI-empowered imaging applications in pneumonia. Two imaging modalities, i.e., X-ray and CT, are used to demonstrate the effectiveness of AI-empowered medical imaging for pneumonia.

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