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# “Covid 19 Lung Infection Detection System Using Machine Learning”: A Review

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**ABSTRACT:** The coronavirus disease (COVID-19) is rapidly spreading all over the world, and has infected more than 1,966,000 people in more than 200 countries and territories as of October, 2020. Detecting COVID-19 at early stage is essential to deliver proper healthcare to the patients and also to protect the uninfected population. To this end, we develop a framework to automatically diagnose COVID-19 from the community acquired pneumonia (CAP) in chest computed tomography (CT). In particular, we propose a Noise Robust Segmentation approach with a recurrent neural network (RNN) to focus on the infection regions in lungs when making decisions of diagnoses. Note that there exists imbalanced distribution of the sizes of the infection regions between COVID-19 and CAP, partially due to fast progress of COVID-19 after symptom onset. Our framework is evaluated upon the largest multi-centre CT data for COVID-19 from hospitals.

**KEYWORDS:** COVID-19, Deep Learning, Recurrent neural network, noisy label, segmentation, pneumonia

## I. INTRODUCTION

The coronavirus disease 2019 (COVID-19) has become a global pandemic since the beginning of 2020. The disease has been regarded as a Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO) and the end of January 2020. Up to April 10, 2020, there have been more than 1.5 million cases of COVID19 reported globally, with more than 92 thousand deaths. The most common symptoms of COVID-19 patients include fever, cough and shortness of breath, and the patients typically suffer from pneumonia. Computed Tomography (CT) imaging plays a critical role for detection of manifestations in the lung associated with COVID-19, where segmentation of the infection lesions from CT scans is important for quantitative measurement of the disease progression in accurate diagnosis and follow-up assessment. As manual segmentation of the lesions from 3D volumes is labour-intensive, time-consuming and suffers from inter- and intra-observer variabilities, automatic segmentation of the lesions is highly desirable in clinic practice.

Despite its importance for diagnosis and treatment decisions, automatic segmentation of COVID-19 pneumonia lesions from CT scans is challenging due to several reasons. First, the infection lesions have a variety of complex appearances such as Ground-Glass Opacity (GGO), reticulation, consolidation and others. Second, the sizes and positions of the pneumonia lesions vary largely at different stages of the infection and among different patients. In addition, the lesions have irregular shapes and ambiguous boundaries, and some lesion patterns such as GGO have a low contrast with surrounding regions.

The goal of this work is three-fold. First, to deal with noisy annotations for training RNNs to segment COVID19 pneumonia lesions, we propose a novel noise-robust Dice loss function, which is a combination and generalization of MAE loss that is robust against noisy labels and Dice loss that is insensitive to foreground-background imbalance. Second, we propose a novel noise-robust learning framework based on self-ensembling of RNNs where an Exponential Moving Average (EMA, a.k.a. teacher) of a model is used to guide a standard model (a.k.a. student) to improve the robustness. Differently from previous self-ensembling methods for semi-supervised learning and domain adaptation, we propose two adaptive mechanisms to better deal with noisy labels: adaptive teacher that suppresses the contribution of the student to EMA when the latter has a large training loss, and adaptive student that learns from the teacher only when the teacher outperforms the student. Thirdly, to better deal with the complex lesions, we propose a novel COVID-19 Pneumonia Lesion segmentation network (COPL-Net) that uses a combination of max-pooling and average pooling to reduce information loss during down sampling, and employs bridge layers to alleviate the semantic gap between features in the encoder and decoder.



## II. LITERATURE REVIEW

1. In summary [1], this experiment examined three common types of label noise in medical image datasets, as well as the relative effectiveness of several approaches for mitigating label noise's negative impact. Label noise in medical imaging has a variety of sources, statistics, and strengths, and this study demonstrates that the effects of label noise should be carefully analysed when training deep learning algorithms. This necessitates additional research and the development of robust models and training algorithms.
2. On the first layer of the CNN model, the most primitive [2] building blocks that comprise the images are located; these building blocks correspond to the motifs. By applying filters to the images, the CNN detects these motifs. Each filter is composed of pixels that have the same shape as the corresponding motif. The first layer filters in this example correspond to the letters of the alphabet. Each filter is sequentially shifted to each location in the image, and the degree to which the image's local properties match the filter at each location is measured, a process known as convolution. Convolution produces a new array (or new image) called a featuremap as a result of this process. The degree to which the filter matches each local region in the original image is quantified by feature maps. If there are N first layer filters, the convolutional process generates N 2D feature maps.
3. The purpose of this study [3] was to evaluate a quantitative CT Image Parameter, defined as the percentage of lung opacification (QCT-PLO), that was automatically calculated using a deep learning tool. We evaluated QCT-PLO in covid -19 patients at baseline and on follow-up scans, with an emphasis on cross-sectional and longitudinal differences in patients with varying degrees of clinical severity.
4. The diagnosis of 2019-nCoV pneumonia [4] was made based on epidemiologic characteristics, clinical manifestations, chest images, and laboratory findings. After three days of treatment with interferon inhalation, the patient's clinical condition deteriorated, with progressive pulmonary opacities discovered on repeat chest CT.
5. This article [5] proposes that a deep learning model can accurately detect and distinguish COVID -19 from community-acquired pneumonia and other lung diseases.
6. The author[6] used this pipeline to compare the evolution of two confirmed COVID-19 cases from Wuhan, China, who received similar supportive therapy. Figure 1 depicts the favourable evolution of a 48-year-old woman imaged at four time points over a 16-day period, whereas Figure 2 depicts the disease progression of a 44-year-old man over a 12-day period, particularly between the second and third studies.
7. Authors present UNet++, a new, more powerful architecture for medical image segmentation, in this paper [7]. This architecture is essentially a densely supervised encoder-decoder network, with the encoder and decoder sub-networks connected via a series of nested, dense skip paths.
8. A cluster of patients with pneumonia of unknown origin was linked to a seafood wholesale market in Wuhan, China, in December 2019[8]. Unbiased sequencing of samples from pneumonia patients identified a previously unknown betacoronavirus. We isolated a novel coronavirus, 2019-nCoV, from human airway epithelial cells. This virus formed a new clade within the subgenus sarbecovirus, Orthocoronavirinae subfamily. In contrast to MERS-CoV and SARS-CoV, 2019-nCoV is the seventh member of the human coronavirus family.
9. This study [9] describes the same population genetic dynamic as the SARS 2003 epidemic, emphasising the critical need for the development of effective molecular surveillance strategies for Betacoronavirus in animals and Rhinolophus in the bat family.
10. This article [10] discusses how artificial intelligence (AI) can be used to provide safe, accurate, and efficient imaging solutions for COVID-19 applications. COVID-19 covers the entire pipeline of AI-enabled imaging applications, including intelligent imaging platforms, clinical diagnosis, and pioneering research. Two imaging modalities, X-ray and CT, are used to demonstrate the efficacy of AI-assisted medical imaging in the diagnosis of COVID-19.



### III. OPEN ISSUES

Lot of work has been done in this field because of its extensive usage and applications. In this section, some of the approaches which have been implemented to achieve the same purpose are mentioned. These works are majorly differentiated by the algorithm for Pneumonia Abrasion systems.

### IV. PROPOSED SYSTEM

Despite several recent studies on automatic segmentation of COVID-19 pneumonia lesions from CT scans, previous work has relied heavily on off-the-shelf models such as U-Net and a standard training procedure that ignores the presence of noisy labels. The purpose of this work is to develop a more advanced SVM model for the challenging segmentation task and to attempt to overcome the effect of noisy annotations on segmentation performance.

#### A. Architecture

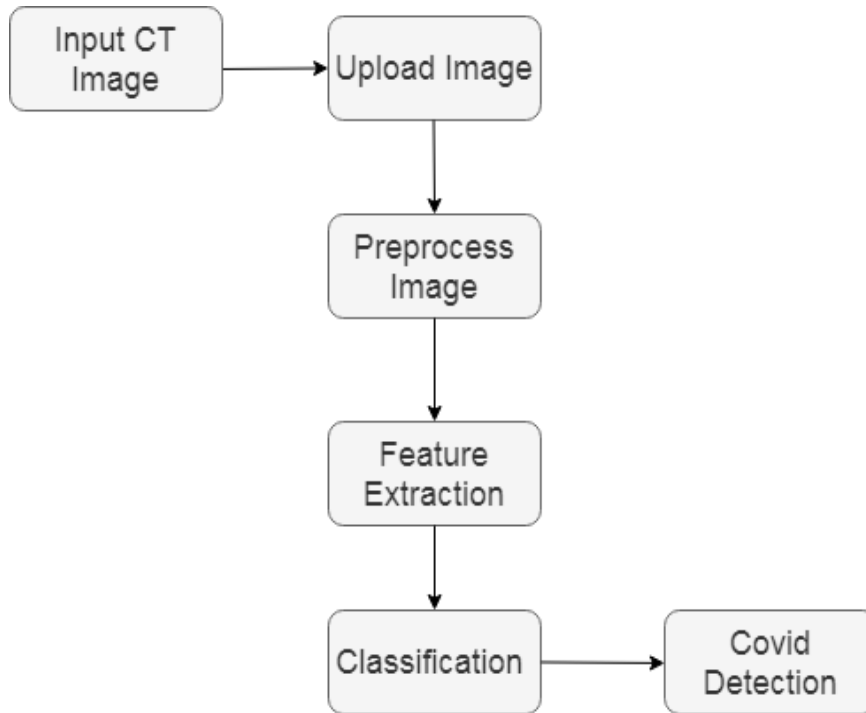


Fig 1. System Architecture

1. Input Image:

Here we can upload the Input CT Image.

2. Image Pre-processing:

In this step we will applying the image pre-processing methods like grey scale conversion, image noise removal.

3. Image Feature Extraction:

In this step we will applying the image pixel extraction methods to remove the image features from image.



#### 4. Image Classification:

In this stage we will applying the picture classification methods to distinguish the contaminated region and safe area from features.

#### 5. Result:

In this step will show the final result detection result.

### V. CONCLUSION

COVID-19, it is important to get the diagnosis result at soon as possible. CT is shown as a powerful tool and could provide the chest scan results in several minutes. It is beneficial to develop an automatic diagnosis method based on chest CT to assist the COVID19 screening. In this study, we explore a deep-learning based method to perform automatic COVID-19 diagnosis from CAP in chest CT images. We evaluate our method by the largest multi-centre CT data in the world.

### REFERENCES

- [1] N. Zhu, D. Zhang, W. Wang, X. Li, B. Yang, J. Song, X. Zhao, B. Huang, W. Shi, R. Lu, P. Niu, F. Zhan, X. Ma, D. Wang, W. Xu, G. Wu, G. F. Gao, and W. Tan, "A novel coronavirus from patients with pneumonia in China, 2019," *N. Engl. J. Med.*, vol. 382, pp. 727–733, 2020.
- [2] D. Benvenuto, M. Giovanetti, M. Salemi, M. Prosperi, C. De Flora, L. C. Junior Alcantara, S. Angeletti, and M. Ciccozzi, "The global spread of 2019-nCoV: A molecular evolutionary analysis," *Pathog. Glob. Health*, pp. 1–4, 2020.
- [3] F. Shi, J. Wang, J. Shi, Z. Wu, Q. Wang, Z. Tang, K. He, Y. Shi, and D. Shen, "Review of Artificial Intelligence Techniques in Imaging Data Acquisition, Segmentation and Diagnosis for COVID-19," *IEEE Rev. Biomed. Eng.*, vol. 3333, no. c, pp. 1–13, 2020.
- [4] L. Huang, R. Han, T. Ai, P. Yu, H. Kang, Q. Tao, and L. Xia, "Serial quantitative chest CT assessment of COVID-19: Deep-learning approach," *Radiol. Cardiothorac. Imaging*, vol. 2, p. e200075, 2020.
- [5] J. Lei, J. Li, X. Li, and X. Qi, "CT imaging of the 2019 novel coronavirus (2019-nCoV) pneumonia," *Radiology*, p. 200236, 2020.
- [6] L. Li, L. Qin, Z. Xu, Y. Yin, X. Wang, B. Kong, J. Bai, Y. Lu, Z. Fang, Q. Song, K. Gao, D. Liu, G. Wang, Q. Xu, X. Fang, S. Zhang, J. Xia, and J. Xia, "Artificial intelligence distinguishes COVID-19 from community acquired pneumonia on chest CT," *Radiology*, p. 200905, 2020.
- [7] Y. Cao, Z. Xu, J. Feng, C. Jin, X. Han, H. Wu, and H. Shi, "Longitudinal assessment of COVID-19 using a deep learning-based quantitative CT pipeline: Illustration of two cases," *Radiol. Cardiothorac. Imaging*, vol. 2, no. 2, p. e200082, 2020.
- [8] D. Karimi, H. Dou, S. K. Warfield, and A. Gholipour, "Deep learning with noisy labels: exploring techniques and remedies in medical image analysis," *arXiv:1912.02911*, pp. 1–17, 2020.
- [9] D. Shen, G. Wu, and H.-I. Suk, "Deep learning in medical image analysis," *Annu. Rev. Biomed. Eng.*, vol. 19, no. 1, pp. 221–248, 2017.



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