

## Paper Review

As requested, I am excited to share a brief summary of an interesting paper I recently came across in the domain of Deep Learning for computer vision.

Title: "Automatic Classification Segmentation for COVID-19 Pneumonia Using Chest CT Imaging" [1]

This paper presents an automatic classification and segmentation tool designed to assist in screening COVID-19 pneumonia using chest CT imaging. The tool aims to identify and segment COVID-19 lesions in chest CT images to assess the severity of pneumonia and monitor patients' progress.

The authors propose a multitask deep learning model that can simultaneously perform three learning tasks: segmentation, classification, and reconstruction. The model leverages multiple related tasks to improve the performance of both segmentation and classification. It also addresses the challenge of limited data for each task by jointly learning from different datasets.

The architecture of the proposed model consists of a common encoder responsible for extracting disentangled feature representations, which are then used for the three tasks. Two decoders and a multi-layer perceptron are used for reconstruction, segmentation, and classification, respectively.

The model is evaluated and compared with other image segmentation techniques using a dataset of 1369 patients. This dataset includes 449 patients with COVID-19, 425 normal individuals, 98 with lung cancer, and 397 with various other pathologies.

The results obtained from the evaluation show promising performance for the proposed model. The segmentation task achieves a Dice coefficient higher than 0.88, indicating accurate lesion segmentation. The classification task achieves an area under the receiver operating characteristic (ROC) curve higher than 97%, indicating robust performance in distinguishing COVID-19 patients from others.

In summary, the proposed multitask deep learning model demonstrates effective performance in automatically classifying and segmenting COVID-19 pneumonia from chest CT images. The joint learning approach allows the model to utilize information from multiple related tasks and handle limited data efficiently, making it a valuable tool for assisting medical professionals in COVID-19 screening and patient assessment.

Why this Publication was Interesting to Me:

The paper caught my attention due to its application of cutting-edge deep learning techniques to address the pressing issue of COVID-19 pneumonia diagnosis. The proposed multitask model not only achieves accurate segmentation of COVID-19 lesions but also demonstrates effective patient classification. I was particularly intrigued by their approach to

leverage information from multiple tasks to improve performance, especially when dealing with limited data for each task.

In my work on roads and fields classification, I often encounter challenges related to the scarcity of data. However, when I experimented with the multitask model involving two tasks: classification and reconstruction autoencoder, I did not observe any improvement in terms of accuracy. I suspect that the absence of a segmentation task or object detection task might have contributed to this issue. Including road lane line detection or segmentation, especially for road images, could potentially enhance the accuracy of the multitask model.

As an AI Engineer at Trimble/Bilberry, I believe that staying updated with state-of-the-art publications is crucial in driving innovation and enhancing our products. This paper aligns perfectly with our company's vision, and I am eager to explore how the techniques presented can be applied to improve our existing solutions.

#### Reference:

[1] Amine Amyar, Romain Modzelewski, Hua Li d, Su Ruan, Automatic Classification Segmentation for COVID-19 Pneumonia Using Chest CT Imaging, Computers in Biology and Medicine, Volume 126, November 2020