

DIAG a Diagnostic Web Application Based on Lung CT Scan Images and Deep Learning

Amel Imene HADJ BOUZID^{a1}, Said YAHIAOUI^a, Anis LOUNIS^a, Sid-Ahmed BERRANI^b, Hacène BELBACHIR^a, Qaïs NAÏLI^c, Mohamed El Hafedh ABDI^c, Kawthar BENSALAH^a and Djamal BELAZZOUGUI^a

^a CERIST, Research Center on Scientific and Technical Information, Algiers, Algeria

^bNational Polytechnic School, Algiers, Algeria

^cCentre d'imagerie scintigraphique, Blida, Algeria

Abstract. Coronavirus disease is a pandemic that has infected millions of people around the world. Lung CT-scans are effective diagnostic tools, but radiologists can quickly become overwhelmed by the flow of infected patients. Therefore, automated image interpretation needs to be achieved. Deep learning (DL) can support critical medical tasks including diagnostics, and DL algorithms have successfully been applied to the classification and detection of many diseases. This work aims to use deep learning methods that can classify patients between Covid-19 positive and healthy patient. We collected 4 available datasets, and tested our convolutional neural networks (CNNs) on different distributions to investigate the generalizability of our models. In order to clearly explain the predictions, Grad-CAM and Fast-CAM visualization methods were used. Our approach reaches more than 92% accuracy on 2 different distributions. In addition, we propose a computer aided diagnosis web application for Covid-19 diagnosis. The results suggest that our proposed deep learning tool can be integrated to the Covid-19 detection process and be useful for a rapid patient management.

Keywords. Covid-19, CT-scan, Deep learning, CNN, Classification

1. Introduction

SARS-CoV-2 disease (Covid-19) is a highly contagious respiratory disease. Early diagnosis of Covid-19 is crucial in reducing the spread of the disease and its mortality. Diagnosis can be based on several methods: clinical symptoms, molecular tests, serology, laboratory examinations and imaging using chest X-ray examination, chest computed tomography (CT-scans) or lung ultrasound [1].

SARS-CoV-2 RT-PCR is the gold standard diagnosis. Although it can be useful to do imaging diagnosis for patients with clinical signs of Covid-19 and negative initial molecular test [2], most of the findings observed in CT-scans are “ground glass opacities”, “crazy paving” and “reversed halo sign” [1].

In pandemic times it is necessary to offer tools to help clinicians' decision making for quick isolation and appropriate patient treatment. Deep learning in the field of

¹ Corresponding Author, Amel Imene Hadj Bouzid, CERIST, Algeria; E-mail: aihadjbouzid@cerist.dz.