

Chapter 8

An Advanced Lung Disease Diagnosis Using Transfer Learning Method for High-Resolution Computed Tomography (HRCT) Images: High-Resolution Computed Tomography

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ABSTRACT

In the past decades, medical image technologies have been rapidly growing. The x-rays, ultrasound (US), MRI scan, and CT scan are the pulmonary techniques to examine human diseases, and CT techniques have more resolution images than other techniques. HRCT is another advanced technology derived from the CT family and working in 3D to capture the images. High-resolution computed tomography techniques are used to examine all humankind's problems like heart, brain, breast, lung, kidney, etc. The diagnosis accuracy depends on expert doctors, radiologists, or pathologists, and wrong judgment leads to wrong treatment or diagnosis. To overcome this, a computer-based technology is introduced instead of manual operation because of its higher efficiency, accuracy, and achieved by transfer learning methods.

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INTRODUCTION

Medical-based research was supported by the analysis of medical images. Before going to diagnosis, a large amount of research (in terms of research) was conducted in the laboratory (Haas et.al., 2008). Day-to-day development of medical technology has led to a variety of medical images emerging. The commonly available methods that are available nowadays are Magnetic resonance imaging (MRI), X rays, Computer tomography (CT), and Ultrasound (UT) (Shen et.al., 2017). The first technique used in medical imaging is X-rays. They are simple to examine, and the cost is lower. Compared to all the techniques, CT provides higher density, higher resolution images, but it depends on the doctor's skill. These two techniques are harmful to the human body and should not be used too often (Inoue et.al., 2021). MRI does not emit radiation and provides a clear image, but it takes longer to investigate, and some patients may suffer due to the longer time it takes to investigate the patients (Duan et.al., 2015).

High-resolution computed tomography (HRCT) image is an advanced technology used to capture images in 3D technology and is driven by the CT family, to enhance image resolution. The spatial resolution method is used to enhance imaging parameters, and the speed of the scan is also enhanced to minimize the size of each pixel. All the techniques have their own characteristics, and the doctor needs to prefer one based on a patient diagnosis.

The transfer learning-based methods are non-invasive class-type techniques, not harmful to the patient's system and applied to several parts of the human body, such as the brain, lung, kidney, heart, etc. This type of medical analysis is done by an expert doctor's team to identify the problem, and a wrong judgment will lead to a wrong diagnosis. To overcome this, scientists and doctors are studying and performing research to introduce computer-based technology instead of manual operation because of its more efficiency and accuracy. The growth of the transfer learning method is shown in Figure 1, and data is taken from the web of science journal on transfer learning methods.

In this manuscript, a HRCT image is described in Section 2. The review of interstitial lung diseases (ILD) is explored in Section 3. Section 4 will give a little overview of the transfer learning methods. Finally, Section 5 gives a clear overview of this review paper that is conclusive and followed by references.

HIGH RESOLUTION COMPUTED TOMOGRAPHY (HRCT)

HRCT image is a cutting-edge CT technique that collects images in 3D to improve image clarity by improving image resolution. It makes use of the spatial resolution concept to increase scan speed by reducing pixel size. HRCT images can reveal disease features and use visual patterns to aid in differential diagnosis and narrowing (Hussein et.al., 2017).

Surgery for lung biopsy has decreased as a result of HRCT's influence on clinical treatment. Clinical practise recommendations for diagnosis and treatment have been updated in recent years in light of new data provided by the ATS/ERS consensus statement from 2002 (Raghu et.al., 2011). Although the cellular infiltration and architectural deformation with honeycombing indicative of a process like UIP are not clearly seen in the HRCT images (Peikert et.al., 2008). HRCT is still a valuable non-invasive approach for revealing aberrant parenchymal densities caused by microscopic morphological changes (Misumi & Lynch, 2006). It can provide direction for the best spot to get a biopsy of a characteristic or active disease (Costabel et.al., 2007).

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