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Current Applications of Artificial Intelligence (AI) in Chest Radiology

Authors : Angelis P. Barlampas

Abstract : Learning Objectives: The purpose of this study is to inform briefly the reader about the applications of AI in chest radiology. Background: Currently, there are 190 FDA-approved radiology AI applications, with 42 (22%) pertaining specifically to thoracic radiology. Imaging findings OR Procedure details Aids of AI in chest radiology1: Detects and segments pulmonary nodules. Subtracts bone to provide an unobstructed view of the underlying lung parenchyma and provides further information on nodule characteristics, such as nodule location, nodule two-dimensional size or three dimensional (3D) volume, change in nodule size over time, attenuation data (i.e., mean, minimum, and/or maximum Hounsfield units [HU]), morphological assessments, or combinations of the above. Reclassifies indeterminate pulmonary nodules into low or high risk with higher accuracy than conventional risk models. Detects pleural effusion . Differentiates tension pneumothorax from nontension pneumothorax. Detects cardiomegaly, calcification, consolidation, mediastinal widening, atelectasis, fibrosis and pneumoperitoneum. Localises automatically vertebrae segments, labels ribs and detects rib fractures. Measures the distance from the tube tip to the carina and localizes both endotracheal tubes and central vascular lines. Detects consolidation and progression of parenchymal diseases such as pulmonary fibrosis or chronic obstructive pulmonary disease (COPD).Can evaluate lobar volumes. Identifies and labels pulmonary bronchi and vasculature and quantifies air-trapping. Offers emphysema evaluation. Provides functional respiratory imaging, whereby high-resolution CT images are post-processed to quantify airflow by lung region and may be used to quantify key biomarkers such as airway resistance, air-trapping, ventilation mapping, lung and lobar volume, and blood vessel and airway volume. Assesses the lung parenchyma by way of density evaluation. Provides percentages of tissues within defined attenuation (HU) ranges besides furnishing automated lung segmentation and lung volume information. Improves image quality for noisy images with built-in denoising function. Detects emphysema, a common condition seen in patients with history of smoking and hyperdense or opacified regions, thereby aiding in the diagnosis of certain pathologies, such as COVID-19 pneumonia. It aids in cardiac segmentation and calcium detection, aorta segmentation and diameter measurements, and vertebral body segmentation and density measurements. Conclusion: The future is yet to come, but AI already is a helpful tool for the daily practice in radiology. It is assumed, that the continuing progression of the computerized systems and the improvements in software algorithms , will redder AI into the second hand of the radiologist.

Keywords : artificial intelligence, chest imaging, nodule detection, automated diagnoses
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