
Enhancing Pulmonary Nodule Assessment with AI



The rise in follow-up imaging for pulmonary nodules has created an urgent need for tools that can support efficient and accurate longitudinal assessments. With increasing reliance on computed tomography (CT) scans for lung cancer screening and disease monitoring, radiologists face a mounting workload, especially as CT sensitivity results in frequent incidental findings. Addressing this challenge, a recent study evaluated the effectiveness of an artificial intelligence (AI)-based system designed to automate the matching of pulmonary nodules across serial chest CTs. By focusing on algorithm performance, particularly in relation to the number and localisation of nodules, the study provides critical insights into the strengths and limitations of AI in clinical radiology workflows.

High Matching Accuracy Supports Clinical Use

The AI algorithm demonstrated a high overall matching rate, correctly identifying and matching 87.2% of nodules identified on baseline scans with their counterparts on follow-up CTs. When limiting the analysis to nodules that were detected in both baseline and follow-up scans, this rate increased to 97.8%. These figures indicate robust performance in scenarios with standard imaging conditions and lesion visibility. Across 153 follow-up examinations in 100 patients, the AI system successfully automated the matching of pulmonary nodules that were between 5 mm and 30 mm in size. Importantly, false-positive identifications comprised just 3.2% of the total lesions evaluated, reinforcing the algorithm's reliability in differentiating true nodules from anatomical structures.

The automated matching process was fully integrated into a cloud-based platform, leveraging anatomical landmarks and affine co-registration without relying on complete 3D imaging data from prior scans. This streamlined approach suits real-world clinical workflows where data availability may be limited. The analysis also revealed that missed matches were more common than incorrect pairings, suggesting that while detection remains a limiting factor, the algorithm performs well once a lesion is properly identified in both scans. Such accuracy supports the potential integration of AI-assisted nodule matching into routine follow-up protocols, aiding standardised reporting systems like RECIST and Lung-RADS.

Impact of Nodule Number on Matching Performance

Despite its high accuracy in typical cases, the algorithm's performance declined as the number of pulmonary nodules increased. In follow-up scans with fewer than 20 nodules, the median correct matching rate was 100%, whereas this dropped to 90% for scans with 20 to 50 nodules, and further to 80% for scans exceeding 50 nodules. The decline was primarily due to an overrepresentation of missed matches in high-nodule-count cases, highlighting a challenge in registering numerous lesions that may obscure anatomical landmarks or overlap spatially. In contrast, scans with fewer nodules showed a higher proportion of false-positive detections, likely due to the inclusion criteria focusing on the ten largest nodules per scan.

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This pattern reflects the complexity introduced by extensive pulmonary metastasis or diffuse nodule distributions. It underscores the importance of understanding AI limitations in advanced disease presentations, where manual oversight may still be necessary. Nonetheless, even in such complex cases, the algorithm maintained a baseline level of performance that supports its use as a decision-support tool, potentially reducing the time radiologists spend on tedious and error-prone comparison tasks. These findings also support the refinement of AI models to better handle higher nodule volumes and improve anatomical recognition under congested imaging conditions.

Role of Nodule Localisation in Algorithm Accuracy

The localisation of pulmonary nodules was found to significantly influence matching success. Among the 1,105 confirmed nodules, parenchymal nodules had the highest matching rate at 91.8%, followed by peripheral (84.4%) and juxta vascular nodules (82.4%). Juxtaphrenic nodules

exhibited the lowest matching rate at 71.1%, affected by challenges such as diaphragm movement during breathing and proximity to dense anatomical structures. The study also identified distinct error patterns based on location: juxtavascular nodules were more prone to being missed, while juxtaphrenic nodules were more likely to be incorrectly assigned to the wrong counterpart.

These findings indicate that the performance of automated systems is not uniformly distributed across lung regions. While high-contrast environments, like the parenchyma surrounded by aerated lung, facilitate accurate detection and matching, anatomically complex or motion-affected regions hinder consistent performance. This localisation-dependent variability should be considered when interpreting AI-generated outputs, particularly in serial imaging assessments where precision in longitudinal tracking is crucial for determining disease progression or response to therapy.

The study demonstrated that AI-based automated matching of pulmonary nodules on chest CTs is a highly accurate and clinically valuable tool, particularly when assessing nodules in parenchymal and peripheral lung regions and in patients with lower nodule counts. Although performance decreases in cases with numerous nodules or challenging nodule locations, the algorithm remains a reliable solution for standardising follow-up assessments. Its integration into clinical workflows has the potential to reduce radiologist workload, enhance diagnostic consistency, and support evidence-based decision-making. Ongoing optimisation and validation across diverse clinical conditions will further strengthen the role of AI in thoracic imaging and oncologic follow-up care.

Source: [European Radiology Experimental](#)

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