

Title : Enhanced deep learning model for precise nodule localization and recurrence risk prediction following curative-intent surgery for lung cancer

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## Purpose

Radical surgery is the primary treatment for early-stage resectable lung cancer, yet recurrence after curative surgery is not uncommon. Identifying patients at high risk of recurrence using preoperative computed tomography (CT) images could enable more aggressive surgical approaches, shorter surveillance intervals, and intensified adjuvant treatments. This study aims to analyze lung cancer sites in CT images to predict potential recurrences in high-risk individuals.

## Methods

We retrieved anonymized imaging and clinical data from an institutional database, focusing on patients who underwent curative pulmonary resections for non-small cell lung cancers. Our study used a deep learning model, the Mask Region-based Convolutional Neural Network (MRCNN), to predict cancer locations and assign recurrence classification scores. To find optimized trained weighted values in the model, we developed preprocessing python codes, adjusted dynamic learning rate, and modifying hyper parameter in the model.

## Results

The model training completed; we performed classifications using the validation dataset. The results, including the confusion matrix, demonstrated performance metrics: bounding box (0.390), classification (0.034), mask (0.266), Region Proposal Network (RPN) bounding box (0.341), and RPN classification (0.054). The model successfully identified lung cancer recurrence sites, which were then accurately mapped onto chest CT images to highlight areas of primary concern.

## Conclusion

The trained model allows clinicians to focus on lung regions where cancer recurrence is more likely, acting as a significant aid in the detection and diagnosis of lung cancer. Serving as a clinical decision support system, it offers substantial support in managing lung cancer patients.

