

An Improved Anchor-Free Nodule Detection System Using Feature Pyramid Network

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Lung cancer (LC) is the leading cause of cancer death. Detecting LC at the earliest stage facilitates curative treatment options and will improve mortality rates. Computer-aided detection (CAD) systems can help improve LC diagnostic accuracy. In this work, we propose a deep-learning-based lung nodule detection method. The proposed CAD system is a 3D anchor-free nodule detection (AFND) method based on a feature pyramid network (FPN). The deep learning-based CAD system has several novel properties: (1) It achieves region proposal and nodule classification in a single network, forming a one-step detection pipeline and reducing operation time. (2) An adaptive nodule modeling method was designed to detect nodules of various sizes. (3) The proposed AFND also establishes a novel center point selection mechanism for better classification. (4) Based on the new nodule model, a composite loss function integrating cosine similarity (CS) loss and SmoothL1loss was designed to further improve the nodule detection accuracy. Experimental results show that the AFND outperforms other similar nodule detection systems on the LUNA 16 dataset.