

SUPPLEMENTARY MATERIALS 4

False Positive Filtering Method

During the processing of the lesions detected by the YOLOv3 model, the detected lesions that had a short-axis diameter greater than 1.5 cm, observed only on a single slice but not on the adjacent slices, were regarded as invalid findings to reduce false-positive findings. Supplementary Figure 2 illustrates the theoretical background of this false-positive filtering method. A nodule or mass is almost spherical. Thus, if the diameter of the lesion exceeds 1.5 cm, the lesion should be observed sequentially in a minimum of two of the reconstructed CT images with a slice thickness of 3 mm or 5 mm. In the present study, a metastatic lesion with a diameter greater than 1.5 cm was detected in more than 2 slices in almost all cases. Meanwhile, false-positive detections in the elongated tubular or flat structures, such as hepatic vessels, dilated bile ducts, or partial volume artifacts were mostly detected in a single slice. Based on the proposed method, our DLLD was programmed to automatically invalidate observations when detecting a lesion with a short-axis diameter greater than 1.5 cm found only in one slice. It is assumed that this method would have reduced the number of false positives in our DLLD.

Extrahepatic False-Positive Finding

As DLLD was designed for the detection and classification of liver lesions, the detection markings outside the liver were excluded from this evaluation. An abdominal radiologist with 5 years of experience classified DLLD's detections in the CT axial images of the validation cohort patients into intrahepatic and extrahepatic findings. The extrahepatic false positives per patient (FPP) with DLLD were 0.694 (59 extrahepatic false-positive findings in 85 patients).

A recent study has proved that the technology for liver segmentation using a deep learning algorithm is highly advanced [10]. If automatic liver segmentation technology is applied in future studies, it will be possible to detect and classify only intrahepatic lesions.