

Supplementary Materials: COVID-19 diagnosis from chest CT Scans: a weakly supervised CNN-LSTM approach

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For the evaluation of the similarity between activation maps of the original image and the perturbed image which are based on Grad-CAM, cosine similarity (CS) is used. First, the perturbation is applied on the original image and activation map is obtained from Grad-CAM. After flattening activation map of the perturbed image, P vector is obtained. This is compared with the vector of activation map of the original image in the perturbed state, which is O_p . The following equation (1) is used to calculate CS in which the two vectorized maps are similar when CS is close to 1.

$$CS = \frac{\overrightarrow{O_p} \cdot \vec{P}}{\|\overrightarrow{O_p}\| \|\vec{P}\|} \quad (1)$$

In the Figure S1, we compared four perturbed states: clockwise rotated (Figure S1.B), counterclockwise rotated (Figure S1.C), 30 pixels right and 15 pixels down translated (Figure S1.D), and 20 pixels left and 15 pixels to up translated (Figure S1.D).

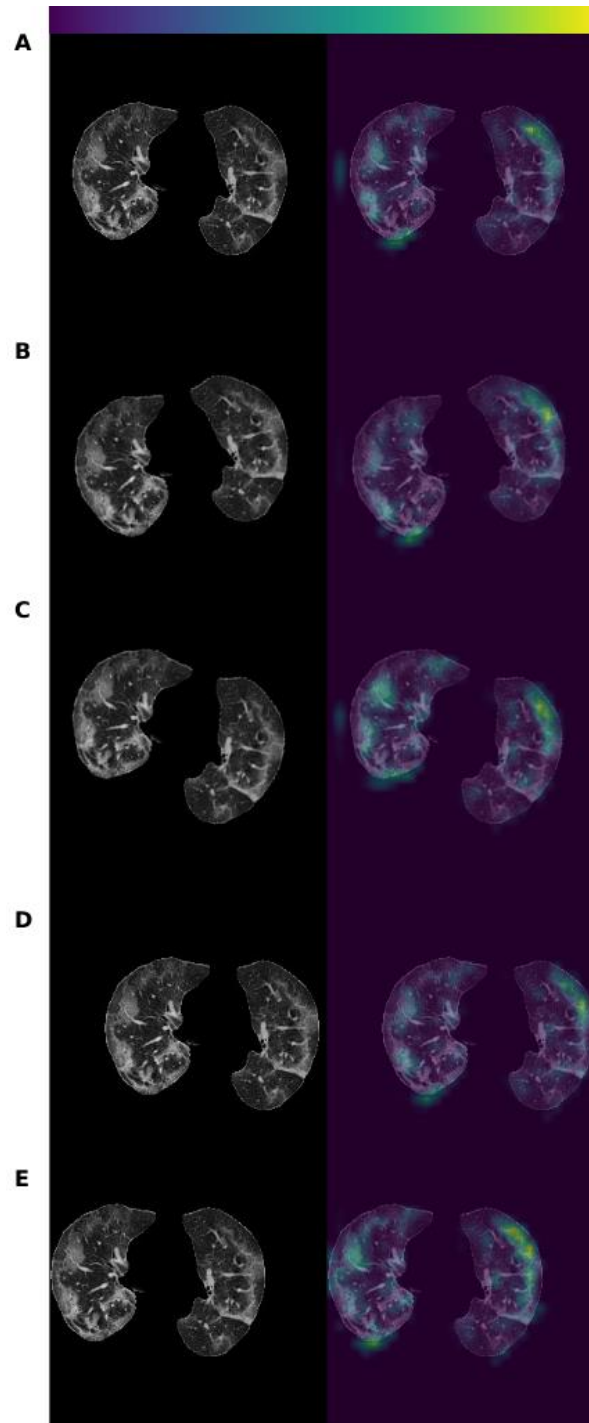


Figure S1. Illustration of the original CT slices (left) and activation maps (right) of the original (A) and the perturbed images (B-E) based on Grad-CAM. (A) Original image (left) and its activation map (right) (B) 15-degrees counterclockwise rotation of the original slice (left) and its calculated activation map (right) (CS: 99%), (C) 15-degrees clockwise rotation of the original image (left) and its calculated activation map (right) (CS: 98%), (D) 30 pixels right and 15 pixels down translation of the original image (left) and its calculated activation map (right) (CS 97%), (E) 20 pixels left and 15 pixels to up translation of the original image (left) and its calculated activation map (right) (CS: 99%). Colormaps indicates the importance of the last convolutional layer and colorbar of the activation maps is illustrated at the top panel.