Using deep learning on chest CT to track COVID-19 patients

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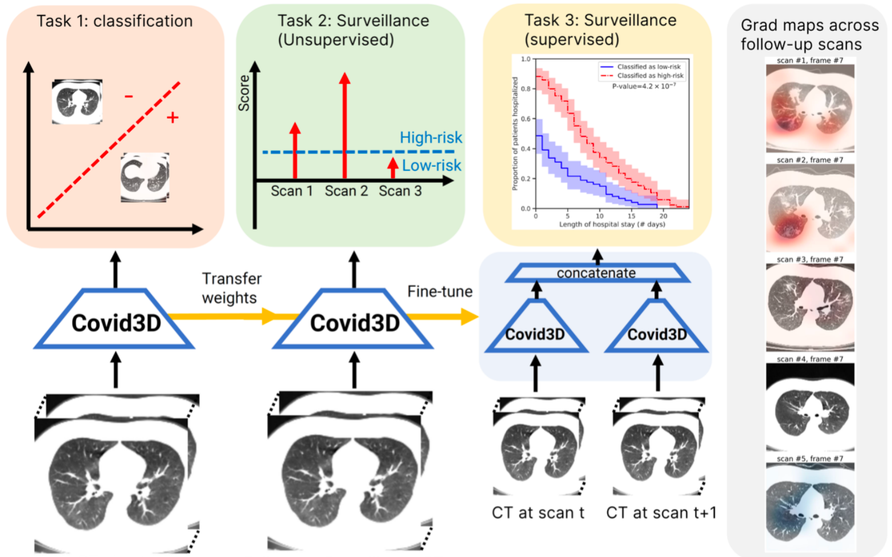
- We demonstrate a simple-to-use model that automatically enables differential diagnosis between COVID+ from COVID- pneumonia without the use of automated tools for extracting regions of interest (ROIs) or segmentation
- Using 397 CT scans (84,806 image slices), the model achieved comparable accuracy to that of radiologists and was evaluated on two external, hold-out institutions
- We examine quantitative relationships between AI features and hospitalization time and illustrate deep learning attention maps that can enhance visual presentation on follow-up scans



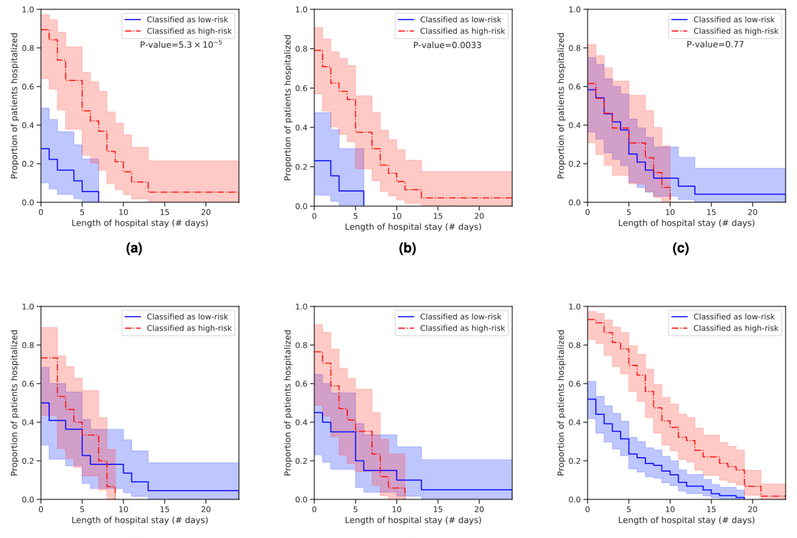
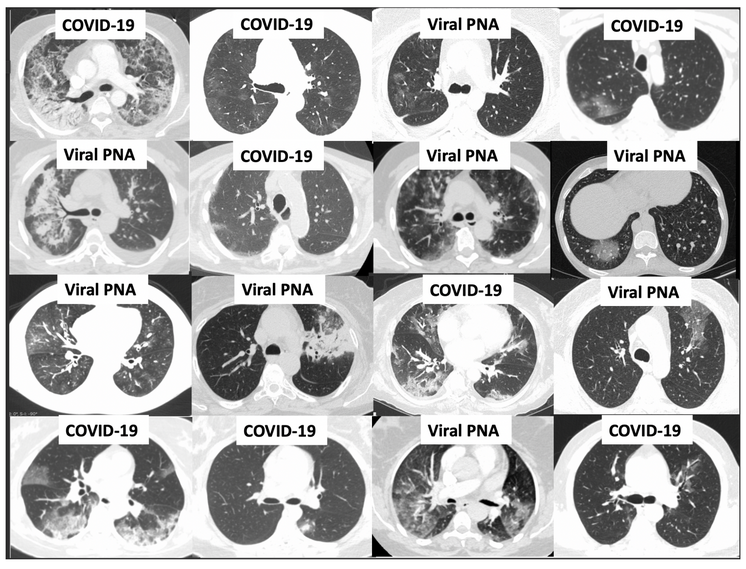


Figure 8. Kaplan–Meier plots on COVID disease course. Different configurations of COVID3D: (a) 1 prior + 1 follow-up scans; (b) 1 scan only; (c) age and sex only; (d) Radiologist 1 using 1 scan only; (e) Radiologist 1 using 1 prior + 1 follow-up; (f) 1 prior + 1 follow-up scans (5-fold cross-validation over all validation folds).



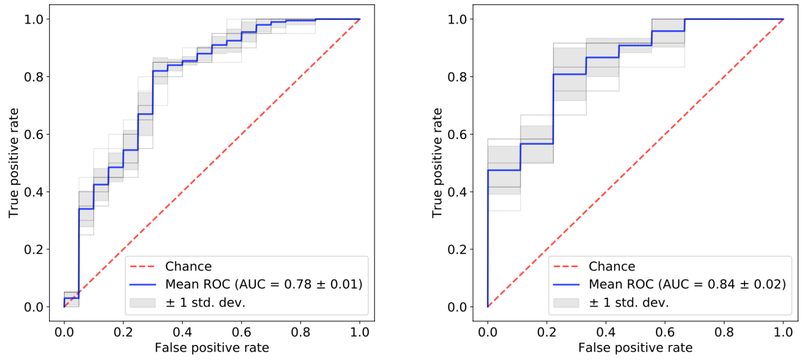
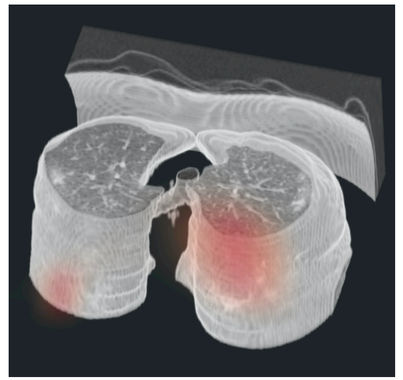


Figure 3. Receiver operating characteristics (ROC) curves and area under the curve (AUC) for COVID3D on external institutions: (a) Hospital B, and (b) Hospital C.

	External Institution B	External Institution C
2D ResNet-50 (pretrained-ImageNet)	0.65 ± 0.01	0.69 ± 0.02
COVID3D	$\mathbf{0.78 \pm 0.01}$	$\mathbf{0.84 \pm 0.02}$
COVID3D* (tuned lung window)	0.81 ± 0.01	0.87 ± 0.02



Grad-CAM highlighting salient regions of COVID+