

# Supplementary Materials: A Convolutional Neural Network for Anterior Intra-Arterial Thrombus Detection and Segmentation on Non-Contrast Computed Tomography of Patients with Acute Ischemic Stroke

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## Analysis S1: Comparison of the presented results with related work.

To the best of our knowledge, only Lisowska et al. [31] have published a thrombus segmentation method that was similar to our approach. Their method consisted of a butterfly network that detects thrombus on non-contrast computed tomography images based on asymmetry between the affected and healthy side. The asymmetry is caused by the appearance of the hyperdense sign at the location of the thrombus. Results were presented with an AUC curve showing the balance between precision and sensitivity.

Additional to the approach presented by Lisowska et al. we combined asymmetry detection with an additional CNN that was trained specifically for the detection of the hyperdense sign. In order to compare our results with those presented by Lisowska et al. we estimated the maximum Youden's J statistic from their presented AUC and computed the Youden's J statistic from our results.

The maximum of the Youden's J statistic is defined at the point on the AUC curve with highest distance from the chance line. The Youden's J statistic is defined as:

$$J = \text{sensitivity} + \text{precision} - 1$$

The maximum Youden's J statistic for the AUC curve presented by Lisowska et al. was estimated for a sensitivity of 0.63 and precision of 0.54. Hence, the maximum Youden's J statistic was estimated at  $0.63 + 0.54 - 1 = 0.17$ . The Youden's J statistic for the presented network is:  $0.86 + 0.69 - 1 = 0.55$

A higher Youden's J statistic is related to a lower proportion of the total misclassified results. The Youden's J statistic computed from our results was higher to the statistic estimated from the results presented by Lisowska et al. and therefore we were able to conclude that our network outperformed their network.

## Reference

- [31] A. Lisowska, E. Beveridge, K. Muir, and I. Poole, "Thrombus Detection in CT Brain Scans using a Convolutional Neural Network," *Proc. 10th Int. Jt. Conf. Biomed. Eng. Syst. Technol.*, no. Biostec, pp. 24–33, 2017.