

Stroke Lesion Segmentation in Perfusion Images using Fully Convolutional Neural Networks

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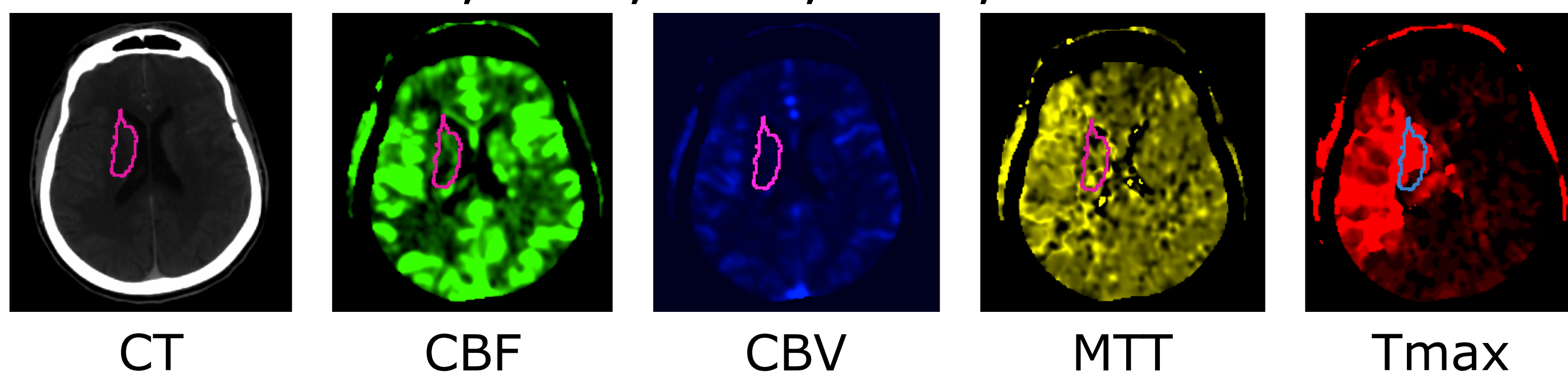
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Goal: Automatically segment ischemic stroke lesions in CT perfusion images as part of the ISLES 2018 challenge.

Motivation:

- CT imaging is more accessible than MRI
- Improve time-sensitive treatment planning

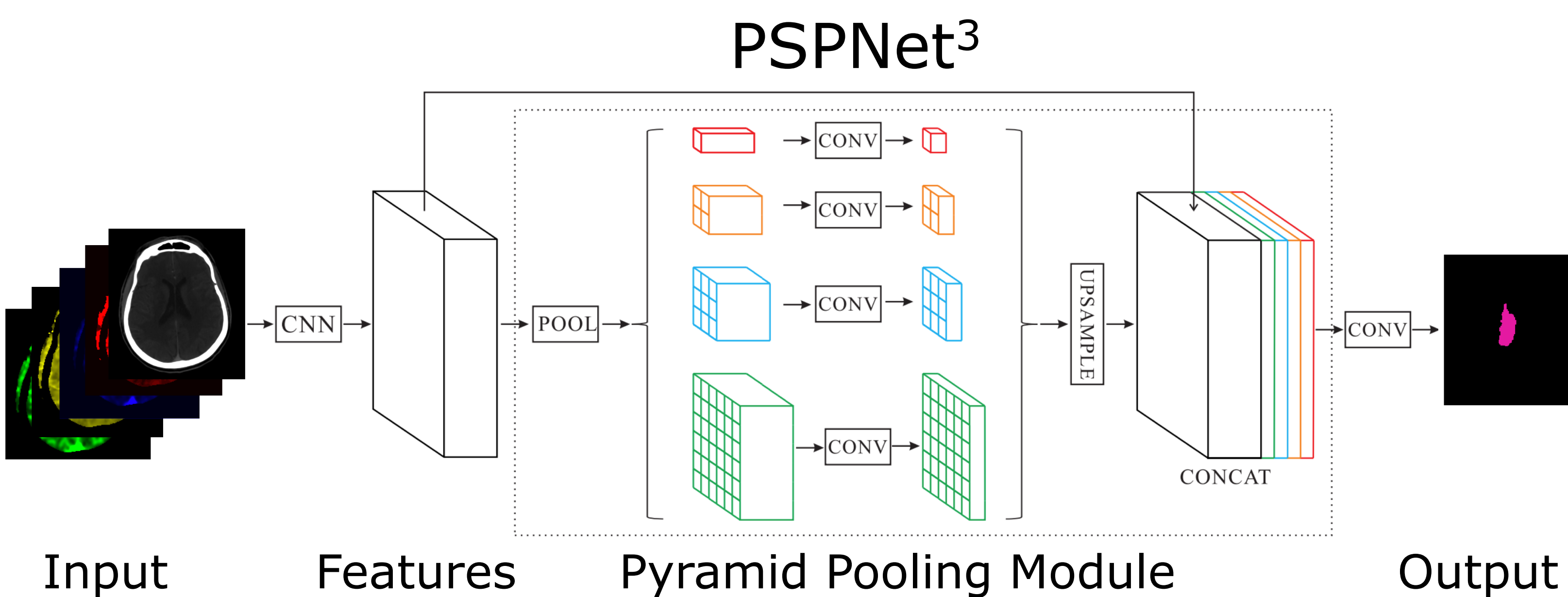
Data: stack CT, CBF, CBV, MTT, Tmax



Augmentation: flip, rotate, translate, elastic deformation

Models:

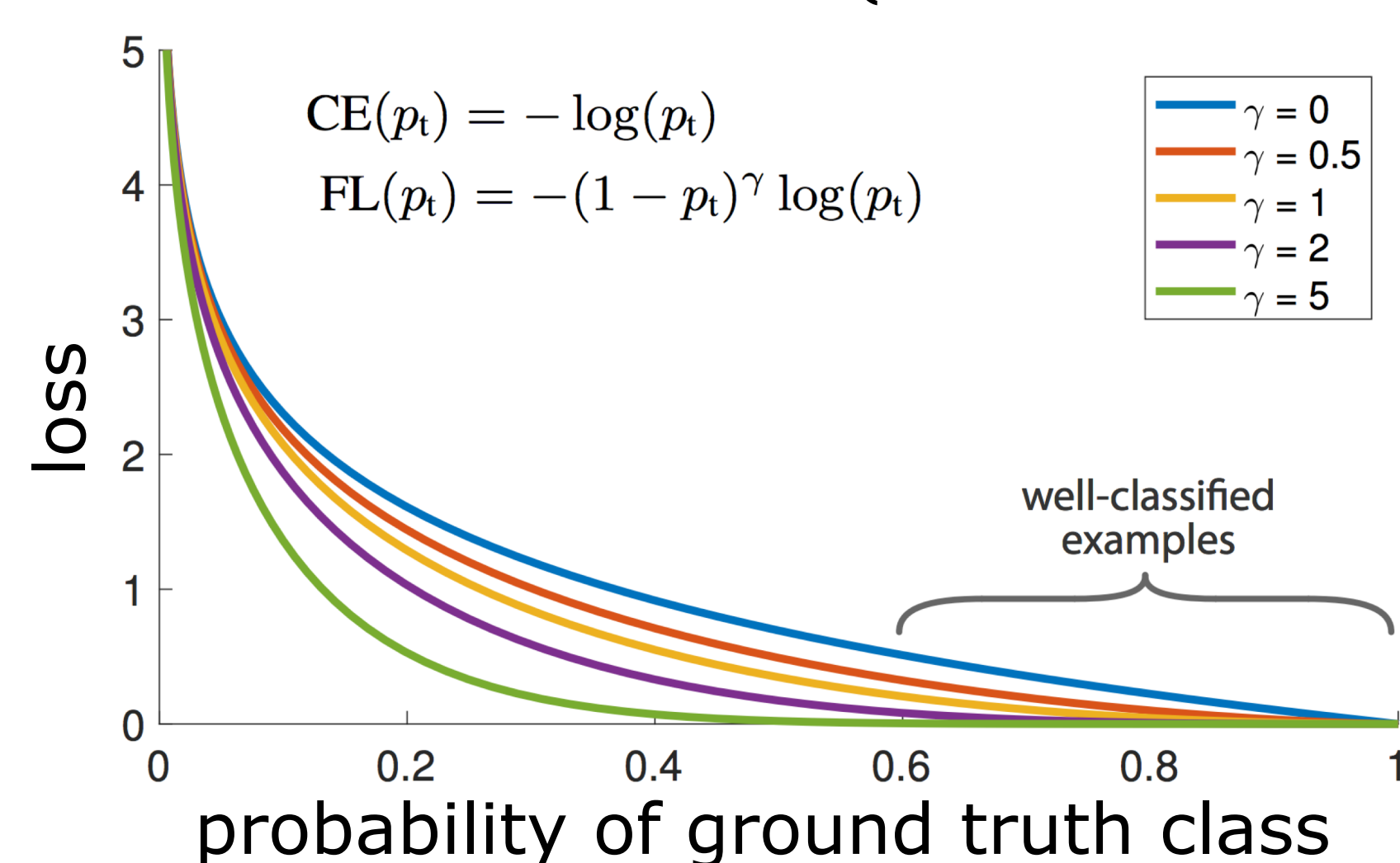
- 2D: U-Net¹, DenseNet², PSPNet³
- 3D: U-Net¹, V-Net⁴



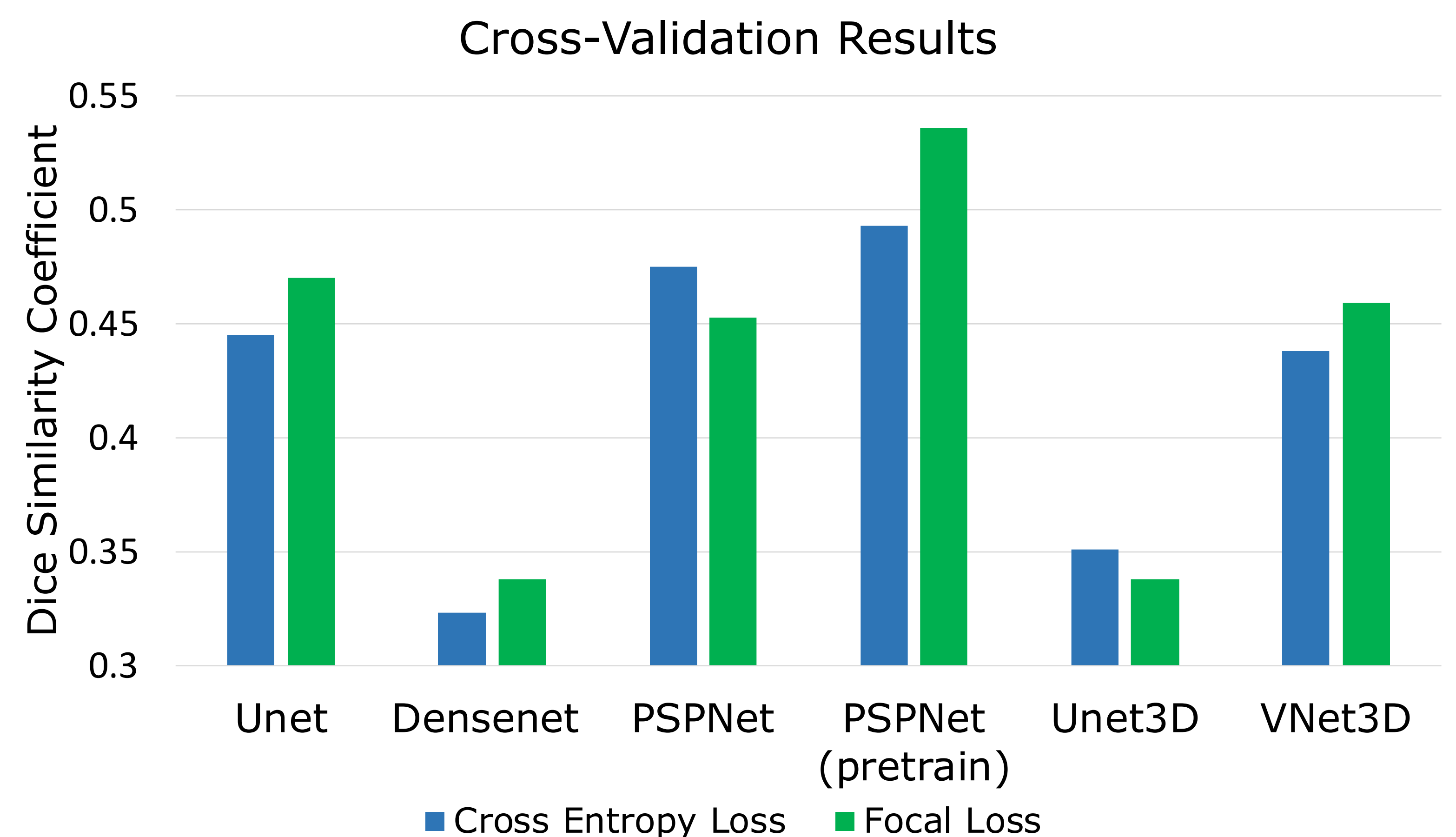
Loss functions:

- Cross-Entropy
- Focal Loss⁵

$$FL(p_n) = \begin{cases} (1 - p_n)^\gamma \log(p_n) & y_n = 1 \\ p_n^\gamma \log(1 - p_n) & y_n = 0 \end{cases}$$



Evaluation: 5-fold cross-validation, Dice Similarity Coefficient



Focal loss can discriminate finer details



Submission: 1) Ensemble PSPNet, U-Net (2D)
2) V-Net

References: ¹Ronneberger et al., 2015, MICCAI. ²Jegou et al., 2017, CVPR. ³Zhao et al., 2017, CVPR. ⁴Milletari et al., 2016, IEEE 3DV. ⁵Lin et al., 2018, IEEE TPAMI.