DoNuSeg (Supplementary Material)

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Pseudo Bounding Box Generating. The initial size of point p_i is calculated by distances to its K-th nearest points:

$$\begin{cases} w_i^{init} = \frac{1}{K} \sum_{k=1}^{K} \beta w_{i,k} \\ h_i^{init} = \frac{1}{K} \sum_{k=1}^{K} \beta h_{i,k} \end{cases}, \tag{1}$$

where w_i^{init} and h_i^{init} are the initial width and height of p_i, $w_{i,k}$ and $h_{i,k}$ is the distance of x and y direction of its k-th nearest neighbor, and β is a hyperparamater. The initial object sizes are then smoothed by:

$$\begin{cases} w_i = \frac{1}{|R_{p_i}|} \sum_{l \in R_{p_i}} w_i^{init} \\ h_i = \frac{1}{|R_{p_i}|} \sum_{l \in R_{p_i}} h_i^{init} \end{cases}, \tag{2}$$

where R_{p_i} is the p_i-centered circle, $|R_{p_i}|$ is the number of objects in the circle, and w_i and h_i are the width and height of the bounding box of p_i. We set $K = 3$ and $\beta = 0.5$ in Equation 1. $|R_{p_i}| = 40$ in Equation 2.
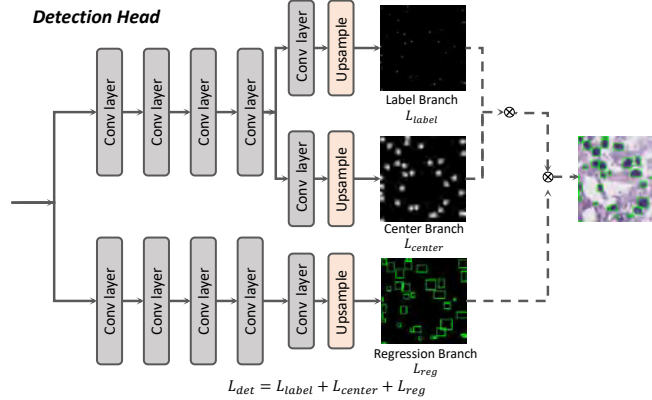

Fig. 1: The structure of the Detection Head in the DoNuSeg Backbone, which contains three branches. The regression branch outputs the distances from the current position to the edges of the bounding box supervised by an IoU loss. The label branch predicts its probability belongs to nuclei supervised by a cross-entropy loss. The center branch filters low-quality prediction bounding boxes by centrality supervised by an MSE loss. The three branches' predictions are combined to obtain the bounding boxes prediction.
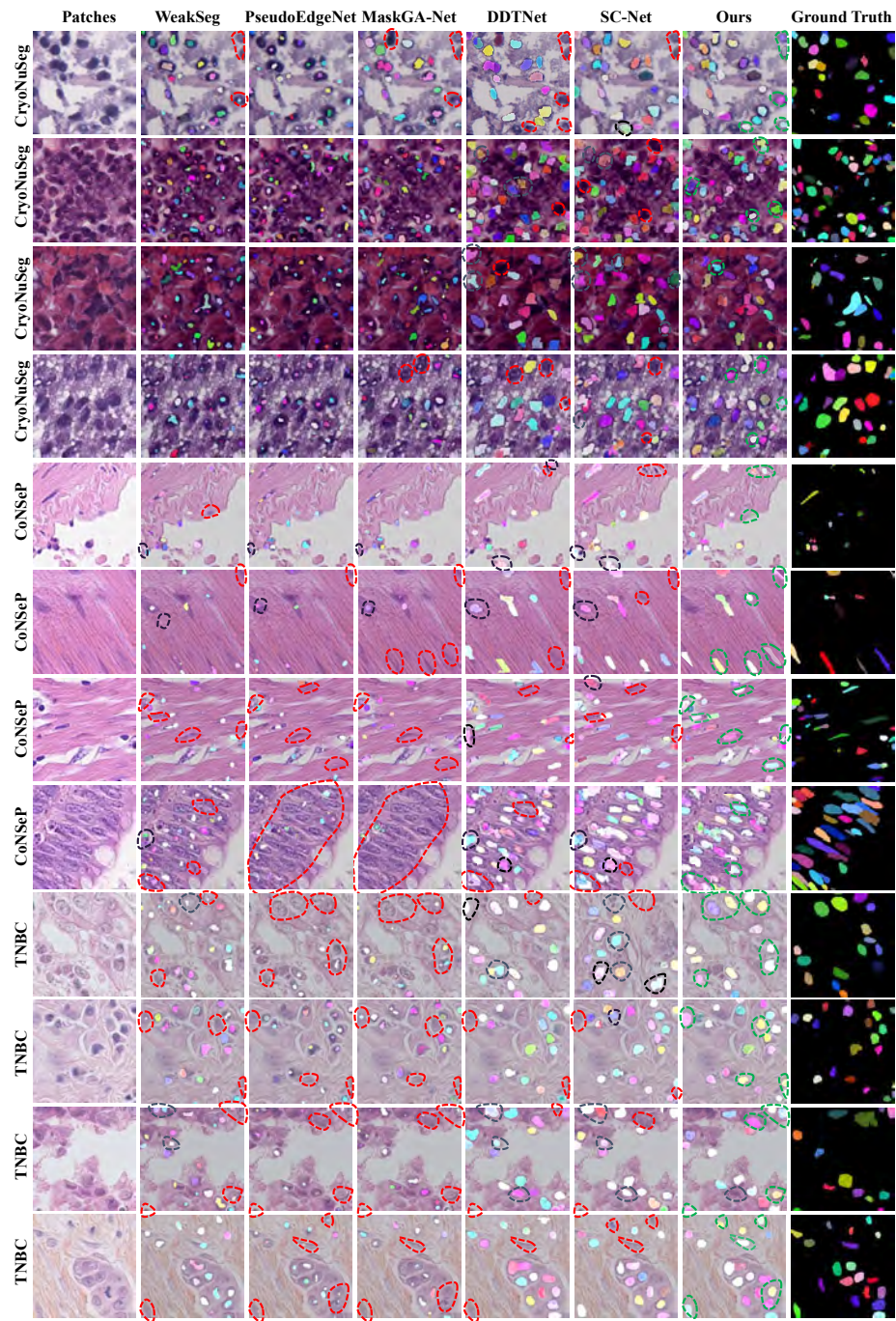
Fig. 2: More visualization comparisons on the three datasets. Red and black circles indicate the false negative (FN) and false positive (FP) errors. Green circles denote how DoNuSeg corrects these errors.