

Supplementary material

Here we list in tables the most commonly used metrics that are applied to evaluate the segmentation performance.

Table 18 Summary of Performance Metrics.

Name	Formula	About	Range	Unit
Accuracy	$\frac{TP + TN}{TP + TN + FP + FN}$	Ratio of correctly predicted instances to total instances.	$[0, 1]$	%
Precision; Positive Predictive Value (PPV)	$\frac{TP}{TP + FP}$	Ratio of true positives to total positive predictions.	$[0, 1]$	%
Recall (Sensitivity); True-Positive Rate (TPR)	$\frac{TP}{TP + FN}$	Ratio of true positives to total actual positives.	$[0, 1]$	%
Specificity/True-Negative Rate (TNR)	$\frac{TN}{TN + FP}$	Proportion of actual negatives correctly identified.	$[0, 1]$	%
False-positive rate (FPR)	$\frac{FP}{FP + TN}$	Proportion of actual negatives incorrectly identified as positives.	$[0, 1]$	%
Dice Similarity Coefficient (DSC)	$\frac{2 A \cap B }{ A + B } = \frac{2TP}{2TP + FP + FN}$	Harmonic mean of precision and recall, measuring the overlap between ground truth A and prediction B .	$[0, 1]$	%
Jaccard Index (JI)	$\frac{ A \cap B }{ A \cup B } = \frac{TP}{TP + FP + FN}$	Measures overlap between ground truth A and prediction B . Also known as IoU.	$[0, 1]$	%
Volumetric overlap error (VOE)	$1 - \frac{2 A \cap B }{ A + B }$	Complement of DSC, measures dissimilarity between A and B .	$[0, 1]$	%
Area Under the ROC Curve (AUC)	$\int_0^1 TPR(FPR) d(FPR)$	Area under ROC curve, quantifies classifier's ability to distinguish classes.	$[0, 1]$	%
Maximum symmetric surface distance (MSSD)	$\max_{x \in A} \left(\max_{y \in B} d(x, B), \max_{y \in B} d(y, A) \right)$	Maximum distance between surfaces of objects A and B .	$(0, +\infty)$	mm

Table 18 Summary of Performance Metrics (continued).

Name	Formula	About	Range	Unit
Hausdorff Distance (HD)	$\max \left(\sup_{a \in A} \inf_{b \in B} d(a, b), \sup_{b \in B} \inf_{a \in A} d(b, a) \right)$	Maximum distance of a point in one set to the closest point in the other set, where smaller values indicate greater similarity between the sets.	$(0, +\infty)$	mm
Relative Volumetric Distance (RVD)	$\frac{ V_{\text{pred}} - V_{\text{gt}} }{ V_{\text{gt}} }$	Relative difference in volume between predicted and ground truth volumes.	$(-\infty, +\infty)$	mm
Average symmetric surface distance (ASSD)	$\frac{1}{ A + B } \left(\sum_{y \in B} \min_{x \in A} d(x, y) + \sum_{x \in A} \min_{y \in B} d(y, x) \right)$	Average of surface distances between objects A and B .	$(0, +\infty)$	mm
Root Mean Square Error (RMSE)	$\sqrt{\frac{1}{n} \sum_{i=1}^n (\hat{y}_i - y_i)^2}$	Square root of average of squared differences between predicted and actual values. Smaller values indicate better model performance.	$(0, +\infty)$	%
Root-mean-square symmetric surface distance (RMSD)	$\sqrt{\frac{1}{ A } \sum_{x \in A} d(x, B)^2 + \frac{1}{ B } \sum_{y \in B} d(y, A)^2}$	Root-mean-square of surface distances between objects A and B .	$(0, +\infty)$	mm