



Figure 1: Key to symbols: X = positives ('ground truth'), \bar{X} = negatives ('ground truth'), Y = predicted positives, TP = true positives, TN = true negatives, FP = false positives and FN = false negatives.

Theorem 1. *In a one-class segmentation problem the Sørensen-Dice coefficient (DSC) and the F_1 score are equivalent.*

Proof. By definition:

$$DSC = \frac{2|X \cap Y|}{|X| + |Y|} \quad (1)$$

where $|\cdot|$ indicates 'the cardinality of'. Now, with reference to Fig. 1, we have:

$$DSC = \frac{2TP}{2TP + FN + TP} \quad (2)$$

On the other hand, again by definition, we have:

$$F_1 = 2 \frac{PR}{P + R} \quad (3)$$

where P and R respectively indicate *precision* and *recall*, i.e.:

$$P = \frac{TP}{TP + FP} \quad (4)$$

$$R = \frac{TP}{TP + FN} \quad (5)$$

From Eq. 4–5 we obtain:

$$P + R = \frac{TP(2TP + FP + FN)}{(TP + FN)(TP + FP)} \quad (6)$$

$$PR = \frac{TP^2}{(TP + FN)(TP + FP)} \quad (7)$$

Finally, substituting Eq. 6–7 into Eq. 3 we get:

$$F_1 = \frac{2TP}{2TP + FP + FN} \quad (8)$$

□