Reviewer's Report

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Title: Comparing estimators of discriminative performance of time-to-event models

Major comments:

1. In Section 3.2, the authors mention that "Specifically, we propose to smooth the non-parametric $\widehat{\text{AUC}}^{I/D}(t)$ using penalized regression splines via the mgcv package (Wood, 2003, 2011, 2017) in R (R Core Team, 2021)." Providing more details would be helpful for practical implementation. For example, (i) the method for estimating unknown parameters in the additive model; (ii) the penalty used in the estimation procedure; (iii) which function in the mgcv package is used for solving this problem.

2. The authors mention that "the smoothed survival function $\widetilde{S}(t)$ is modelled as a linear combination of P-spline basis functions $M_1(t), \ldots, M_K(t)$", See lines 16-17, page 8. Is the proposed estimator sensitive to the selection of the P-spline basis functions?

3. What is the distribution of $\boldsymbol{Z}$ in Equation (12) in Section 4.1.1? Is it a multivariate normal distribution?

4. In simulations, the authors considered that an average of 58.6% of participants were censored. Does the censoring rate affect the proposed estimators? For example, does a lower/higher censoring rate result in smaller/larger variation?

Minor comments:

1. The notation C denotes both concordance (see Section 2.2) and censoring time (see Section 4.1.1). To avoid confusion, it is better to use different notations.