

A machine learning approach to Model for End Stage Liver Disease score in cardiac surgery

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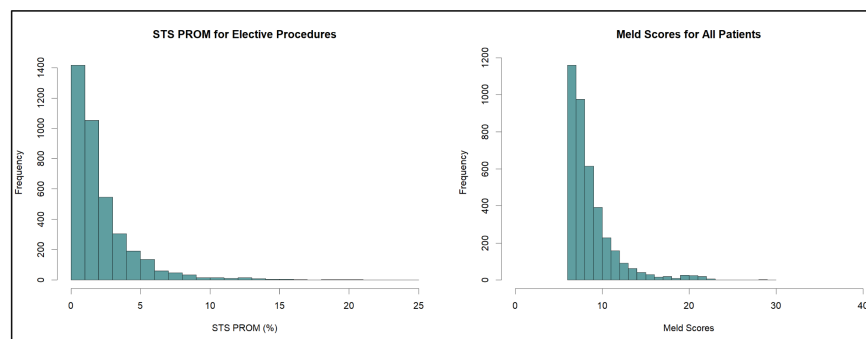
July 4, 2021

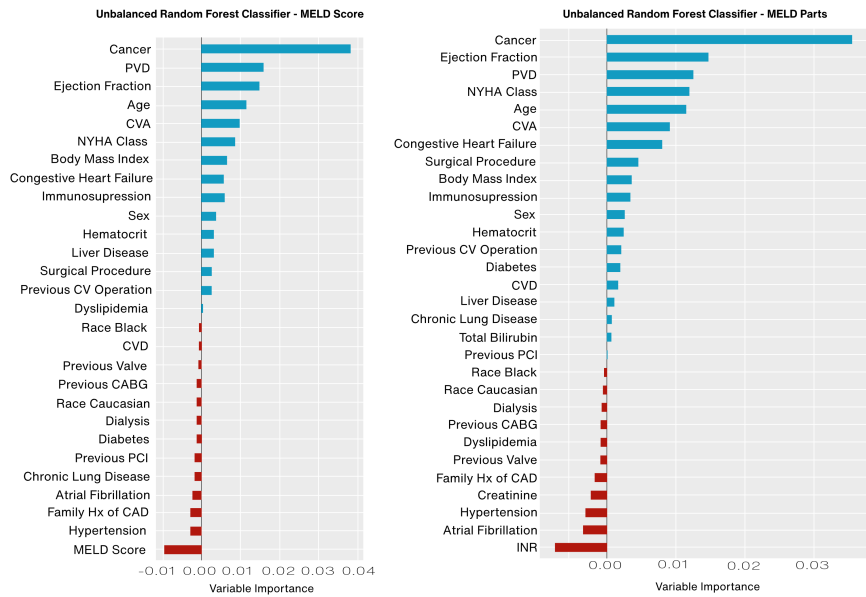
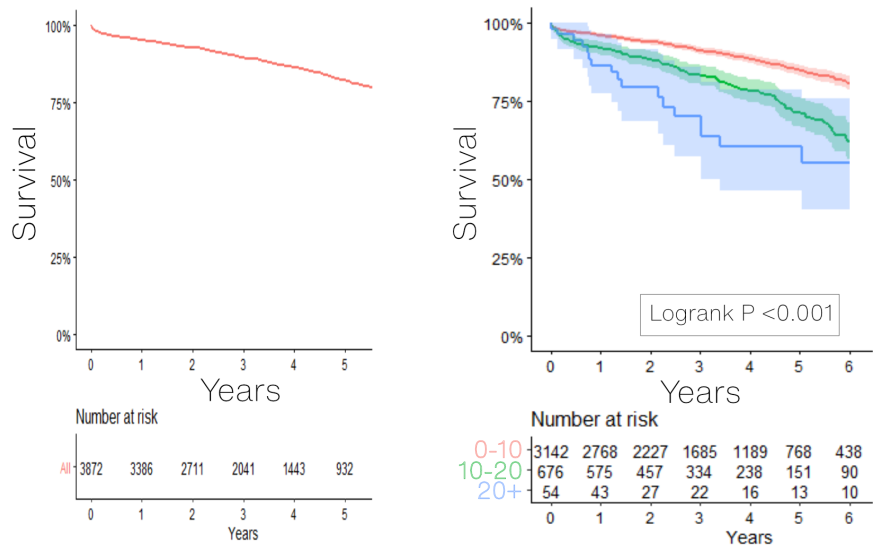
Abstract

Objective The Model for End- Stage Liver Disease (MELD) score is a composite number of physiologic parameters and likely has non-linear effects on operative outcomes. . We use machine learning to evaluate the relationship between MELD score and outcomes of cardiac surgery. **Methods** All STS indexed elective cardiac surgical procedures at our institution between 2011 and 2018 were included. MELD score was retrospectively calculated. Logistic regression models and an imbalanced random forest classifier was created on operative mortality using 30 preoperative characteristics. Cox regression models and random forest survival models were created for long-term survival. Variable importance analysis (VIMP) was conducted to rank variables by predictive power. Linear and machine learned models were compared with their receiver operating characteristic (ROC) and Brier score respectively. **Results** The patient population included 3,872 individuals. Operative mortality was 1.7% and 5-year survival was 82.1%. MELD score was the 4th largest positive predictor on VIMP analysis for both operative long-term survival and the strongest negative predictor for operative mortality. The logistic model ROC area was 0.762, compared to the random forest classifier ROC of 0.674. The Brier score of the random forest survival model was larger (worse) than the cox regression starting at 2 years and continuing throughout the study period. **Conclusions** MELD score and other continuous variables had high degrees of non-linearity to mortality. This is demonstrated by the fact that MELD score was not significant in the cox multivariable regression but was strongly important in the random forest survival model.

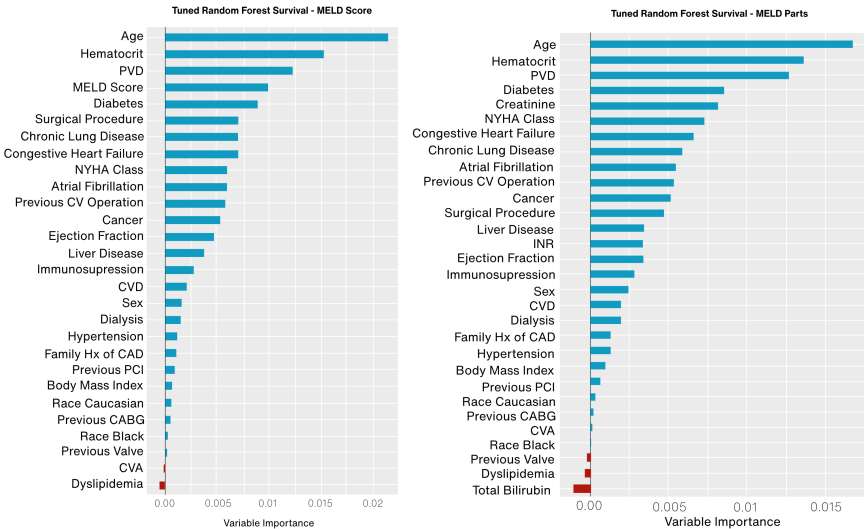
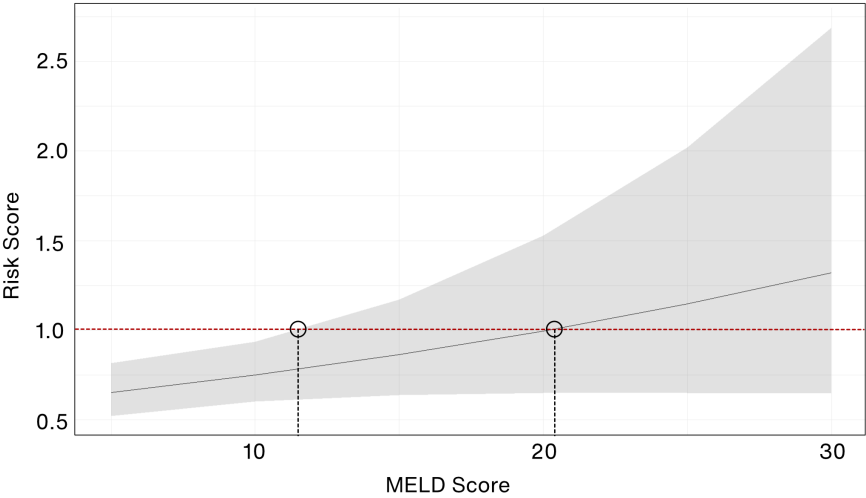
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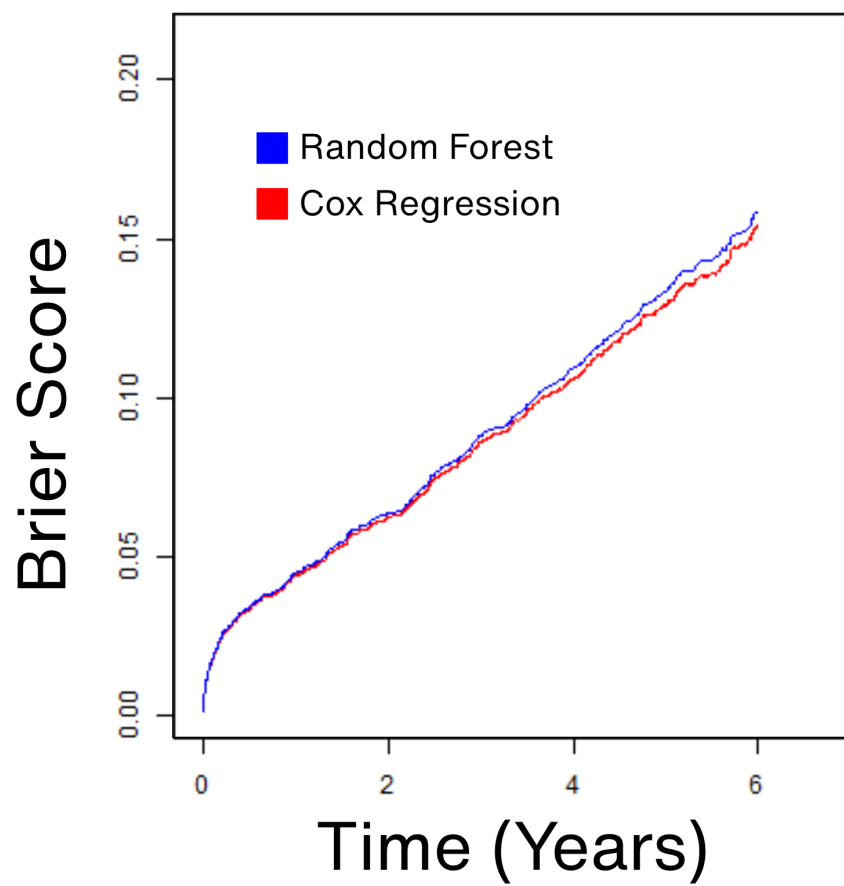
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Marginal Effects





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