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Competing Risks Modeling Using within Node Homogeneity Classification Tree

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Abstract : To design a tree that maximizes within-node homogeneity, there is a need for a homogeneity measure that is appropriate for event history data with multiple risks. We consider the use of Deviance and Modified Cox-Snell residuals as a measure of impurity in Classification Regression Tree (CART) and compare our results with the results of Fiona (2008) in which homogeneity measures were based on Martingale Residual. Data structure approach was used to validate the performance of our proposed techniques via simulation and real life data. The results of univariate competing risk revealed that: using Deviance and Cox-Snell residuals as a response in within node homogeneity classification tree perform better than using other residuals irrespective of performance techniques. Bone marrow transplant data and double-blinded randomized clinical trial, conducted in other to compare two treatments for patients with prostate cancer were used to demonstrate the efficiency of our proposed method vis-à-vis the existing ones. Results from empirical studies of the bone marrow transplant data showed that the proposed model with Cox-Snell residual (Deviance=16.6498) performs better than both the Martingale residual (deviance=160.3592) and Deviance residual (Deviance=556.8822) in both event of interest and competing risks. Additionally, results from prostate cancer also reveal the performance of proposed model over the existing one in both causes, interestingly, Cox-Snell residual (MSE=0.01783563) outfit both the Martingale residual (MSE=0.1853148) and Deviance residual (MSE=0.8043366). Moreover, these results validate those obtained from the Monte-Carlo studies.

Keywords : within-node homogeneity, Martingale residual, modified Cox-Snell residual, classification and regression tree
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