

Deep Nonparametric Inference for Conditional Hazard Function

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Abstract

We propose a novel deep learning approach to nonparametric statistical inference for the conditional hazard function of survival time with right-censored data. We use a deep neural network (DNN) to approximate the logarithm of a conditional hazard function given covariates and obtain a DNN likelihood-based estimator of the conditional hazard function. Such an estimation approach grants model flexibility and hence relaxes structural and functional assumptions on conditional hazard or survival functions. We establish the consistency, convergence rate, and functional asymptotic normality of the proposed estimator. Subsequently, we develop new one-sample tests for goodness-of-fit evaluation and two-sample tests for treatment comparison. Both simulation studies and real application analysis show superior performances of the proposed estimators and tests in comparison with existing methods.