Bayesian Network for Censored Survival Data using Inverse Probability Censored Weighting (IPCW)

Vivek Kumar, Master of Science in Computer Science

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Supervisor: Dr. Bahman Honari

Estimating the chances of experiencing life threatening health outcomes over a specific time interval is an important tool in medical field to take adequate action much before the patient would encounter it and avoid the risk of happening. Moreover, if the tool predicts it based on few patients' medical history record, it becomes a highly significant. Since these health records are derived from administrative and clinical database, some records will not have information for entire time frame. Few patients might have disenrolled from the system and hence loss to follow up. This scenario is very common in any health system, still the requirement of such tool is very essential. In statistical terms, the event time is considered right censored when the observations do not have complete follow up and if they experienced the event or not is unknown to us. This dissertation is addressing the problem of such censored survival data of heart transplant by exploring the weight assignment technique for censored observation. We used Inverse Probability Censoring Weight (IPCW) approach of weight allocation and incorporated it with Bayesian network model to show the causal dependency between the features and find out the probability of feature to be present or not based on event status.

Also, we applied learning algorithms for structure and parameter learning of Bayesian Network. We have further evaluated the model based on different evaluation metrics and reported the result. We have developed the model on heart transplant data where Age, prior Surgery and transplant indicator had come out as key factor to affect the risk outcome. Further, we can use this model as general purpose and also can compare it with other machine learning classifiers to predict the outcome.

Keywords Bayesian networks · Kaplan – Meier , Heart Transplant data · Survival analysis · Inverse probability of censoring weights · Risk prediction