Bayesian Predictive Modeling for Mortality Risk in Heart Failure Patients

Group 11
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Motivation

Heart failure is a critical health issue, causing significant mortality worldwide. Traditional predictive models rely on a fixed-effect approach, which might overlook the inherent uncertainties and individual variabilities present in medical data. The complexity of heart failure, influenced by a multitude of factors ranging from demographics to clinical symptoms, requires a more careful approach. Bayesian estimation presents an opportunity to address these challenges by incorporating prior clinical knowledge and a probabilistic understanding of patient outcomes.

Goal

The primary goal of this project is to develop a predictive model for mortality due to heart failure using Bayesian estimation techniques. By employing the No-U-Turn Sampler algorithm within the Bayesian framework, we aim to model the complex relationships between various patient characteristics and their mortality risk. This model will not only provide probabilistic predictions but also allow for a deeper understanding of the uncertainties and the relative importance of different predictors in heart failure outcomes. The objective is to improve predictive accuracy in clinical settings, aiding healthcare professionals in decision-making and improving patient care for those at risk of heart failure.

Description of the Dataset

This dataset comprises records of 368 patients who visited a cardiology hospital in Pakistan, with symptoms indicative of heart failure. It features a collection of 60 quantitative parameters for each patient. These parameters include data such as age, smoking status, mortality during the hospital visit, and maximum heart rate achieved, among many others. The dataset's diversity in variables allows for a detailed and nuanced modeling approach. This dataset, sourced from Kaggle, serves as an excellent resource for honing our skills in Bayesian Estimation and MCMC methods, offering a real-world context for predictive modeling. It is particularly suitable for Bayesian estimation since it presents a clear binary outcome: patient mortality.

References

Khan, Asghar Ali. "Mortality Rate Heart Patient Pakistan Hospital." Kaggle,
https://www.kaggle.com/datasets/asgharalikhan/mortality-rate-heart-patient-pakistan
-hospital. Accessed 19 Nov. 2023.