
Estimation of the bivariate distribution function for interval censored data

Gustavo Soutinho¹[0000-1234-5678-9012], Luís Meira-Machado²[0000-0002-8577-7665],
and Marta Azevedo²[0009-0003-4412-6991]
gustavo.soutinho@upt.pt, lmachado@math.uminho.pt, marta.vasconcelos4@gmail.com

¹ *REMIT - Research on Economics, Management and Information Technologies, Universidade Portucalense, Portugal*

² *CMAT - Centro de Matemática, Universidade do Minho, Portugal*

Abstract: Analyzing time-to-event data is crucial across fields like medicine, engineering, and social sciences to understand underlying processes and support decision-making. A common issue is *interval censoring*, where events are known to occur within specific intervals, but their exact timing is unknown.

In some studies, individuals may experience multiple events, and the time between them—known as *gap times*—is of particular interest. While much research focuses on right-censored event times, few studies address scenarios where one or both events are interval censored.

This paper introduces new estimation methods that are based on the Turnbull estimator of survival, aimed at addressing the gap in literature regarding interval-censored events. Specifically, we explore the possibility of comparing the new estimators with methods based on the imputation of the event time. These imputation methods include estimating the event time as the midpoint of the interval, the point to the right of the interval, and the point to the left of the interval. Through empirical evaluation and simulation studies, we aim to provide insights into the relative performance and suitability of these estimation approaches for analyzing gap times with interval-censored data.

Keywords: Gap times · Interval censoring · Nonparametric estimation

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