



Notice for the PhD Viva Voce Examination

Ms Shruthi P, Registration Number: 2073001, PhD Scholar at the Department of Statistics and Data Science, School of Sciences, CHRIST (Deemed to be University) will defend her PhD thesis at the public viva-voce examination on Wednesday, 24 June 2026 at 02.00 pm in Room No. 044, Ground Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis	:	Classical and Bayesian Inference for Newly Developed Bivariate Lifetime Distributions Under Different Censoring Schemes and Dependent Competing Risks
Discipline	:	Statistics
External Examiner - I	:	Dr Rajesh G Professor Department of Statistics Cochin University of Science and Technology Kochi - 682022 Kerala
External Examiner - II	:	Dr Muralidharan Kunnummal Professor Department of Statistics The Maharaja Sayajirao University of Baroda Pratapgunj, Vadodara Gujarat - 390002
Supervisor	:	Dr Jiju Gillariose Assistant Professor (Former) Department of Statistics and Data Science School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Place: Bengaluru
Date: 22 June 2026

Registrar (Academics)

ABSTRACT

This research develops and studies new bivariate lifetime distributions for modeling dependent time-to-event data when the marginal failure rates are monotonic and non-monotonic when observations are obtained under practical censoring schemes. The central methodological idea is to construct flexible bivariate models by combining suitable lifetime marginals with copula-based dependence, with particular focus on the Farlie-Gumbel-Morgenstern (FGM) copula due to its analytical tractability and inter-pretable dependence structure. This work is further motivated by the need to analyze competing risks data in which two potential failure modes may be statistically dependent a scenario frequently encountered in practice but not adequately addressed by models that assume independence between risks. The probabilistic properties of the proposed Bivariate Odd Lindley Half-Logistic (BOLiHL) and Bivariate Inverted Nadarajah-Haghighi (BINH) distributions are derived, including their joint density, marginal and conditional distributions, Survival Functions (SF), and Hazard Rate Functions (HRFs). Parameter estimation is conducted within both classical and Bayesian paradigms, using Maximum Likelihood Estimation (MLE) to estimate parameters and quantify uncertainty via Fisher information-based Standard Errors (SE) or Confidence Intervals (CI), and Bayesian inference with suitable prior distributions (e.g., a Gamma-Dirichlet prior for the bivariate Weibull model) and Markov Chain Monte Carlo (MCMC) methods, including Gibbs sampling with Metropolis-Hastings (MH) steps, to obtain posterior estimates and Credible Intervals (CrI). This thesis also considers censoring schemes commonly used in life-testing experiments. In particular, the likelihood functions for both the BOLiHL and BINH models are extended to accommodate progressive Type-II censoring (PRTIICS) and adaptive Progressive Type-II Censoring (APRTIICS) settings. These censoring frameworks are incorporated into the inferential procedures to reflect realistic experimental designs in which not all units fail or where testing may stop early. An additional contribution is the development of an inferential framework for dependent competing risks using a Marshall-Olkin Bivariate Weibull (MOBW) model under an Adaptive Type-II Progressive Hybrid Censoring Scheme (APTIIHCS). This research work introduces and rigorously evaluates two novel bivariate lifetime distributions and dependent competing risks inference framework. The findings highlight that incorporating flexible hazard shapes and dependence structures leads to more accurate modeling of complex lifetime data. The proposed methods not only contribute to statistical theory by expanding the class of tractable bivariate lifetime models, but also provide practical tools for reliability engineering and survival analysis, particularly in settings involving censoring and multiple dependent failure modes.

Keywords: FGM Copula, Odd Lindley Half Logistic Distribution, Bayesian method, Inverted Nadarajah-Haghighi Distribution, Progressive Type-II censoring, Adaptive Progressive Type II Censoring, Hybrid Censoring, MCMC method, Competing Risk.

Publications:

1. **Polipu, S., & Gillariose, J.** (2025). Bayesian and Non-Bayesian Parameter Estimation for the Bivariate Odd-Lindley Half-Logistic Distribution Using Progressive Type-II Censoring with Applications to Sports Data. *Modelling*, 6(1), 1–13. <https://doi.org/10.3390/modelling6010013> (WoS & Scopus indexed; JIF: 1.5; Q2).
2. Kumar, Mithali S., **P. Shruthi**, and Jiju Gillariose. "A REVIEW OF COMPETING AND SEMI-COMPETING RISKS METHODS IN SURVIVAL ANALYSIS." *Reliability: Theory & Applications* 20.4 (89) (2025): 1129-1139.
3. **Polipu, S., & Gillariose, J.** Adaptive Progressive Type-II Censoring Analysis of the Bivariate Inverted Nadarajah-Haghighi Distribution with Application to Kidney Infection Recurrence Data. *The American Statistician*. (SCIE, WoS & Scopus indexed; JIF: 2.1; Q1) (Accepted)
4. **Polipu, S., & Gillariose, J.** A Comprehensive Analysis of the Bivariate Inverted Nadarajah Haghighi Distribution Constructed Using a Copula. *American Institute of Mathematical Science*. (SCIE, WoS & Scopus indexed; JIF: 1.6; Q1). (Revised manuscript under second-round review)