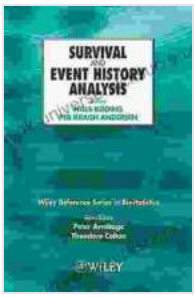
Survival and Event History Analysis: A Comprehensive Guide to Modeling Time-to-Event Outcomes

Survival and event history analysis are statistical methods used to analyze time-to-event outcomes, where the event of interest is not observed for all individuals in a sample. Survival analysis is particularly useful in medical research, epidemiology, and social sciences to investigate the occurrence of events such as death, disease onset, or treatment success.

Survival Time and Censoring:

- Survival time is the time from the start of the study until the occurrence of the event of interest.
- Censoring occurs when the event of interest does not occur for an individual during the study period.

Survival Function:



Survival and Event History Analysis: A Process Point of View (Statistics for Biology and Health)

by Krislert Samphantharak

4.6 out of 5

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Screen Reader	: Supported
Print length	: 558 pages

- The survival function, S(t),represents the probability that an individual survives beyond time t.
- It is the complement of the cumulative distribution function of survival time.

Hazard Function:

- The hazard function, h(t),represents the instantaneous risk of experiencing the event at time t.
- It is the derivative of the survival function with respect to time.

Kaplan-Meier Estimator:

- Estimates the survival function without making any assumptions about the underlying distribution.
- Calculates the probabilities of surviving each time interval by taking into account censoring.

Cox Proportional Hazards Model:

- A semi-parametric model that assumes the hazard function is proportional to a set of covariates.
- Allows for the estimation of the effect of covariates on the risk of the event.

Accelerated Failure Time Model:

- Assumes that the survival time is accelerated or decelerated by a factor depending on the covariates.
- Useful for modeling scenarios where the hazard function changes over time.

Medical Research:

- Estimating survival rates after surgery or treatment
- Identifying factors that influence disease progression

Epidemiology:

- Determining the risk of developing chronic diseases
- Investigating environmental and lifestyle factors associated with disease occurrence

Social Sciences:

- Analyzing job tenure or time to graduation
- Investigating factors that influence relationship duration

Competing Risks:

- Models situations where subjects can experience multiple types of events.

Penalized Regression:

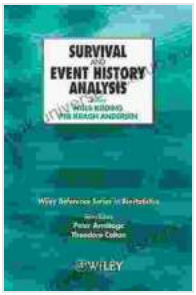
- Techniques for incorporating large numbers of covariates into survival models.

Bayesian Survival Analysis:

- Incorporates prior information into the analysis and allows for more flexible modeling.

Survival and event history analysis provide powerful tools for understanding and predicting time-to-event outcomes. By leveraging these methods, researchers and practitioners can gain valuable insights into the factors that influence the occurrence of important events, leading to improved decision-making and policy development.

- UCLA Statistical Consulting Group: Survival Analysis
- Johns Hopkins Bloomberg School of Public Health: Survival Analysis Course
- RStudio Cheat Sheet for Survival Analysis



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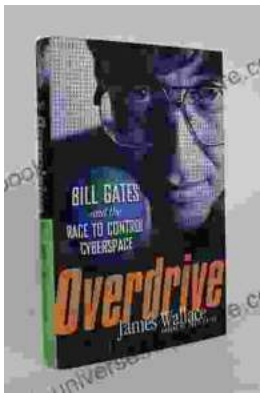

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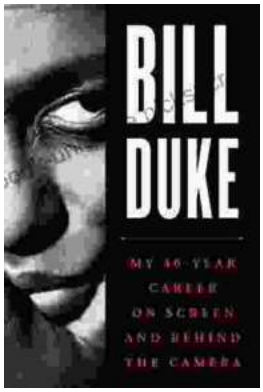

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