جامعة نيويورك أبوظبي
NYU | ABU DHABI

NYU Abu Dhabi
Public Health Research Center
PO Box 129188
Abu Dhabi, UAE

Stat 04: Survival Analysis

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Course Description:

This course provides a comprehensive introduction to survival analysis, a statistical method used to analyze time-to-event data. Survival analysis is widely applied in various fields, including healthcare, engineering, finance, and social sciences, to model and understand the time until an event of interest occurs. Students will learn the theory, application, and interpretation of survival analysis techniques, including Kaplan-Meier estimation, Cox proportional hazards regression, and advanced topics in survival modeling.

Prerequisites:

- Basic understanding of statistics and probability.
- Familiarity with the statistical software R.
- Knowledge of basic concepts in data analysis.

Course Objectives:

By the end of this course, students should be able to:

1. Understand the principles and theory behind survival analysis.
2. Apply Kaplan-Meier estimation to estimate survival curves.
3. Perform Cox proportional hazards regression for modeling survival data.
4. Handle censored data and account for time-varying covariates.
5. Explore advanced topics in survival modeling, including frailty models and competing risks.

Course Outline:

Module 1: Introduction to Survival Analysis

- Definition and importance of survival analysis.
- Characteristics of time-to-event data.
- Survival curves and hazard functions.

Module 2: Kaplan-Meier Estimation

- Estimating survival curves.
- Calculating median survival times.
- Confidence intervals for survival probabilities.

Module 3: Log-Rank Test and Cox-Mantel Test

- Testing the equality of survival curves.
- Log-rank and Cox-Mantel tests.
- Assumptions and limitations.

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Module 4: Cox Proportional Hazards Regression
- Introduction to the Cox proportional hazards model.
- Model interpretation and hazard ratios.
- Assumptions and proportional hazards test.

Module 5: Censored Data and Time-Varying Covariates
- Handling right-censored and left-censored data.
- Time-dependent covariates.
- Extended Cox models.

Module 6: Competing Risks Analysis
- Understanding competing risks.
- Cumulative incidence functions.
- Fine-Gray proportional subdistribution hazards model.

Module 7: Real-World Applications
- Applying survival analysis to real-world datasets.
- Case studies and examples from various fields.

Assessment Methods:
1. Quizzes and Homework Assignments: Assessing understanding of theoretical concepts.
2. Final Exam: Covering material from the entire course.
3. Group Projects: Applying hypothesis testing to real-world data analysis.
4. Class Participation: Active engagement in discussions and activities.

Grading:
- Quizzes and Homework Assignments: 30%
- Final Exam: 30%
- Group Projects: 30%
- Class Participation: 10%

Textbook:
- Christian Heumann, Michael Schomaker, Shalabh. Introduction to Statistics and Data Analysis with Exercises, Solutions and Applications in R. ISBN 978-3-031-11832-6, ISBN 978-3-031-11833-3 (eBook) https://doi.org/10.1007/978-3-031-11833-3
- Harrell, F.E. (2001) Regression Modeling Strategies With Applications to Linear Models, Logistic Regression, and Survival Analysis.