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On-line course materials

MATH48052 - Generalized Linear Models and Survival Analysis

Year: 4 - **Semester:** 2 - **Credit Rating:** 15

Requisites

Prerequisites
MATH20701 Probability 2
MATH20802 Statistical Methods
MATH20812 and MATH38011 are helpful but are not strictly required.

Aims

This course unit consists of two parts, one is Generalised Linear Models (10 credits) and the other is Survival Analysis (5 credits). For the specification of Generalised Linear Models, see MATH38052.

Brief Description

The Survival Analysis part of the unit aims to familiarise students with the methodology and practical applications of some standard techniques in modelling and analysing survival data.

Learning Outcomes

Learning Outcomes

On successful completion of the survival analysis part of the unit students will be able to

- carry out exploratory non-parametric analysis of survival data;
- carry out more sophisticated analyses on survival data;
- explore and analyse survival data using using statistical packages;
- interpret the results of such analyses.

Future topics requiring this course unit

This course unit is naturally related to another 4th year unit, Longitudinal Data Analysis.

Syllabus

1.Introduction: background, review of linear models in matrix notation, model assessment, some pre-required knowledge. [2]

2.The exponential family of distributions: Definition and examples. Mean and variance, variance function and scale parameter. [2]

3.Generalized linear models (GLM): linear predictor, link function, canonical link, maximum likelihood estimation, iterative reweighted least squares and Fisher scoring algorithms, significance of parameter estimates, deviance, Pearson and deviance residuals, Pearsons chi-square test and the likelihood ratio test, model fitting using R or S-Plus. [7]

4.Normal linear regression models: least squares, analysis of variance, orthogonality of parameters, factors, interactions between factors. [2]

5.Binary and Binomial data analysis: distribution and models, logistic regression models, odds ratio, one- and two-way logistic regression analysis. [5]

6.Poisson count data analysis: Poisson regression models with offset, two-dimensional contingency tables, log-linear models. [4]

7.Survival data. Censoring. The survivor, hazard, cumulative hazard functions. Kaplan-Meier estimate of survivor function. [3]

8.Fitting exponential and Weibull distributions to survival data. Hazard plots and log cumulative hazard plots. [3]

9.Proportional hazards (ph) and Cox regression: assumptions and interpretation.. Model fitting and diagnostics. Hazard ratios and confidence intervals. [5]

Teaching & Learning Process (Hours Allocated To)

Lectures	Tutorials/ Example Classes	Practical Work/ Laboratory	Private Study	Total
33	11	0	106	150

Assessment and Feedback

- Coursework: 20%
- End of semester examination: Three hours weighting 80%

Further Reading

- Dobson, A. J., An Introduction to Generalized Linear Models, Chapman & Hall 2002.
- Krzanowski, W., An Introduction to Statistical Modelling, Edward Arnold 1998.
- McCullagh, P. and Nelder, J. A., Generalized Linear Models, Chapman & Hall 1990.
- Collett, D., Modelling Survival Data in Medical Research, 2nd edition, Chapman and Hall 2004.

- Klein, J. P. and Moeschberger, M. L., Survival Analysis, 2nd edition, Springer 2003.

Staff Involved

Dr Jingsong Yuan - Lecturer

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Back To Top