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MATH48091

Statistical Computing

Unit code:	MATH48091
Credit Rating:	15
Unit level:	Level 4
Teaching period(s):	Semester 1
Offered by	School of Mathematics
Available as a free choice unit?:	N

Requisites

Prerequisite

- [MATH20701 - Probability 2](#) (Compulsory)
- [MATH20802 - Statistical Methods](#) (Compulsory)
- [MATH20812 - Practical Statistics](#) (Recommended)

Additional Requirements

MATH48091 pre-requisites

Students are not permitted to take more than one of MATH38091, MATH48091 or MATH68091 for credit, either in the same or different undergraduate year or in an undergraduate programme and then a postgraduate programme, as the contents of the courses overlap significantly.

Aims

To introduce the student to computational statistics, both the underlying theory and the practical applications.

Overview

Computers are an invaluable tool to modern statisticians. The increasing power of computers has greatly increased the scope of inferential methods and the type of models which can be analysed. This has led to the development of a number of computationally intensive statistical methods, many of which will be introduced in this course.

Assessment methods

- Other - 50%
- Written exam - 50%

Assessment Further Information

- ten pieces of coursework : 50%
- End of semester written examination (2 hours): 50%

Learning outcomes

On successful completion of this course unit students will be able to

- appreciate the usefulness of computational methods in modern statistics;
- understand the basic ideas underpinning the theory;
- be able to apply the methodology to standard problems.

Syllabus

- Simulating random variables: inversion, rejection, ratio of uniforms, transformations. [4]
- Monte Carlo integration: introduction, importance sampling, antithetic variables, control variates. [4]
- Kernel density estimation. [2]
- Non-parametric Bootstrap and Jackknife. [3]
- Nonlinear regression: model specification, least squares estimation, Gauss-Newton algorithm. [3]
- EM algorithm: Data augmentation, mixture distributions, censored data, standard errors, Monte-Carlo EM. [6]

Recommended reading

Rizzo, M. L., Statistical Computing with R. Chapman & Hall

Feedback methods

Tutorials will provide an opportunity for students' work to be discussed and provide feedback on their understanding.

Study hours

- Lectures - 22 hours
- Practical classes & workshops - 22 hours
- Independent study hours - 106 hours

Teaching staff

Peter Foster - Unit coordinator