

School of Mathematics

Course 453 — Multivariate analysis
(Optional JS & SS Mathematics)

2000-01

Lecturer: Dr. C. Walsh & Dr. B. Murphy (Statistics)

Requirements/prerequisites: 251

Duration: 24 weeks

Number of lectures per week: 3

Assessment:

End-of-year Examination: One 3-hour examination

Description: Statistics is concerned with studying uncertainty in many guises. In recent years there has been a growth in the number of methods available. Many of these methods of analysis were very difficult or impossible to implement in the past, but with the recent increase in computational power, these are now possible.

Applications of these methods are now commonly found in actuarial studies, financial statistics, risk analysis, medical statistics, and the physical sciences.

This course will give an overview of many of these statistical methods. The theory behind the methods will be covered as well as the implementation of these methods. The comparison of the various methods will be emphasised.

While the methods covered in this course require a significant amount of computer involvement in practice, the emphasis of the course will be on the theoretical background, and algorithms for implementation rather than any specific computer coding or package. Some specific software will be mentioned, and students will have the opportunity to refer to these, should they so wish.

Topics covered may include:

1. Likelihood based methods
2. Generalized Linear Models
3. Generalized Additive Models
4. Non-parametric regression and smoothing
5. Survival Analysis
6. The Bootstrap, Jackknife and other resampling methods
7. The EM Algorithm and Data Augmentation
8. Markov Chain Monte Carlo Methods
9. Maximum Entropy Methods

References

- Dobson, A. (1990) Introduction to Generalized Linear Models. Chapman & Hall.
- Efron, B. and Tibshirani, R. (1994) An Introduction to The Bootstrap. Chapman & Hall.
- Ferguson, T. (1996) A Course in Large Sample Theory. Chapman & Hall.
- Hastie, T. and Tibshirani, R. (1990) Generalized Additive Models. Chapman & Hall.
- McCullagh, P. and Nelder, J. (1989) Generalized Linear Models. Chapman & Hall.
- Sivia, D. (1996) Data Analysis: A Bayesian Tutorial. Oxford.
- Tanner, M. (1997) Tools for Statistical Inference. Springer-Verlag.
- Venables, W. and Ripley, B. (2000) Modern Applied Statistics with S-Plus. Springer-Verlag.

October 17, 2000