

STATS 730

Statistical inference based on the likelihood

Course outline 2010

Lecturer:

Russell Millar, Room 211

Office hour: 1.30-2.30 Thurs. Drop-ins welcome at other times.

Assessment:

60% final exam + 20% midterm + 20% assignments, or 100% final exam, whichever is to your advantage.

Midterm:

60 mins duration, in class on Tuesday 4 May.

Course content:

Theory:

Fundamental paradigms and principles of inference

Properties of ML estimation, examples

Efficient estimation, Cramer-Rao lower bound, information

Consistency and asymptotic normality of ML estimators

Likelihood ratio test

Expected and observed information

Application:

What you really need to know in practice

Implementation of ML: Newton Raphson, Fisher's method of scoring, EM algorithm

Use of R and/or SAS for analysis and simulation

Bootstrapping and prediction

Hierarchical mixed models

Box-Cox transformations, survival analysis, mixture models

Exponential family models

Quasi-likelihood and estimating equations

Coping with nuisance parameters: conditional likelihood, marginal likelihood, profile likelihood

Reference texts

- Arnold, S. F. 1990. *Mathematical statistics*. Prentice-Hall, New Jersey. 636 p.
- Azzalini, A. 1996. *Statistical inference based on the likelihood*. Chapman and Hall, London. 341 p.
- Berger, J. O., and R. L. Wolpert. 1988. *The likelihood principle*, 2nd edition. IMS Lecture Notes - Monograph Series, Vol 6.
- Bickel, P. J., and K. A. Doksum. 1977. *Mathematical statistics*. Holden-Day.
- Casella, G., and R. L. Berger. 2002. *Statistical inference*. Thomas Learning, Pacific Grove, California.
- Cox, D. R., and D. V. Hinkley. 1974. *Theoretical statistics*. Wiley, New York. 511 p.
- Der, G., and B. S. Everitt. 2001. *A handbook of statistical analyses using SAS*, 2nd edn. Chapman and Hall/CRC, New York.
- Edwards, A. W. F. 1972. *Likelihood*. Cambridge University Press. 235 p.
- Everitt, B. S. 1987. *Introduction to optimization methods and their application in statistics*. Chapman and Hall.
- Everitt, B. S. 2002. *A handbook of statistical analyses using S-PLUS*. Chapman and Hall/CRC, Boca Raton, FL. 240 p.
- Garthwaite, P. H., I. T. Jolliffe, and B. Jones. 2002. *Statistical inference*, 2nd edn. Oxford University Press, New York.
- Lehmann, E. L. 1983. *Theory of point estimation*. Wiley, New York. 506 p.
- Mc Cullagh, P. and J. A. Nelder. 1989. *Generalized linear models*, 2nd edition. Chapman and Hall. 511 p.
- Pace, L. and A. Salvan. 1997. *Principles of statistical inference from a Neo-Fisherian perspective*. World Scientific. 535 p.
- Severini, T. A. 2000. *Likelihood methods in statistics*. Oxford University Press, New York.
- Venables, W. N., and B. D. Ripley. 2002 *Modern applied statistics with S*, 4th edn. Springer-Verlag, New York.
- Wilks, S. S. 1962. *Mathematical statistics*. Wiley, New York. 644 p.