

STATS 730: Statistical inference based on the likelihood

with examples in R and SAS

Lecturer:

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Office hours: Open door policy.

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:

Implementation of ML: Newton Raphson, Fisher's method of scoring, EM algorithm
Use of R and/or SAS for analysis and simulation
What you need to know in practice: profile likelihood, delta method, AIC and BIC.
Exponential family models
Examples: Survival analysis, mark-recapture models
Quasi-likelihood and estimating equations
Coping with nuisance parameters: conditional likelihood, marginal likelihood, profile likelihood, mixture models.

Assessment:

100% final exam or (60% final exam + 40% assignments), whichever is to your advantage, notwithstanding that a minimum of 45% in the final exam is required to pass.

Reference books

- 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.