UNIVERSITY OF CALGARY

The Department of Mathematics and Statistics

STATISTICS 531
"MONTE CARLO METHODS AND STATISTICAL COMPUTING"

Calendar Description: H(3-1)
Introduction to a variety of statistical languages and packages and introductory statistical programming in SPLUS. Pseudo-random variate generation. Bootstrapping. Variance reduction techniques. Computation of definite integrals. Model design and simulation, with applications.

Prerequisite: Mathematics 323 or consent of the Division.

Syllabus

Topics

Introduction into basic ideas of computer hardware and software. Micro- and mini-, mainframe and supercomputers. Special requirements for statistical data processing: mass storage media.

Operating systems: MS-DOS, UNIX etc. File systems, ASCII files, extended ASCII. Micro and macro data editors, data entry software, spreadsheets and databases.

Principles of statistical data files. Free and fixed formats, FORTRAN formats. ASCII data files and their handling.

Principles of statistical computing. Statistical algorithms for random number generation, distributions and their inverses, descriptive statistics etc. Program development using a high level language with matrix capabilities such as APL, MATHEMATICA or C++M++.

Principles of statistical program development in regression, analysis of variance, non-parametric statistics etc. Writing own programs using APL, MATHEMATICA or C++M++.

Use of statistical packages. Detailed and extensive use of a standard package such as SPSS or SAS. Advanced topics such as cluster analysis, factor analysis, MANOVA, statistical graphics, time series analysis including ARIMA, spectral analysis and coherence, non-linear regression etc. Interpretation of the computer output.

Survey of important statistical packages including SPSS, SAS, BMDP, SYSTAT, STATA, STATGRAPHICS, IMSL, MINITAB, NCSS, GEOMATH, GEOGRAPHICS etc. Problems of numerical stability and required handling capacity. Data interchange between packages on micro-, mini- and mainframe computers. Principles of independent design and development of statistical packages.

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