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(U) ILLINOIS UNIV AT URBANA DEPT OF STATISTICS J SACKS
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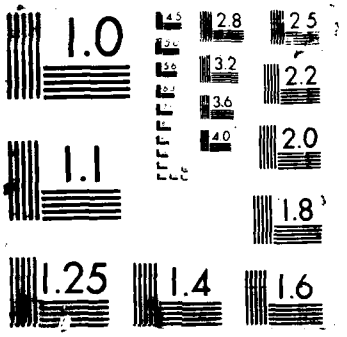
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This is the final report of a grant issued under the University Research Instrumentation Program. Computing equipment was purschased to establish a network of 14 Sun work-stations. This network made a variety of research efforts in the area of design and analysis of computational experiments. This report details purchases and related publications.

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FINAL TECHNICAL REPORT

INSTRUMENTATION FOR COMPUTATIONAL STATISTICAL RESEARCH

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The equipment grant has been used to establish a network of 14 Sun work stations now being used for several research activities. The network has been operational since April 1987. The network is being used both for local computing, for connecting to the local Cray X-MP when large-scale computing is needed, and for providing adequate graphics displays.

One area of research underway is on design and analysis of computational experiments in which methodology is sought to permit adequate inference about complex computational models. Here, inputs to a computer model have to be specified to enable prediction of the behavior of the model at untried inputs. Prediction methods and selection of inputs require extensive computing and there is also a need for good graphics. This research is being carried out under the direction of Professor Sacks. Results on this project have been found in several areas, including the design of VLSI circuits.

Other (and somewhat related) research by Professor Cox involves simulation studies for probability density estimation and for estimation of associated quantities such as the score function $-f'/f$ where f is the density. The score function arises in projection pursuit, data analysis, and critical applications of adaptive inference methods and sound procedures are needed for its estimation. The convenience of available software for the Sun and unused CPU's available on the network provides an excellent setting.

Research under the direction of Professor Andrew Barron has led to software for estimating probability density functions using variable dimensions exponential families. A new technique is being developed on the computer to perform multivariate density estimation using a network of univariate exponential family estimators.

Research by Professor Stout on psychological testing is being directed in part towards developing code for a portable version of explicit methods devised by Stout to uncover test bias. A large scale trial Monte Carlo simulation of Stout's statistical test of educational test unidimensionality was conducted. The positive results were crucial to the publication of this research and the use of Stout's methods by educational practitioners.

A list of publications, completed or in preparation is attached.

Research Completed and in Progress

Barron, A. R. "Are Bayes rules consistent in information?" Open Problems in Communication and Computation (T. M. Cover and G. Gopinath, editors), Springer-Verlag, New York, 1987, pp. 85-91.

Barron, A. R. "Uniformly powerful goodness of fit tests." Annals of Statistics. [Tentatively accepted]

Barron, A. R. "The exponential convergence of posterior probabilities with implications for Bayes estimators of density functions." Submitted to the Annals of Statistics.

Cox, D. and Martin, R. D. "Estimation of score functions." (In preparation)

Lim, Y. B., Sacks, J., Welch, W. "Asymptotic designs for production in computer experiments." (Manuscript)

Marden, J. I. and Brown, L. D. "Complete Class Results for Hypothesis Testing Problems with Simple Null Hypotheses. Ann. Statist. [Tentatively Accepted]

Marden, J. I. and Brown, L. D. "Local Admissibility and Local Unbiasedness in Hypothesis Testing Problems." (Manuscript)

Martinsek, Adam T. "Sequential Estimation in Regression Models Using Analogues of Trimmed Means." (Manuscript)

Portnoy, Stephen. "Using regression quantities to identify outliers," Stat. Data Anol. Based on the L$_1$ Norm and Related Methods, (ed: Dodge) North Holland, Amsterdam, 1987, 345-356.

Portnoy, Stephen. (with J. Jureckova). "Asymptotics for one-step M-estimators in regression with applications to combining efficiency and high breakdown," Comm. Stat. Th. and Meth., 16, (1987) 2187-2200.

Sacks, J., Schiller, S. and Welch, W. "Designs for Computer Experiments." (Submitted to Technometrics)

Simpson, Douglas G. and Dallal, Gerard E. "BUMP: A FORTRAN Program for Identifying Dose-Response Curves Subject to Downturns." Computers and Biomedical Research. (In Review)

Simpson, Douglas G. "Hellinger Deviance Tests: Efficiency, Breakdown Points and Examples." JASA. (In Review)

Stout, William. "A nonparametric approach for assessing latent trait unidimensionality. Psychometrika, December, 1987 (To appear)

Ying, Z. and Lai, T. L. "Linear Rank Statistics in Regression Analysis with Censored or Truncated Data." Technical Report. 1987.

Ying, Z. "A Note on the Asymptotic Properties of the Product-Limit Estimator on the Whole Line." Technical Report. 1987.

Yu, T-K, Welch, W., Kang, S., Sacks, J. "Computer experiments for quality control." (Manuscript)

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