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November 1, 1996

Dear Friends of the Department of Statistics,

We are extremely pleased to send you this report of the past year’s activities in the Department of Statistics at the University of Tennessee. We’ve certainly been busy. We graduated 12 students with the Master of Science in Statistics, and 13 with the Bachelor of Science in Statistics. Also, 9 students graduated with Minors in Statistics through the Intercollegiate Graduate Statistics Program. To see the accomplishments of some of our students, browse over to the section on “Theses and Independent Projects of Graduate Students” to see some of the work they have done.

During the last year, we bid a sad farewell to Judy Snow and Alberta Randles, both of whom moved on to other opportunities at the University of Tennessee. We welcomed aboard Gina Keeling as Office Supervisor, and Karen Poland as Department Secretary.

At the Department’s Spring picnic, special recognition for academic excellence was given to Jelena Olman (undergraduate student), and to Anne Freeman (graduate student).

Recent graduates are now working at such diverse places as the Intel Corporation, Federal Express, Fleetguard, Rockwell International, General Electric, Eli Lilly, General Motors, Unilever Research, BellSouth, BTR, Executive Learning, and MathSoft.

Faculty continue strong involvement with the Management Development Center. Mary Leitnaker continues to provide strong leadership for the Practical Strategies for Process Improvement (new name for the “Three Week Institute”). *The Power of Statistical Thinking*, by Mary Leitnaker, Richard Sanders, and Cheryl Hild appeared in 1995, published by Addison Wesley. If you need to contact us: If you have World Wide Web access, just browse over to http://funnelweb.utcc.utk.edu/~stat and see the home page for the Department of Statistics. We’ve got lots of information there about our students, programs, and faculty. Feel free to check it out and make suggestions for improvement.

Alumni: If you’d like to give us some quotable comments about how the education you received at UT has helped you in your career, we’d love to include that on our homepage. You can see what some others have said by selecting “Programs” at the departmental home page mentioned above, and then selecting the link to the “Master of Science Program”. (We hope to get quotes regarding the Bachelor of Science Program soon.)

That’s all I have room for now. You’ll see a lot more about what’s been going on as you read through this report. If you have ideas on what you’d like to see included in these reports - drop me a line, either by email to wparr@utk.edu, a phone call to 423-974-1631, or ordinary mail to the address below.

With highest regards, and hoping to hear from you,

William C. Parr
Professor and Head, Department of Statistics
University of Tennessee
332 Stokely Management Center
Knoxville, Tennessee 37996-0532
Major Progress in Department's Computing and Telecommunications Capabilities

A Report by

Ramón León and William Parr

During this year, the Department continued its efforts to become a leader in the use of telecommunications technology in education. This year’s achievements in this area include:

• The department homepage was created by Rodney Bates and Randy Dawson (check http://funnelweb.utcc.utk.edu/~stat). We encourage all readers of this annual report to browse to our homepage and send us your feedback.

• The installation of a Novell Netware server. Faculty and students can now access from their workstations statistical and mathematical software located on the server. The server has five megabytes of mirrored disk space, two CD ROMS, and a Zip drive.

• A graphics workstation is now available. A scanner, digital camera, and color printer are part of the workstation. It contains software like Pagemaker, Photoshop, Illustrator, and OmniPage Pro. With this workstation, images can be processed for the Department’s homepage, newsletters can be formatted, and optical character recognition can be performed.

• Lotus Notes is being used by the Department. The Technology Committee is using it to keep public records of its activities, to keep track of computer-support requests, and to keep inventory of hardware and software owned by the Department.

• Ramón León obtained a grant from the CBA to explore the use of course homepages in the college. Course homepages can be used to help former students keep learning once they graduate, as well as to improve communication with current and prospective students.

• The Quality and Productivity Section of the American Statistical Association is serving its homepage from UT. The webmaster of this homepage is Ramón León. Bill Parr manages a page “Q & P Links” of links to information on Quality and Productivity on the World Wide Web.
THE FACULTY, STAFF, AND STUDENTS

Professors

Hamparsum Bozdogan, Ph.D., University of Illinois at Chicago
Frank M. Guess, Ph.D., Florida State University
Robert A. Mclean, Emeritus, Ph.D., Purdue University
Robert W. Mee, Ph.D., Iowa State University
William C. Parr, Ph.D., Southern Methodist University, Department Head
John W. Philpot, Ph.D., Virginia Tech
Richard Sanders, Ph.D., University of Texas, Austin
David Sylwester, Ph.D., Stanford University
Charles C. Thigpen, Emeritus, Ph.D., Virginia Tech

Instructors

Charles M. Cwiek, M.S., University of Tennessee, Knoxville
Sharon R. Neidert, M.S., Miami University, Ohio
S. Paul Wright, M.S., University of Tennessee, Knoxville

Adjunct and Part-time Faculty

John J. Beauchamp, Ph.D., Florida State University, Adjunct Professor
Kimiko O. Bowman, Ph.D., Virginia Polytechnic Institute & State University, Adjunct Professor
Darryl J. Downing, Ph.D., University of Florida, Adjunct Professor
Val V. Fedorov, Ph.D., Moscow State University, Adjunct Professor
Stephen A. McGuire, Ph.D., Kansas State University, Part-time Assistant Professor, Adjunct Professor
Max D. Morris, Ph.D., Virginia Polytechnic Institute, Adjunct Professor
William L. Seaver, Ph.D., Texas A&M, Part-time Associate Professor

Lecturer

James L. Schmidhammer, Ph.D., University of Pittsburgh

Associate Professors

Mary G. Leitnaker, Ph.D., University of Kentucky
Ramon Leon, Ph.D., Florida State University
Esteban Walker, Ph.D., Virginia Tech
Mary Sue Younger, Ph.D., Virginia Tech
**Intercollegiate Graduate Statistics Program Faculty**

All Statistics Department Assistant Professors plus:

Dewey L. Bunting, Professor of Ecology

Arun Chatterjee, Professor of Civil and Environmental Engineering

Donald J. Dessart, Professor of Curriculum and Instruction

Carl Dyer, Associate Professor of Textiles, Retailing, and Interior Design

Ben G. Fitzpatrick, Assistant Professor of Mathematics

Henry A. Fribourg, Professor of Plant and Soil Science

Michael M. Gant, Associate Professor of Political Science

Charles A. Glisson, Professor of Social Work

Louis J. Gross, Associate Professor of Mathematics

Schuyler W. Huck, Professor of Ed. Psychology & Guidance

Larry James, Professor of Management Science

Robert T. Ladd, Associate Professor of Management, Industrial/Organizational Psychology Program

John Lounsbury, Professor of Psychology

William Lyons, Professor of Political Science

Dan L. McLemore, Associate Professor of Agricultural Economics

M. Mark Miller, Professor of Journalism

John Orme, Associate Professor of Social Work

Donald Ploch, Professor of Sociology

Balram S. Rajput, Professor of Mathematics

Lillard Richardson, Assistant Professor of Political Science

Jan Rosinski, Associate Professor of Mathematics

Fumiko Samejina, Professor of Psychology

Arnold Saxton, Professor of Animal Science

Michael W. Singletary, Professor of Journalism

Julius Smith, Associate Professor of Mathematics

Carl G. Wagner, Professor of Mathematics

**Support Staff**

Gina Keeling, Office Supervisor
Karen Poland, Department Secretary
Karen Welch, Student Assistant

**Graduating Students**

**Master of Science Graduates**

Rodney Bates
University of Mississippi
B.S. & M.S. in Mathematics
Internship: AT&T, Orlando, FL
Employment: Intel Corporation, Scottsdale, AZ

Deborah Boykin
Tennessee State University
B.S. in Mathematics
Ka Lai Chao
University of Tennessee
B.S. in Statistics
Internship: Southeastern Mills, Rome, GA
Employment: Federal Express, Memphis, TN

Tianshu Chen
Sichuan, China
University of Tennessee
B.S. in Statistics
Internship: Deroyal Industries, Inc., Maynardville, TN
Employment: Fleetguard, Inc., Cookeville, TN

Jonathon Dickman
Spring Lake, MI
Central Michigan University
B.S. in Statistics
Internship: Corning, Inc., Corning, NY
Employment: Rockwell International, Las Angeles, CA

Anne Freeman
Papillion, NE
Baylor University
B.B.A. in Business
Internship: Georgia-Pacific Corporation, Holly Hills, SC
Employment: Executive Learning Inc., Nashville, TN

Rufus Gomez
Singapore
University of Tennessee
B.S. in Electrical Engineering
Internship: AlliedSignal Safety Restraints Systems, Knoxville, TN
Employment: General Electric CR&D, Niskayuna, NY

Jeffrey Louallen
Dayton, TN
Bryan College
B.A. in Mathematics
Internship: Ocean Spray, Kenosha, WI
Employment: Eli Lilly & Co., Terre Haute, IN

Charles Morello
Saginaw, MI
Western Michigan University
B.S. in Industrial Engineering
Internship: Saturn/Power Train/Lost Foam, Spring Hill, TN
Employment: General Motors, Saginaw, MI

Jennifer Petryszyn
Massapequa Park, NY
State University of New York at Albany
B.A. in Mathematics
Internship: Corning, Inc., Corning, NY
Employment: Unilever Research Laboratory, Edgewater, NJ

Charles Reeves
Knoxville, TN
University of Tennessee
B.S. in Management
Employment: Bell South, Atlanta, GA

Robert E. Williams
Clinton, TN
Saint Louis University
M.A. in Mathematics
Internship: Schlegal NC, Reidsville, NC
Employment: Math Soft, Washington, D.C.

Graduates with Minor in Statistics Through Intercollegiate Graduate Statistics Program

Jennifer Bannister, M.S. Entomology and Plant Pathology
Bryan Denham, Ph.D. Communications
Steven Donnelly, Ph.D. Anthropology
Heide Harriman, M.S. Experimental Psychology
Kip Krumwiede, Ph.D. Accounting
Ning Ku, M.S. Management Science
Jung Hoou Lee, M.S. Food Science and Technology
Chris Newbold, M.S. Wildlife Science
Mark Remaly, M.S. Forestry

Bachelor of Science Graduates -
College of Business Administration

Gloria Blevins, Kingsport, TN
Paula Fielden Stinnett, Oliver Springs, TN
Cedric King, Oak Ridge, TN
Travis Lacey, Franklin, TN
Jack Martin, Knoxville, TN
Jelena Olman, Estonia
Clay Scott, Jackson, TN
Davean Tonkery, Knoxville, TN

Bachelor of Science Graduates -
College of Liberal Arts

Kim Burley, Knoxville, TN
Cristie Hummel, Oak Ridge, TN
Norella Hashim, Knoxville, TN
Robert Logans, Knoxville, TN
Mazni Mohamad, Malaysia

Continuing Graduate Students

Patrice Burley
Atlanta, GA
University of Tennessee
B.S. in Mathematics
1996 Internship: UT Energy
Environment & Resource

Randell Dawson
Murfreesboro, TN
Middle Tennessee State University
B.S. Mathematics/Statistics

Yiting Ding
Shanghai, China
East China Normal University
B.S. Statistics
1996 Internship: Masonite Laurel, Laurel, MS

Renee Dowdy
Pamplico, SC
Francis Marion University
B.S. in Mathematics

Jeffrey Freyer
Delmar, NY
University of South Carolina
B.S. in Statistics
1996 Internship: Eastman Chemical Co., Longview, TX

Dawn Heaney
Blacksburg, VA
Virginia Tech
B.S. in Mathematics
1996 Internship: Eastman Chemical Co., Kingsport, TN

Scott Nix
Columbia, SC
University of South Carolina
B.S. in Statistics
1996 Internship: BTR Sealing Systems, Reidsville, SC
Wakana Shinke  
Knoxville, TN  
University of Tennessee  
B.S. in Math/Statistics  
1996 Internship: Whirlpool Corp.,  
St. Joseph, MI

Yukiko Taketani  
Kawasaki, Japan  
Tennessee Tech. University  
M.S. in Biology  
1996 Internship: Ocean Spray, Inc.,  
Kenosha, WI

Phillip Yates  
Fayetteville, NC  
North Carolina State University  
B.S. in Mathematics  
1996 Internship: Pratt & Whitney,  
West Palm Beach, FL

Continuing Intercollegiate  
Graduate Statistics Program  
Students

Candidates for MS in Statistics

Douglas Baney, Ph.D. in Management  
Science

Robin Hutcheson, Ph.D. in Management  
Science

Bill Kelch, Ph.D. in Comparative & Exper.  
Medicine

Greg Kellar, Ph.D. in Logistics

Rich Neubert, Ph.D. Strategic Management

Candidates for Minor in Statistics

Valerie Beaman, M.S. in Mathematics

Paul Dillingham, Ph.D. in Anthropology

Deanna Flinchum, M.S. in Civil Engineering

Heidi Harriman, M.S. in Psychology

Derek Martin, M.S. in Sociology

Amy McCaskill, M.S. in Entomology & Plant  
Pathology

Chris Newbold, M.S. in Forestry, and  
Wildlife & Fisheries

Stephen Page, Ph.D. in Cultural Studies

Nikke Rodgers, M.S. in Anthropology

Megan Wilson, M.S. in Psychology

Priscilla Wisner, Ph.D. in Accounting

Continuing MBA Students with  
Statistics Minor

Barry Chiu, B.S. in Mathematics, Vanderbilt  
University

Kevin Claffey, B.S. in Interdisciplinary  
Engineering, and Management, Clarkson  
University

Rosanna Gensini, M.S. in Industrial  
Engineering, Georgia Institute of  
Technology

Cecily McSurdy, B.S. in Mathematics,  
University of the South

Continuing Undergraduate Students

Azlin Arahaman, Malaysia

Azlinda Abd Aziz, Bloomington, IN

Sonny Bolton, Knoxville, TN

Jocelyn Booher, Knoxville, TN

Sharon D. Brady, Knoxville, TN

Phillip Cleek, Knoxville, TN
SCHOLARLY ACTIVITIES

PUBLICATIONS

Refereed Publications

Williams, L. J., Bozdogan, H., and Smith, Aiman L., "Inference Problems with Equivalent Models." This chapter focuses on a special case of the problem of alternative models in structural equation methods (SEM), in which the competing models have the special property of being “equivalent” (they result in identical implied or predicted covariance matrices and have identical chi-square degrees of freedom, and traditional goodness of fit values). We discuss statistical and non-statistical approaches to dealing with this problem, including the role of complexity based fit measures Bozdogan. Invited book chapter in Advanced Structural Equation Modeling Techniques, Lawrence Earlbaum Publishers. April, 1996.

Bozdogan, H., and Haughton, D., “Informational Complexity Criteria for Regression Models.” This paper pursues three objectives in the context of multiple regression models: (1) To give a rationale for model selection criteria which combine a badness of fit term (such as minus twice the log likelihood) with a measure of complexity of a model. We show that the ICOMP criterion introduced by Bozdogan can be seen as an approximation to the posterior expectation of a certain utility. (2) To investigate the asymptotic consistency properties of the class of ICOMP criteria, first in the case when one of the models considered is the true model, and to introduce and establish a consistency property from the case when none of the models is the true model. In the first case, we find that asymptotic consistency holds under some assumptions; in this respect, some ICOMP criteria resemble Akaike’s AIC, while other ICOMP criteria resemble Schwarz’s BIC criterion. In the second case, we find that ICOMP, as well as AIC and BIC are all asymptotically consistent. (3) To investigate the finite sample behavior of ICOMP criteria by means of simulation study where none of the models considered is the true model. We find that the ICOMP criteria tend to agree with decisions based on minimizing the Kullback-Leibler distance between the true model and each estimated model more often than that of AIC or BIC. Computational Statistics and Data Analysis.

Van Manen, F., Pelton, M.R., and Bozdogan, H., “An Informational Approach to Variable Selection in Logistic Regression Models of Wildlife Habitat Use.” Statistical inference is only meaningful when based on appropriately selected models. Conventional procedures for model selection have several conceptual and practical difficulties. Akaike’s information criterion (AIC) and information-theoretic measure of complexity (ICOMP) are information-based or entropic measures and provide a practical and conceptually appropriate technique to identify optimal statistical models. Our objectives are to describe model selection techniques based on AIC and ICOMP and demonstrate their use in selection of statistical models of wildlife habitat use. We use data of black bears (Ursus americanus) in the southern Appalachian mountains of Tennessee, USA, as an example. We used 10 variables from a geographic information system (GIS) database to characterize radio-telemetry locations of black bears. We used the same variables to characterize random locations to provide a measure of available habitat. The bear and random locations were used in a logistic regression analysis as a binomial dependent variable with the habitat variables as independent variables. AIC and ICOMP generally agreed on the best
predicting models of habitat use. Hosmer-Lemeshow chi-square tests showed that AIC and ICOMP were effective in selecting appropriate models of black bear habitat use. The information-theoretic criteria are based on the principle of parsimony, combine parameter estimation and model selection, and provide objective comparisons of all possible subsets of variables. In review in *Environmetrics*, 1996.

Luh, H-K, Minesky, J.J., and Bozdogan, H., "Choosing the Best predictors in Regression Analysis via the Genetic Algorithm with Informational Complexity as the Fitness Function." For *Communications in Statistics, Theory & Methods*. In this paper we show how a genetic algorithm (GA) as a searching method, can be utilized along with information-based model selection criteria to choose the best predictors in regression model selection. The GA is an optimal algorithm which mimics Darwinian evolution. According to Darwin’s theory, individuals differ in terms of fitness (i.e., the ability to survive and produce offspring). Those individuals with higher fitness values are more likely to survive and leave offspring than others. Thus, living organisms which are produced through the process of evolution can be viewed as the “best problem solver” to the struggle of survive. Similar to the evolutionary process, we apply the GA to the problem of selecting an appropriate statistical model. We treat each of candidate models as a living organism. The measure of an information-based model selection criterion is calculated for each model as its fitness value. Using the evolutionary mechanisms, selection, crossover and mutation, the GA searches for the “best” regression model with the fitness landscape which is formed by all possible fitness values.

Bearse, P. M., Bozdogan, H., and Schlottmann, A., "Empirical Econometric Modeling of Food Consumption Using a New Informational Complexity Approach." Invited world title winning paper to appear in *Journal of Applied Econometrics*. This paper is concerned with empirical econometric modeling of food consumption in the U.S. and the Netherlands using new and novel information theoretic model selection and evaluation techniques. The efficacy of the information theoretic approach is studied on these data sets by introducing some new and efficient statistical modeling techniques in empirical econometric modeling of economic data. Specifically, using autoregressive distributed lag models ADLs selected via the Informational Complexity (ICOMP) criterion, we study short and long run relationships between food consumption and income. Whether food consumption obeys the homogeneity postulate is tested using information criteria. Using information theoretic techniques, we identify the optimal information set and lag order for a VAR forecast of food consumption in the Netherlands. We demonstrate how multisample cluster analysis, a combinatorial grouping of samples or data matrices, can be used to determine when the pooling of data sets is appropriate, and how ICOMP can be used in conjunction with the Genetic Algorithm GA to determine the optimal predictors in the celebrated seemingly unrelated regressions SUR model framework. Our analyses demonstrate the utility of information theoretic model selection and evaluation procedures in approximating the underlying structure of the economic data. In contrast to the classical statistical procedures, these new methods avoid the use of sampling distributions. In particular, they do not require any arbitrarily specified level of significance alpha and the table lookup in the decision making process.

Luh, H-K, Gittleman, J. L., Bozdogan, H., and Anderson, C.G., "Phylogeny and Multivariate Correlated Traits: An Information-Based Approach." In review in *Evolution*. Modern comparative statistical methods are effective at testing functional and adaptive hypotheses of bivariate correlated trait evolution. However, few methods have been proposed to assess multivariate relationships. We develop a multiple regression model with autoregressive process which simultaneously accounts for phylogenetic pattern in many quantitative traits. Then, an
information-based approach is used for submodel selection which diagnoses which variables are most salient in a multivariate problem. Using a multivariate hypothesis from Pagel and Harvey (1990), we present a working example of our proposed method which shows interrelationships among mammalian brain size, life history traits, and mortality rates.

Guess, F., “Bayesian Applications.” Briefly discusses Bayesian thinking and applications. Also, it suggests sources for further education on applied Bayesian tools. STATS, p15-17, 1996.

Guess, F., Lin, D., Usher, J., “Bayesian Estimation of Component-Reliability from Masked System-Life Data.” Technical details of Bayesian estimation of reliability when systems level data does not always yield the exact cause of failure (“masked data:” either component 2 or 3 caused the failure, but it is not known which of those was the cause). IEEE Transactions on Reliability, p233-237, 1996.

Mee, R.W., and Eberhardt, K.R., “A Comparison of Uncertainty Criteria for Calibration.” Calibration consists of using a fitted regression line to estimate the value of an unobserved independent variable \( x \) corresponding to an observed dependent variable \( y \). To construct a confidence interval for a single \( x \), Eisenhart introduced a procedure that consists of inverting prediction intervals around the regression line. Numerous other inference procedures have been proposed for multiple-use calibration, in which a single fitted regression line is used repeatedly to estimate many \( x \)’s. We provide a synthesis of this literature and offer some numerical comparisons. We also attempt to motivate the use of various criteria based on the particular points of view of those involved in determining the calibration or using the results. Technometrics, p221-229, 1996.


Papers and Reports


Younger M.S., Revised Statistics Department manual “Intro to Running SAS Programs on Unix Computers at UTK”, for use by the University community. Spring, Fall, 1996.
Theses and Independent Projects of Graduate Students


The Techniques used to manufacture integrated circuits often require that an experiment take the form of a split lot design. An alternative to the designs currently used will be presented. This alternative design is compared to the conventional designs from both statistical and engineering viewpoints.

Advisor: Dr. Robert Mee

Chen, T., "A Study in the Comparison of Measurement Processes"

In many industrial settings, two or more measurement processes are used for the same production process at different locations, or a measurement process changes over time. In order to determine the consistency and the efficiency of the measurement processes, comparing the processes is very necessary. Several techniques for measurement process comparison, such as Grubbs’ Estimators, and Two-instrument and Three-reading model, are discussed in this study. For estimating measurement variation, examples demonstrate the general procedures for practical application of the techniques. To obtain the precise estimates in a two-instrument case, the recommendation is that at least three readings need to be taken----one device takes repeat measurements, and another device takes a single measurement.

Advisor: Dr. Robert Mee

Dickman, J., “Filling Machine Analysis Study”

This paper attempts to find the most efficient and/or economical method(s) of diagnosing variation for filling machines based on some of the work that has been done in the past through computer simulations, and by using real data. Based on control chart results we hope to show possible scenarios that will allow the reader the opportunity to get a better idea of what to expect in terms of variation, and what variation might exist depending on what the chart itself looks like.

Advisor: Dr. Bill Parr

Freeman, A., “The Sliding Cube Design”

Sequential experimentation is utilized in a large percentage of response surface methodology applications. Traditionally, an initial $2^k$ or $2^{k-p}$ design is followed either by augmentation (with an additional fraction or with axial points) or with a one-dimensional search based on the method of steepest ascent. This work considers a compromise between these choices by proposing a follow-up (fractional) factorial design with new location and spacing for some factors.

Advisor: Dr. Robert Mee

Gomez, J., “Simulations Using Chi Square Probability Plots for Three Level Fractional Factorials”

In the area of designed experiments, F tests and partial t-tests are often used by engineers and scientists to detect significant effects. When the experiment is too small or replication is not possible due to time and or financial constraints, normal and half normal plots are used to detect significant factors. In normal and half normal plots, the cumulative normal probability is plotted against the magnitude of each effect which includes main effects and possible interactions. These plots can be useful in the analysis of experiments run at two levels. Chi square probability plots can be used in the analysis of experiments run at three levels. These plots are based on the knowledge that a sum of squares with two
degrees of freedom is a multiple of a $\chi^2$ probability plots, the natural logarithm of the cumulative probability is plotted against the mean square error of each effect to check for significance.

Advisor: Dr. Mary Leitnaker


Advisor: Dr. Hamparsum Bozdogan

**Liu, R.**, "Run Order Considerations for Certain Two-Level Designs."

Randomization is a conventional principle in running designed experiments. This paper concentrates on two level 12-run Plackett and Burman designs to show that certain systematic run orders can perform considerably better than randomized run order, based on the criterion that systematic run order will generally reduce the bias of main effects caused by the time trend. An example is given to illustrate the problems of randomization. A computer algorithm is also developed to find the optimal run orders for the 12-run Plackett and Burman design such that main effects are time trend free or near time trend free. Furthermore, some results are discussed to reveal the advantage of systematic run orders over randomized run orders in experimental design. Finally, given that a factor (factor A, say) is already robust to time trend in a two factor 2-level design with 12 runs, this paper explains how to determine run levels of a factor (factor B say) such that factor B will be orthogonal to both factor A and the time trend.

Advisor: Dr. Dennis Lin

**Morello, C.**, "Robust Design Experimentation for Lost Foam Casting"

Robust design is a popular technique for reducing process variation and improving product quality. This report summarizes a strategy for conducting robust design experiments. In addition, this report describes a robust design experiment that was completed on the Cylinder Head Cast Line at Saturn Corporation. The results of this experiment present an opportunity for reducing fill time process variation while reducing casting porosity.

Advisor: Dr. Robert Mee

**Petryszyn, J.**, "Optimizing Multiple Response Problems"

The objective of this study is to investigate the capability of existing methods for analyzing various multiple response experiments. Methods considered the most useful include the desirability function approach of Derringer and Suich (1980) and the overlaying of contour plots.

Advisor: Dr. Robert Mee

**Reeves, C.**, "Using the Bootstrap to Detect Influential Subsets in Regression"

Numerous strategies have been developed in the statistical literature to identify influential subsets in multiple regression. Bootstrap was done on the off-diagonal elements of the $H^*$ to show that the distributions as well as the sampling distributions are not usually normal. The off-diagonal elements of $H^*$ that correspond to influential observations have similar distribution properties as evidenced by variation, skewness, and kurtosis. In fact, observations that clustered together using several published datasets had similar measures of skewness and kurtosis. In fact, observations that clustered together using several published datasets had similar measures of skewness and kurtosis. Measures for the observations in a dataset can be easily and quickly used to identify influential subsets in many software packages.

Advisor: Dr. Bill Seaver

Advisor: Dr. Hamparsum Bozdogan

Presentations


Parr, W.C., One of four presenters of three day workshop on Academic/Industrial cooperation. San Luis Obispo, California, July 1995.


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**Grants and Contracts**


Mee, R.W., Continues to be Principal Investigator of three year grant sponsored by the United States Information Agency, $178,053.


Younger, M.S., Awarded grant (amount not specified) to attend a professional conference by the Department of Audiology and Speech Pathology, in appreciation of the work she has done with their Graduate Students.

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**Conferences**


Younger, M.S., Publications Officer, ASA Section on Statistical Education.


Books


HONORS AND AWARDS

Faculty


Bozdogan, H., Research Incentive Award of the Research Administration, The University of Tennessee, June 13, 1995, $1,000.

Bozdogan, H., National Science Foundation (NSF) Group Travel Award, September 17-21, 1995.

Bozdogan, H., Ball Corporation Travel Award, March 27-30, 1996.

Bozdogan, H., Finalist, CBA the Hoechst-Celanese Teaching & Research Award, 1996.


Graduate Excellence Awards

Anne Freeman

Graduate Scholarships

Rodney Bates
Patrice Burley
Ka Lai Chao
Tianshu Chen
Randy Dawson
Jonathon Dickman
Yiting Ding
Renee Dowdy
Anne Freeman
Jeff Freyer
Joseph R. Gomez
Dawn Heaney
Jeff Louallen
Scott Nix
Marta Peralta
Jennifer Petryszyn
Charles Reeves
Wakana Shinke
Yukiko Taketani
Phillip Yates

Undergraduate Excellence Awards

Jelena Olman

Undergraduate Scholarships

Cedric King
Travis Lacey
Jelena Olman
COLLOQUIUM SERIES

April 1, 1996, Doug Sanders, Management Science Program, The University of Tennessee, “System Reliability Study In Industry.”

March 1, 1996, Dr. W.J. Padgett, Department of Statistics, The University of South Carolina, “Some New Failure Models For Fibrous Composite Materials Based On Cumulative Damage Arguments.”

February 2, 1996, Cheryl Hild, Management Science Program, The University of Tennessee, “Tree-Based Classification of Predictors in Regression Models and Structure Determination Via Self Organization.” The GMDH.

February 23, 1996, Dr. Peter G. Groer, Department of Nuclear Engineering, The University of Tennessee, “Bayesian Methods For Radiation Dosimetry and Risk Analysis.”


October 20, 1995, Dr. Steve Hora, Visiting Exchange Professor, The University of Hawaii at Hilo, “Combining Expert Densities Using Scoring Rules.”

STUDENT ACTIVITIES

Sigma Mu Alpha

President: Jennifer Petryszyn
Secretary/Treasurer: Anne Freeman
Faculty Advisor: David Sylwester

Student Seminar Series

September, 1995
Internship Presentations, Anne Freeman, Rufus Gomez, Jeff Louallen, Jennifer Petryszyn

September, 1995

September, 1995
Chad Hoffman, Pratt & Whitney, West Palm Beach, Fl

FACULTY SERVICE TO THE UNIVERSITY

University and College Committees

Hamparsum Bozdogan
UT Faculty Senate Research Council.

Hamparsum Bozdogan
UT Research Council Subcommittee Chair on Research Computing Needs.

Hamparsum Bozdogan
CBA Graduate Fellowship Awards Committee.

Hamparsum Bozdogan
CBA I/O Program Committee.

16
Frank Guess
Stokely Task Force for Undergraduate Innovations Curriculum, College of Business, UTK.

John Philpot
Intercollegiate Graduates Statistics Program.

David L. Sylwester
Chair Administrative Review Committee for Associate Dean of College of Communications, 1995 to present.

Mary Sue Younger
Intercollegiate Graduate Statistics Program, CBA Undergraduate Scholarships Committee, CBA Ad Hoc Committee on Compensation.

Thesis and Dissertation Committees

Hamparsum Bozdogan
- Gregory Keller, Ph.D., Marketing, Logistics, and Transportation
- Jim Minesky, Ph.D., Ecology
- David Steward, Ph.D., Finance

John Philpot
- Todd Allen, M.S., Forestry, Wildlife and Fisheries
- Robert Brewer, M.S., Ecology
- Chris Coleman, Ph.D., Psychology
- David Denton, Ph.D., Organizational Psychology
- Kathy Jones, Ph.D., Strategic Management
- Dan Martello, M.S., Forestry, Wildlife, and Fisheries
- Deanna Putney, Ph.D., Organizational Psychology
- Mei Ling Shili, Ph.D., Journalism
- Chen X, M.S., Statistics

David L. Sylwester
- Michael Bobic, Ph.D., Political Science
- Paul Dillingham, Ph.D., Anthropology
- Stephen Donnelly, Ph.D., Anthropology
- Tom Douglas, Strategic Management
- Rebecca Emans, M.S., Anthropology
- Kip Krumwiede, Ph.D., Accounting
- Derek Martin, M.S., Sociology
- Madeleine F. Ocola, Ph.D., Sociology
- Mei-Ling, Ph.D., Communications

M.S. Younger
- Vincent Adams, Ph.D., Civil Engineering
- Lynn Chapman, Ph.D., Audiology & Speech Pathology
- Rob Collignon, Ph.D., Health Education
- Lucia Couto, Ph.D., Geology
- Nataraj Gosavi, Ph.D., Textiles, Retailing, & Interior Design
- Sri Kilambi, Ph.D., Environmental Engineering
- Charles Konetsky, M.S., Child & Family Studies
- Janet Krantz, M.S., Educational & Counseling Psychology
- Dee Lance, Ph.D., Audiology & Speech Pathology
- Kirk Miles, M.S., Forestry, Wildlife & Fisheries
- David Martorello, M.S., Forestry, Wildlife & Fisheries
- Joel Pedersen, M.S., Forestry, Wildlife & Fisheries
- June Rose, Ph.D., Communications
- Terence Scott, Ph.D., Communications
- Vickie Slater, Ph.D., Nursing
- Ladonna Tornabene, Ph.D., Health Leisure & Safety
- Janet Secrest, Ph.D., Nursing
- Steven Trotter, Ph.D., Civil & Environmental Engineering
- Ayub Yatim, Ph.D., Nutrition

Other Activities

Charles M. Cwiek
Management Development Center Instructor, Manager of graphics for use in seminars.
Robert W. Mee
Organized and co-taught (with Norman Draper, Dennis Lin, and Geoff Vining) a new one-week course through the Management Development Center: “Response Surface Methodology: Statistical and Optimization.”

Robert W. Mee
Taught a one week course along with Dr. Mary Leitnaker, a course in Statistical Process Control at the Technical University of Timisoara, Romania. This course for both practicing engineers, and university professors was supported by the U.S.I.A. grant. Plans are being made for follow-up courses next year.

Mary Sue Younger

Service to the Department
Charles M. Cwiek
Mary Sue Younger

Faculty Affairs
Hamparsum Bozdogan
Frank Guess
John Philpot

Colloquium Program
Hamparsum Bozdogan

Computing Affairs
Esteban Walker (Chair)
Charles Cwiek
Ramon Leon

Department Enrichment
S. Paul Wright

External Relations Committee

Graduate Student Affairs
David Sylwester (Chair)
Hamparsum Bozdogan
William Parr

Sigma Mu Alpha Advisor
David Sylwester

Undergraduate Student Affairs
Sharon Neidert (Chair)
Charles M. Cwiek
David L. Sylwester, Co-Chair, 1995-present.
S. Paul Wright
Mary Sue Younger

Statistics 201 Coordinator
Sharon Neidert
Service to the Profession

Bozdogan, Hamparsum
Co-Chair of the Scientific Program Committee of the International Society of Bayesian Analysis (ISBA), August 15-18, 1997, Istanbul, Turkey.

Bozdogan, Hamparsum

Guess, Frank
Associate Member, Institute of Electrical and Electronics Engineers.

Mee, Robert W.
Program Chair for the Quality and Productivity Section, American Statistical Association, 1996.

Parr, William C.

Sylwester, David L.

Wright, S. Paul
Member, American Statistical Association, 1996.
1995-1996 COURSE OFFERINGS

Undergraduate Courses
201 Introduction to Statistics
221 Sampling Techniques
251 Probability and Stat for Scientists and Engineers I
252 Probability and Stat for Scientists and Engineers II
261 Computing for Data Management and Analysis
302 Statistical Methods
365 Industrial Statistics
411 Introduction to Statistical Computing
461 Applied Regression Analysis
462 Analysis of Variance and Experimental Design
471 Random Processes and Probability Models
481 Special Topics/Probability
483 Special Topics
485 Principles of Statistical Process Management
492 Internship
493 Independent Study

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Graduate Courses

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<td>Theory of Statistical Inference</td>
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<td>Statistical Techniques in Industrial Processes</td>
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<td>Principles of Statistical Process Management</td>
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CONTINUING EDUCATION AND STATISTICAL CONSULTING

UT Hospital and Medical Research Center (E. Walker, S.H. Donnelly)

The use of the statistical consulting service by the medical community at UTMC is growing. Among the many projects in which we were involved are:

- Sample size determination for Continuous Quality Improvement. (Theresa Renfro, ICU)
- Detection of ovarian cancer using PET. (Dr. Hubner, Dept. of Radiology)
- Prediction of pneumothorax in trauma patients. (Dr. Brooks and Mark Gately, Lifestar)
- Evaluating PET as a diagnostic tool in cardiac patients. (Dr. Sun, and Dr. Smith, Dept. of Radiology)
- Study of resistance to certain bacteria. (Dr. Baddour, CEC)
- Studies of the incidence of pneumothorax and intestinal perforations in preterm newborns. (Dr. M. Gaylord, and Dr. V. Lorch, Dept. of Pediatrics)
- Identify stress indicators in family members of trauma patients. (Dr. R. Levee, Dept. of Medicine and Trauma Surgery)
- A study of the effects of space travel using rats. (L. Gibson, and Dr. Z. Allebban, Research Center)
- Comparison survival rates in different breast cancer risk groups. (Dr. Joseph Fuhr, Research Center)

Center for Advancement of Organizational Effectiveness
(Bill Parr, Richard Sanders and Mary Leitnaker)

The Center for Advancement of Organizational Effectiveness (CAOE) continues to mature. CAOE is an organization which provides a method for faculty learning, validation of learning, and sharing that learning with industrial partners, and with graduate and undergraduate students.

Bill Parr is Director of CAOE, and in that role works with John Riblett (Director of the Management Development Center), Richard Sanders, Mary Leitnaker, Ken Kirby, Harlan Carothers, and other faculty members of the Institutes for Productivity through Quality to further CAOE’s central role in driving the Colleges of Business Administration and Engineering toward playing a vital role in the world of the future.

One major aspect of CAOE is the collection of Management Development Center Programs known as the Institutes for Productivity through Quality. The University of Tennessee’s Institutes for Productivity through Quality began in 1981, in response to an outcry from industry for help in
responding to the challenges presented by their international competitors. One goal of these Institutes, as they have now evolved, is to offer organizations a comprehensive set of integrated courses in managing. These courses revolve around a set of central themes:

- Management of strategic organizational suprasystems
- Customer value
- Managing in the presence of variation

The first course, the *Three Week Institute for Productivity Through Quality*, has been in operation since 1981, with participants from operational levels in organizations from virtually all segments of the U.S. economy. Courses currently offered are:

- **Practical Strategies for Process Improvement**: (Previously Three Week Institute for Productivity Through Quality.) A three week course focused on subgrouping plans for data collection, operational definitions, measurement, capability and designed experiments, and control charts.

- **The Senior Executive Institute**: A one week course on the management of strategic organizational suprasystems, in the interest of providing best net comparative customer value, featuring extensive use of statistical thinking.

- **The Service Institute**: A two week course covering philosophy and tools of continuous improvement for mid-level managers from service organizations.

- **The Government Services Institute**: A two week course covering philosophy and tools of continuous improvement for mid-level managers from government.

- **The Cost Management Institute**: A one week program providing an understanding of the changing responsibilities of managers of accounting and financial information in the operating environment of today’s globally competitive firms.

- **The Design of Experiments Institute**: A three week course providing advanced statistical techniques for designing experiments for product, process, and systems improvement.

- **The Logistics Institute**: A two week course applying systems management for improving customer value to logistics and physical distribution.

- **The Building Customer Value Institute**: A two week course applying systems management for improving customer value to marketing, with an overview of the strategic interactions of marketing and other functions.

- **The Institute for Continuous Process Industries**: A two week course focused on the direct and indirect costs of variation for processes, which discusses both short and long term strategies to manage the variation for continuous improvement.

- **Lean Production Institute**: A one week course teaching the concepts and principles needed to improve product delivery, process design and performance.

- **Response Surface Methodology**: A one week course teaching statistical methods for optimizing the performance of product and process through designed experimentation.
These programs have had a profound impact on the curriculum offered to students in the Department of Statistics. Numerous students have the opportunity to be exposed to these programs, and to the participants in these programs, as part of their work for financial support. This gives them valuable exposure to organizational reality. Statistics 566 involves coverage of an extensive collection of cases which are used in the Institutes for Productivity through Quality, and is taken by virtually all M.S. students in Statistics. Statistics 365 also involves several cases from the Institutes, and is taken by virtually all undergraduate Statistics Majors.

The following Statistics faculty participated in teaching these programs:

Charles Cwiek       Robert Mee       David Sylwester
Mary Leitnaker      Sharon Neidert   Jim Schmidhammer
Ramon Leon          Bill Parr         Esteban Walker
Dennis Lin          John Philpot      
Robert McLean       Richard Sanders   

MANAGEMENT DEVELOPMENT CENTER PROGRAMS THAT BEGAN BETWEEN AUGUST 1, 1995 AND JULY 31, 1996

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1995-1996

STATISTICS DEPARTMENT ANNUAL REPORT

UNIVERSITY OF TENNESSEE, KNOXVILLE

If you would like to receive subsequent reports, please complete this form and return it to the address below.

William C. Parr
Department of Statistics
331 Stokely Management Center
Knoxville, TN 37996-0532

I wish to continue receiving annual reports of the University of Tennessee Department of Statistics.

Your Name:______________________________________________

Address:__________________________________________________

__________________________________________________________

__________________________________________________________