

**SYMPOSIUM ON DEPENDENCE IN
STATISTICS AND PROBABILITY**

AUGUST 1-5, 1987



Hidden Valley Conference Center

Laurel Highlands

Somerset, Pennsylvania 15501

PROGRAM

Sponsored by: AFOSR, NSF, ARO and the University of Pittsburgh

- 2 -

**SYMPOSIUM ON DEPENDENCE
IN STATISTICS AND PROBABILITY**

August 1-5, 1987

This research symposium focuses on the theory and applications of positive and negative dependence. The four basic areas to be examined are: (a) modeling foundations in monotone dependence; (b) applications to probability theory, reliability theory, mathematical statistics and other areas; (c) statistical issues arising from monotone dependence considerations; and (d) relationships of monotone dependence concepts to other statistical concepts.

CONFERENCE ORGANIZERS

H. W. Block
A. R. Sampson
T. H. Savits

LOCAL ARRANGEMENTS

D. Stoffer
D. Chhetry
Z. Fang

- 3 -

SATURDAY, AUGUST 1

- 1:00-4:00 p.m. Reception (Room 4)
 4:00-5:30 p.m. *Dependence Concepts, I* (Rooms 1 and 2)
 Chair: Thomas H. Savits, University of Pittsburgh,

Henry W. Block, University of Pittsburgh, "Dependence in probability and statistics."

Devendra Chhetry and **Allan R. Sampson***, University of Pittsburgh, "A projection decomposition for bivariate discrete probability distributions."

Henry W. Block, **Devendra Chhetry***, **Zhaoben Fang***, and **Allan R. Sampson**, University of Pittsburgh, "Partial orderings on permutations and dependence orderings on bivariate distributions."

- 6:30-8:00 p.m. DINNER (Room 4)
 8:00 p.m. CONFERENCE PARTY (Four Seasons Lounge)

SUNDAY, AUGUST 2

- 8:15 - 9:15 a.m. CONTINENTAL BREAKFAST (Balcony off Rooms 1 and 2)
 9:15 - 9:30 a.m. OPENING (Rooms 1 and 2)
 Jack E. Freeman, Executive Vice President, University of Pittsburgh
 9:30 - 11:00 a.m. *Modeling Multivariate Distributions* (Rooms 1 and 2)
 Chair: Frank Proschan, Florida State University

Albert Marshall, University of British Columbia and **Ingram Olkin***, Stanford University, "Modeling multivariate distributions."

Albert Marshall*, University of British Columbia and **Ingram Olkin**, Stanford University, "Families of multivariate distributions."

- 11:00-12:00 Noon *Multivariate Statistical Models* (Rooms 1 and 2)
 Chair: Naftali Langberg, University of Pittsburgh and Haifa University, Israel

Takemi Yanagimoto, Institute of Statistical Mathematics, Toyko, "Positive dependence in statistical models and other notions."

G. P. Patil, Pennsylvania State University and Harvard University, "Dependence perspectives of bivariate distributions arising in encountered data, joint toxicity assessment, and bivariate exponential extensions."

- 12:00-1:30 p.m. LUNCH (Room 4)
 1:30-3:00 p.m. *Life Testing* (Rooms 1 and 2)
 Chair: Morris DeGroot, Carnegie-Mellon University

Nozer Singpurwalla*, and **Mark Youngren**, George Washington University, "Multivariate distributions for the life lengths of items sharing a common (fixed or varying) environment."

- 4 -

Myles Hollander*, Florida State University, **Frank Proschan**, Florida State University, and **James Sconing**, University of Iowa. "Information, censoring, and dependence."

Nancy Flournoy, University of Washington, "Bivariate Markov chains."

3:00-3:30 p.m. BREAK (Balcony off Rooms 1 and 2)

3:30-5:30 p.m. *Dependence and Bivariate Discrete Distributions* (Rooms 1 and 2)
Chair: Allan R. Sampson, University of Pittsburgh

Harry Joe, University of British Columbia, "Relative entropy measures of multivariate dependence."

Marco Scarsini, Stanford University and Università di Parma, "An ordering of dependence."

Truc T. Nguyen, Bowling Green State University, "Complete dependence and a characterization of random variables with normal distributions."

Mei-Ling Ting Lee, Boston University, "Some cross-product difference statistics and a test for trends in ordered contingency tables."

Allan R. Sampson, University of Pittsburgh, and **Lyn Whitaker***, University of California, Santa Barbara, "Estimation of multivariate distributions under stochastic ordering."

3:30-5:30 p.m. *Probability and Dependence*

Chair: Joel Greenhouse, Carnegie-Mellon University

A. Larry Wright, University of Arizona, "Associated processes: results and conjectures."

E. G. Enns, University of Calgary, "Dependence relationships for chords through a convex body generated from within an embedded convex body."

Jürg Hüsler, University of Bern, "Multivariate extreme values of nonstationary sequences."

Nicholas Longford, Educational Testing Service, "Multivariate exponential and geometric distributions derived from hitting times in Markov processes."

7:00-9:30 p.m. BANQUET (Family Entertainment) (Room 4)

9:30-12:00 p.m. INFORMAL GATHERING (Four Seasons Lounge)

- 5 -

MONDAY, AUGUST 3

7:30-8:30 a.m. CONTINENTAL BREAKFAST (Patio outside of Room 4)

8:30-9:45 a.m. *Coincidence Probabilities and Inequalities* (Rooms 1 and 2)

Chair: Henry W. Block, University of Pittsburgh

Samuel Karlin, Stanford University, "Coincidence probabilities and applications to combinatorics."

L. D. Brown, Cornell University and **Yosef Rinott***, Hebrew University, "Inequalities for multivariate infinitely divisible processes."

10:15-11:45 a.m. *Processes in Reliability Maintenance* (Rooms 1 and 2)

Chair: Brian Woodruff, AFOSR

Henry W. Block, University of Pittsburgh, **Naftali A. Langberg**, Haifa University, and **Thomas H. Savits***, University of Pittsburgh, "Stochastic comparisons for some repair models."

E. Arjas*, University of Oulu and **I. Norros**, University of Helsinki, "Should minimal repair depend on information?"

M. Abdel-Hameed, Kuwait University, "Inspection and maintenance policies of devices subject to deterioration."

10:00-11:45 a.m. *Sequential and Nonparametric Analysis* (Room 3)

Chair: Bimal Sinha, University of Maryland, Baltimore

Joseph Glaz, University of Connecticut, "Approximating the distribution of sums of random variables with applications to group sequential test and scan statistics."

James R. Kenyon, University of Southern Maine, "Calculating improved bounds and approximations for sequential testing procedures."

Z. Govindarajulu, University of Kentucky, "Robustness of Mann-Whitney-Wilcoxon test to dependence in the variables."

Pablo Salzberg, University of the Sacred Heart, "On the independence between polynomials in a multinormal random variable."

11:45-1:45 p.m. POOLSIDE BARBEQUE

1:45-3:15 p.m. *Majorization and Orderings* (Rooms 1 and 2)

Chair: Robert L. Launer, ARO

Persi Diaconis, Stanford University, and **Michael D. Perlman***, University of Washington, "Bounds for tail probabilities of linear combinations of independent gamma random variables."

Wai Chan, Ohio State University, **Frank Proschan**, Florida State University, and **Jayaram Sethuraman***, Florida State University, "Convex ordering among functions with applications to reliability and mathematical statistics."

Arthur Cohen* and **Harold B. Sackrowitz**, Rutgers University, "Unbiasedness of tests of homogeneity when alternatives are ordered."

3:15-3:45 p.m. BREAK (Balcony outside of Rooms 1 and 2)

- 6 -

3:45-5:15 p.m. *Dependence Concepts, II* (Rooms 1 and 2)
 Chair: **Moshe Shaked**, University of Arizona

Barry C. Arnold, University of California, Riverside, "Dependence in conditionally specified distributions."

D. R. Jensen, V.P.I., "Invariance properties of arrays through dependence by mixing."

Tadeusz Bromek, Polish Academy of Sciences. Title to be announced.

6:30-8:00 p.m. DINNER (Room 4 and Patio outside)

8:00-9:00 p.m. *Special Interest Group Discussions* (Boardroom), "Contingency tables and positive dependence"

8:00-12:00 p.m. INFORMAL GATHERING (Four Seasons Lounge)

TUESDAY, AUGUST 4

7:30-8:30 a.m. CONTINENTAL BREAKFAST (Patio outside of Room 4)

8:30-9:30 a.m. *Topics in Reliability* (Rooms 1 and 2)
 Chair: **Brian Woodruff**, AFOSR

Mark Brown, City College, CUNY, "Bivariate constructions, coupling and error bounds."

Moshe Shaked*, University of Arizona and **J. George Shanthikumar**, University of California, Berkeley, "Multivariate conditional hazard rate functions."

8:45-10:00 a.m. *Dependence Concepts, III* (Room 3)
 Chair: **David Stoffer**, University of Pittsburgh

K. Subramanyam, University of Pittsburgh, and **M. Bhaskara Rao***, University of Sheffield, "On the structure of $2 \times \infty$ bivariate distributions which are totally positive of order two."

K. Subramanyam, University of Pittsburgh, "Some comments on positive quadrant dependence."

Sanat K. Sarkar, Temple University, "On quasi-independence in ordinal contingency tables."

10:00-11:30 a.m. *Inequalities and Orderings* (Rooms 1 and 2)
 Chair: **Ingram Olkin**, Stanford University

J.H.B. Kemperman, Rutgers University, "Inequalities for the Borda ranking of random variables."

Y. L. Tong, Georgia Institute of Technology, "Inequalities for a class of positively dependent random variables with a common marginal."

Phillip Boland*, University College, Dublin, and **Frank Proschan**, Florida State University, "Multivariate arrangement increasing functions with applications in probability and statistics."

11:30-12:45 p.m. Title to be announced.
 Chair: **Michael Meyer**, Carnegie-Mellon University

- 7 -

Leo A. Goodman, University of California, Berkeley (tentative). Title to be announced.

Ruth Douglas and Stephen E. Fienberg*, Carnegie-Mellon University, "An overview of dependency models for cross-classified categorical data involving ordinal variables."

12:45-1:30 p.m. LUNCH (Room 4)

1:30-3:00 p.m. *Ising Models and Dependence Inequalities* (Rooms 1 and 2)
Chair: Y. Mittal, NSF and VPI

Charles M. Newman, University of Arizona, "Ising models as dependent percolation models."

Kumar Joag-Dev, EPFL Lausanne and University of Illinois, "A version of Kelly-Sherman inequality for Ising model with an application."

Loren D. Pitt, University of Virginia, "Semi-groups and positive correlations."

1:30-3:00 p.m. *Reliability and Dependence* (Room 3)
Chair: Satish Iyengar, University of Pittsburgh

A. P. Basu, University of Missouri, Columbia, "Some inference problems for dependent systems."

William S. Griffith, University of Kentucky, "On the role of dependence in the analysis of consecutive k-out-of-n systems."

Jerzy Filus, Illinois Institute of Technology, "On multivariate probability distributions as models of reliability for systems with dependent life times of their components."

3:00-6:00 p.m. FALLINGWATER TRIP (Sign-up required.)

7:00-8:30 p.m. DINNER (Hearthside Resturant - reservations required)

8:00-9:00 p.m. *Special Interest Group Discussions* (Boardroom) - "Topics in Dependence"

8:30-12:00 p.m. INFORMAL GATHERING (Four Seasons Lounge)

- 8 -

WEDNESDAY, AUGUST 5

7:00-8:30 a.m. CONTINENTAL BREAKFAST (Patio outside of Room 4)

8:30-10:00 a.m. *Time Series and Bayesian Statistics* (Rooms 1 and 2)
Chair: Devendra Chhetry, University of Pittsburgh

Richard A. Johnson* and **Thore Langeland**, University of Wisconsin, "A linear combination test for detecting serial correlation in multivariate samples."

Henry W. Block, University of Pittsburgh, **Naftali Langberg**, Haifa University, and **David S. Stoffer***, University of Pittsburgh, "Time series models for non-Gaussian processes: some recent developments."

Richard E. Barlow and **Carlos A. de B. Pereira***, University of California, Berkeley, "Probabilistic influence diagrams."

10:00-11:00 a.m. *Miscellaneous Topics* (Rooms 1 and 2)
Chair: Zhaoben Fang, University of Pittsburgh

R. D. Gupta, University of New Brunswick, "Estimation of reliability in the case of normal distributions."

Richard A. Vitale, The Claremont Graduate School, "A differential version of the Efron-Stein inequalities."

11:30-12:30 p.m. LUNCH (Hearthside Restaurant or Box Lunch)