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ABSTRACTS OF PAPERS

(An abstract of a paper presented at the European meeting, Amsterdam, Netherlands, September 2–7, 1968. Additional abstracts appeared in earlier issues.)

15. Inference in multivariate normal populations with structure (preliminary report). George P. H. Styan, University of Minnesota, Minneapolis.

We consider inference based on observations from a multivariate normal population with unspecified mean vector; the covariance matrix is assumed to have a specified form or structure. We suppose that the correlation coefficients are all known and the variances completely unknown. We estimate the variances by the method of maximum likelihood and obtain a closed form for the resulting equations using the notion of Hadamard product of matrices. These equations form a set of simultaneous nonhomogeneous quadratic equations and in general cannot be solved analytically. We show that they have a unique real solution and obtain an approximation to this by the Newton-Raphson technique. We prove that the first iterate based on a consistent trial solution is a best asymptotically normal estimate. The asymptotic efficiency of the sample variances over the maximum likelihood estimates is computed and bounds obtained. The Fréchet-Cramér-Rao inequality leads to some interesting results in matrix algebra concerning Hadamard products of positive definite matrices and their inverses. We evaluate likelihood ratio tests for a given correlation structure in a general multivariate normal population and for equality of variances given the correlation coefficients. These results are specialized to the situation where all correlation coefficients are equal and known. (Received 28 February 1969.)

(Abstracts of papers presented at the Central Regional meeting, Iowa City, Iowa, April 23–25, 1969. Additional abstracts have appeared in earlier issues.)

15. Nonparametric tests for multivariate two-way layouts. Rashid Ahmad, University of Michigan.

For the case of one observation per cell the hypothesis "no row eflect" following Friedman (1937) form can be stated $\Omega(H_{0R}) = \{F_{ij} = \cdots = F_{rj}$ for all $j\}$ where the F_{ij} are p-dimensional continuous distributions. Using the ideas of Pitman [(1937), (1938)], Scheffé (1943), Lehmann and Stein (1949), and extending the results of Bell, Deshpandé and Geller (1968) to multivariate case one proves: Theorem 1. (a) *If T is a statistic distribution-free* (DF) wrt $\Omega(H_{0R})$, *then T has a discrete H_0-distribution with probabilities integral multiples of* $(r!)^{-c}$, (b) *T is* DF wrt $\Omega(H_{0R})$ *if and only if T is a function of permutation statistic, and* (c) *for each discrete distribution G with probabilities which are integral multiples of* $(r!)^{-c}$ *there exists a* DF *statistic T with H_0-distribution G.* Theorem 2. *The most powerful* DF *test against a specific alternative is based on the permutation statistic of the likelihood function.* Theorem 3. *Each randomized test based on a similar partition is* DF; *and for each preassigned distribution G, there exists a randomized statistic with H_0-distribution G.* Analogous results hold for "no column eflect," that is $\Omega(H_{0C})$. Finally one tests "no interaction" by independent contrasts. (Received 3 March 1969.)

16. Some aspects of semi-Bayesian discrimination. Peter Enis and Seymour Geisser, State University of New York at Buffalo.

When classifying an observation into one of two multivariate normal populations $N(\mu_1, \Sigma_1)$ or $N(\mu_2, \Sigma_2)$ where μ_1 and Σ_1 $(i = 1, 2)$ are known, the discriminant which minimizes the (total) probability of misclassification is based on the ratio of the pdf's of the populations. When the parameters are unknown, the "usual" procedure, in the case of a