ABSTRACTS OF PAPERS

Presented on September 16, 1945 at the Rutgers meeting of the Institute

1. On The Variance of a Random Set in n Dimensions.

HERBERT ROBBINS, Lieutenant USNR Postgraduate School, Annapolis, Md.

Using a general formula for the moments of the measure of a random set X (*Ann. Math. Stat.* Vol. XV (1944), pp. 70–74) we find the mean and variance in the case where X is a random sum of n-dimensional intervals with sides parallel to the coordinate axes, thus generalizing the results previously found (loc. cit.) for the case $n = 1$.

2. The Non-Central Wishart Distribution and its Application to Problems in Multivariate Statistics.

T. W. ANDERSON, Princeton University.

The non-central Wishart distribution is the joint distribution of sums of squares and cross-products of deviations of observations from multivariate normal distributions with identical variance-covariance matrices and with different sets of means. The rank of the non-central Wishart distribution is defined as the rank of the matrix of sets of means. In a previous paper (by M. A. Girschick and the present author) the non-central Wishart distribution is given explicitly for the rank one and two cases and indicated for the case of any rank. In the present paper the characteristic function of the non-central Wishart distribution is given for general rank. The distribution, which is given in the form of a multiple integral, is the product of a central Wishart distribution and a symmetric function of the roots of a determinantal equation involving the matrix of squares and cross products of observations and the matrix of population means. It is shown that the convolution of two non-central Wishart distributions is again a non-central Wishart distribution if the variance-covariance matrices are the same. The moments of the generalized variance and the moments of the likelihood ratio criterion for testing certain linear hypotheses (for example, the hypothesis that the means of a set of populations are identical, given that the matrices of population variances and covariances are the same) are obtained for the linear and planar non-central cases in terms of infinite series. Likelihood ratio criteria are developed for testing the dimensionality of the means of a set of multivariate populations (with identical variances and covariances) on the basis of one sample from each. The criterion for testing whether the dimensionality is h in the space of p dimensions is a symmetric function of $p - h$ smallest roots of the determinantal equation involving the sample estimate of the matrix of variances and covariances and the sums of squares and cross-products of deviations of sample means. The maximum likelihood estimate of the hyperplanes and positions of means on them are obtained. The asymptotic distributions of the criteria are χ^2-distributions.

3. The Effect on a Distribution Function of Small Changes in the Population Function.

BURTON H. CAMP, Wesleyan University.

It is generally assumed in the application of distribution theory that, if the actual population function is not very different from the one used in the theory, then the true sampling distribution of a statistic will not be very different from the one obtained in the theory. But elsewhere in mathematics we do not assert that a conclusion will be only slightly modified by a small deviation in the hypothesis. This paper presents some theorems which are useful in determining the maximum effect on a sampling distribution of certain kinds of small changes in the population function.