well behaved, although only piecewise continuous with respect to c.

## SUMMARY

We have found MUNOML to be extremely useful in day-to-day operation since it provides the maximum amount of flexibility with a minimum amount of duplicated effort. This is especially true when minor changes to a model's structure are made because there will be a great deal of unchanged code within the user supplied subroutine.

MUNOML has excellent convergence qualities and rarely goes beyond 10 iterations; when it does, it is usually because of programming errors in the calculation of the probabilities or their derivatives.

We are collecting a library of subroutines for use with MUNOML. There are currently subroutines for calculating parameters for a successive categories model and for models based on the theory of signal detectability: unequal variance ROC parameters from binary responses; equal-variance signal-to-noise ratio pairs; constant likelihood ratio decision rules; and Neyman-Pearson decision rules (using objective and subjective probabilities). Complete listings and/or card decks (about 500 cards in all) are available on request. Operational details are described in Curry (Note 1).

## REFERENCE NOTE

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# Computer-generated computation exercises

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Four programs were designed to aid instructors in developing students' statistical skills by generating exercises on (1) z scores, (2) Pearson r correlation with regression or matched groups t test, (3) independent groups t test, and (4) chi square. The programs generate exercises by drawing random samples from populations, a procedure which produces a unique exercise for each student and thus discourages plagiarism. The exercises generated consist of data values plus instructions and are given to students, who do the required calculations either with paper and pencil or electronic calculators and submit them for grading.

For each student exercise that is printed, a corresponding solution is produced for the instructor's use in checking and grading. The solutions contain not only the final answer to problems, but also intermediate summary statistics so that students' computation errors may be located and partial credit given. The printed output of the programs is designed so that the solutions can be conveniently separated from the exercises and the exercises easily separated from one another for distributing to students.

Designed for the convenience of the instructor, the programs require no preparation of raw data. Instead, the instructor enters such information as the number of exercises to be produced, the difficulty level of the exercises, and the parameters (e.g., $\mu$, $\sigma$) of the populations from which the data values are randomly generated. The parameter values can be chosen to produce marginal statistical significance, causing some of the generated exercises to yield statistically significant results and others to be nonsignificant.

In addition to producing computation exercises, the present programs are suitable for sampling experiments based on random samples drawn from normal populations with specified parameters. It is possible to systematically vary sample sizes and different parametric values to study their effects on a number of theoretical propositions. Such experiments might be used to help students understand theoretical concepts.

**Computer and language.** The programs are designed for time-sharing use. They are written in BASIC and were tested on Hewlett-Packard computers (Models 2100A, 2000E, and 2000F), but designed to be compatible with a variety of computers. Because the time-sharing mode minimizes turn-around time, the programs may be used in a classroom or statistics lab setting, perhaps for running sampling experiments.

**Availability.** Program listings and a manual giving detailed use information and sample output may be obtained at no charge from Paul Salmon, Department of Psychology, 2219 North Kenmore Avenue, Chicago, Illinois 60614.