Program Input and Output. Input to the program ORGAN takes the form of the incidence matrices for the networks, the configuration specifications, and certain ancillary information.

Output from the program takes the form of frequency counts of the incidence of the configurations defined by the specification (1) for each individual paired with all other individuals in the organization and (2) for certain specified groups of individuals compared with other groups of individuals.

The program ORGY provides a means for "cleaning" and formatting data prior to its submission to program ORGAN. Information concerning the relationships between individuals may be input to ORGY, which for an authority network could take the following form:

JOHN MARY S TONY M MARK M

indicating that John is Mary's subordinate and that he is the manager of both Tony and Mark. The program checks the information for inconsistencies and permits the user to correct certain errors during run time. After the correction of all detectable errors, the program outputs information in a form suitable for analysis by ORGAN. Although the uses of the programs have been discussed with respect to the problem of analyzing organization structures, they may be used to analyze any two suitably specified sets of relationships arising from the same group of individuals.

Computer and Language. The programs are written in FORTRAN IV for use on a Honeywell time-sharing system (1648). The program ORGY is, for ease of data correction, written for interactive use via an on-line terminal.

Availability. Further information concerning the programs and listings are available from the authors.

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Subroutine for multiple logistic discriminant function analysis

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A number of nonlinear least-squares computer programs obtain a weighted fit to a user-specified function through the use of the Taylor theorem expansion and an iterative procedure. Practically all of the general-purpose versions of these nonlinear programs require user-supplied FORTRAN statements for the evaluation of the function and additional statements for an evaluation of the partial derivatives with respect to the parameters being estimated. These are usually placed into a subroutine format and submitted with the run.

Recently, a multiple logistic discriminant model has been used on large sets of data which have a dichotomous outcome. This model may be run conveniently on such general-purpose computer programs as mentioned above.

Observing computer conventions of the nonlinear regression program of the popular BMD series (Dixon, 1973) the multiple logistic function F for five independent variables X(1) to X(5) is written as

$$F = (1 + EXP(-(P(1) + P(2)X(1) + \cdots + P(6)X(5))))^{-1},$$

where P(1) is the origin value in the argument and P(2) to P(6) are the coefficients for. the independent variables. If DF(I) denotes the value of the i^{th} partial derivative, the user-required subroutine FUN, written in FORTRAN, is as follows:

```
0001      SUBROUTINE FUN(F,DF,P,X,N)
0002      DIMENSION DF(1),P(1),X(1)
0003      A=P(1)
0004      DO 1 I=2,6
0005      A=A + P(I)*X(I)
0006    1 CONTINUE
0007      F=1./(1. + EXP(−A))
0008      DF(1)=EXP(−A)/(1. + EXP(−A))
0009      DF(1)=F*DF(1)
0010      DO 2 I=2,6
0011      DF(I)=DF(1)*X(I)
0012    2 CONTINUE
0013      RETURN
0014      END
```

Statement Numbers 0004 and 0010 can be changed if there are different numbers of independent variables. For example, with seven independent variables, the Statement 0004 would be written as

```
0004      DO 1 I=2,8
```

and Statement 0010 as

```
0010      DO 2 I=2,8
```

REFERENCES

Dixon, W. J. (Ed.) BMD07R: Nonlinear least squares. *BMD Biomedical Computer Programs*. Berkeley: University of California Press, 1973. Pp. 387-396.

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