MIS 652-E: Multivariate Data Analysis I

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Chapter 7 Assignment

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Q1) What are the differences between MANOVA and discriminant analysis? What situations best suit each multivariate technique?

Ans. In a manner of speaking, MANOVA and discriminant analysis are indistinguishable portrayals. The dependent factors in MANOVA (a course of action of metric factors) are the independent factors in discriminant analysis. The single non-metric dependent variable of discriminant analysis transforms into an independent variable in MANOVA. Additionally, both use the relative methodologies in forming the variates and looking over true criticalness between gatherings. Utilization of one strategy over the other basically depends on the examination objective. Discriminant analysis uses a singular non-metric variable as the dependent variable. The independent metric factors are used to outline variates that expand unmistakably between bundles formed by the dependent variable. The objective is to choose the independent factors that isolate between gatherings. In MANOVA, the game plan of metric factors now go about as dependent factors and the objective advances toward getting to be finding gatherings of respondents that show differentiates on the course of action of dependent factors.

Q2) Design a two-way factorial MANOVA experiment. What are the different sources of variance in your experiment? What would a significant interaction tell you?

Ans. Requirements for two-way MANOVA:

1) Two (or more) metric dependent variables.
2) Two (or more) non-metric experimental (treatment) variables. The experimental design is a 2 x 2 (n x n) matrix of independent non-metric variables.
3) Subjects are assigned at random, but in equal numbers to each of the cells.
4) Statistics are calculated for each cell:
    a. totals for both (all) dependent variables b. sums of squares for both (all) dependent variables c. sums of products of dependent variables.
5) Marginals are computed
    a. There are four sources of variance:
        1) Between columns (treatments)
        2) Between rows (factors)
        3) Interactions between factors and treatments
        4) Residual error.

In factorial designs (n x n) the interaction test would aid in discovering an interaction effect. In other words, the joint effect of treatment variables in addition to the individual main effect on the dependent variables.

Q3) Besides the overall, or global, significance, at least three approaches to follow-up tests include
(a) use of Scheffe contrast procedures;
(b) step-down analysis, which is similar to stepwise regression in that each successive F statistic is computed after eliminating the effects of the previous dependent variables; and
(c) examination of the discriminant functions. Describe the practical advantages and disadvantages of each of these approaches?

Ans.

a. Scheffe' Contrast procedures:
    - A test for differences between bunches on any dependent variable.
    - These methodology guarantee that the probability of any Type I error over all comparisons will be held to d = .05 (or at the level specified by the scientist). A disadvantage in using the Scheffe' test is that it requires the utilization of the gcr distribution. If the Scheffe' test is to be used, then the most appropriate general test would be the gcr-statistic in MANOVA.

b. Step-Down Analysis:
    - Like F-tests however takes into consideration correlation among dependent variables.
    - Closely resembling venture wise regression in idea. May disregard a significant dependent (independent) variable because of its high correlation with another dependent (independent) variable.

c. Multiple Discriminant Analysis of the SSCP matrix:
    - The relative importance of every independent variable can be identified by deriving correlations between every original dependent variable and the discriminant function.
    - Significant regions of differences between gatherings can be identified.

Q4) How statistical power is affected by statistical and research design decisions? How would you design a study to ensure adequate power?

Ans. The fundamental parts affecting power can be overviewed before an examination, evaluated affect measure, pined for alpha level, the amount of dependent factors, and test gauge. To ensure palatable power, the researcher ought to evaluate the effect appraise and the required illustration size to achieve the desired level of vitality given the alpha required. In the diagram of the examination, the researcher should think about the use of a few dependent factors as could be normal considering the present situation, especially if they are connected.

Q5) Describe some data analysis situations in which MANOVA and MANCOVA would be appropriate in your areas of interest. What types of uncontrolled variables or covariates might be operating in each of these situations?

Ans. There is a wide variety of use possible in the zones of mind science and preparing. Instances of the usage of these frameworks in these two fields may be found in the picked readings toward the complete of the part. A wide combination of usage is moreover possible in the domain of advancing. One kind of trial which might be done in advancing examination is test the effects of two impart correspondences media at three special conditions of the day on purchaser data and plan to buy in the meantime. Co-variates in such an examination may consolidate sex, age, or direction level of the respondents. These could be controlled for after the trial if these factors did to make sure influence the aftereffect of the test.

Another kind of test might be to test the effect of a condition of obtainment show (present or missing) against every day paper publicizing. Two urban areas could be picked which have relative measurement profiles. The area every day paper in one city just would pass on advancements about the specific thing. A couple of stores would be picked in each city with the end goal of obtainment introductions and some decided for discernment without the grandstands. Dependent factors to be watched may consolidate levels of development on the walkways containing the thing and the degree of purchases containing the thing of interest. Co-variates may join repeat of shopping outings and readership of both every day papers. Relative issues of interest may occur in any teach where trial setup is of concern.

References :

Textbook : Multivariate Data Analysis

Book by Barry J. Babin, Hair, Rolph E Anderson, and William C. Black
Powerpoint : Lecture & Professor's Video Lectures