

Fisher and Inference for Scores

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Summary

This paper examines the work of Fisher and Bartlett on discriminant analysis, ordinal response regression and correspondence analysis. Placing these methods with canonical correlation analysis in the context of the singular value decomposition of particular matrices, we use explicit models and vector space notation to unify these methods, understand Fisher's approach, understand Bartlett's criticisms of Fisher and relate both to modern thinking. We consider in particular the formulation of certain hypotheses and Fisher's arguments to obtain approximate distributions for tests of these hypotheses (without assuming multivariate normality) and put these in modern notation. Using perturbation techniques pioneered by G.S. Watson, we give an asymptotic justification for Fisher's test for assigned scores and thereby resolve a long standing conflict between Fisher and Bartlett.

Key words: Discriminant analysis; Ordinal response regression; Correspondence analysis; Asymptotic approximations.