Contents

	Preface	page	ix
1.	Historical Background		1
	Introduction		1
	Principal component analysis		2 5
	Factor analysis		
	Hierarchical correlation matrices		8
	Additional factors		10
	Naming factors		10
	Explaining the low rank of correlation matrices		11
2.	General Observations		13
	Introduction		13
	Estimating variances and covariances		13
	Linear constraints on variates		16
	Matrices of reduced rank		17
	Terminology		18
	Metric		19
	The distribution of variates		20
3.	Matrices and Determinants		22
	Matrices and their manipulation		22
	Determinants		25
	Inverse matrices		26
	Some uses of matrices and determinants		27
	Rank of matrix		29
	Latent roots and vectors of a matrix		30
	Latent vectors		31
	Orthogonal matrices		33
	Matrix rotation		34
	Triangular matrices		34
	Quadratic forms and their differentiation		35
	Lagrange multiplier		36
	Latent roots and vectors of non-symmetric matrices		37
4.	Principal Component Analysis		39
	Matrix transformation		39

C	1	VΤ	ſΈ	N	T	5

vi	•	CONTENTS
	Appraisal of results	41
	Practical applications	41
	Q-technique	44
	Extracting a 'difficulty' component	45
5.	Factor Analysis	46
	Review	46
	The basic model	46
	Using the model	49
	The residual variates	50
	Factor rotation	53
	A salutary point	57
	Factor analysis or principal component analysis?	58
6.	Confirmatory Factor Analysis	60
	The restricted factor model	60
	Estimating Factor Scores	66
	Oblique factors	68
7.	Multiple Linear Regression	70
	Introduction	70
	The model	71
	Scaling	73
	Precautions	74
	Selective sampling	74
	Selecting independent variates	78
	Appraisal	79
	Regression and factor analysis	81
	Addendum	82
8.	Canonical Correlations	85
	Introduction	85
	The model	85
	A computational problem	88
	Tests of significance	88
	Inter-rater agreement	91
	General comments	93
9.	Discriminant Function and Canonical Variate Analy	sis 94
	Introduction	94
	The case of two groups	95
	Canonical variate analysis	96
	Interpretation	97
	Scaling of scores on the observed variates	98
	Scaling the canonical variates	99
	Quadratic discriminant functions	102
	Comparing congrigace metricus	105

CO:	NTENTS	vii
10.	The Analysis of Contingency Tables	106
	Introduction	106
	Notation	106
	Categories with a natural order	111
	General comments	113
11.	Analysis of Variance in Matrix Notation	115
	Introduction	115
	Experimental designs	115
	Alternative procedures	119
	Non-orthogonal designs	123
	Generalization	126
12	Multivariate Analysis of Variance (MANOVA)	129
	Introduction	129
	The model	129
	Partitioning the matrix O'DO	132
	Tests of significance in MANOVA	133
13	Cluster Analysis and Miscellaneous Techniques by	
	B.S. Everitt	136
	Introduction	136
	Cluster analysis techniques	136
	Similarity and distance measures	137
	Common techniques	137
	Evaluating solutions	140
	Visual Representations of Multivariate Data	143
	Summary	150
	References	153
	Index	159