Contents

Preface		**ix**
1	**Introduction**	**1**
	1.1 Classification, assignment and dissection	1
	1.2 Aims of classification	5
	1.3 Stages in a numerical classification	6
	1.4 Data sets	10
2	**Measures of similarity and dissimilarity**	**15**
	2.1 Introduction	15
	2.2 Selected measures of similarity and dissimilarity	17
	2.3 Some difficulties	23
	2.4 Construction of relevant measures	29
3	**Partitions**	**35**
	3.1 Partitioning criteria	35
	3.2 Iterative relocation algorithms	41
	3.3 Mathematical programming	49
	3.4 Other partitioning algorithms	52
	3.5 How many clusters?	60
	3.6 Links with statistical models	65
4	**Hierarchical classifications**	**69**
	4.1 Definitions and representations	69
	4.2 Algorithms	75
	4.3 Choice of clustering strategy	96
	4.4 Consensus trees	100
	4.5 More general tree models	106
5	**Other clustering procedures**	**111**
	5.1 Fuzzy clustering	111
	5.2 Constrained classification	115
	5.3 Overlapping classification	121

5.4 Conceptual clustering 128
5.5 Classification of symbolic data 136
5.6 Partitions of partitions 142

6 Graphical representations 147
6.1 Introduction 147
6.2 Principal coordinates analysis 149
6.3 Non-metric multidimensional scaling 157
6.4 Interactive graphics and self-organizing maps 167
6.5 Biplots 172

7 Cluster validation and description 183
7.1 Introduction 183
7.2 Cluster validation 185
7.3 Cluster description 204

References 213

Author index 242

Subject index 249