

Contents

<i>Preface</i>	vii
Part 1 Surveys of Selected Topics	1
1. Fixed-Parameter Algorithms for Graph-Modeled Data Clustering	3
<i>F. Hüffner, R. Niedermeier and S. Wernicke</i>	
1.1. Introduction	4
1.2. Fixed-Parameter Tractability Basics and Techniques	6
1.3. Case Studies from Graph-Modeled Data Clustering	12
1.4. Conclusion	22
References	24
2. Probabilistic Distance Clustering: Algorithm and Applications	29
<i>C. Iyigun and A. Ben-Israel</i>	
2.1. Introduction	29
2.2. Probabilistic $\{d,q\}$ -Clustering	31
2.3. The PDQ Algorithm	38
2.4. Estimation of Parameters of Normal Distribution	40
2.5. Numerical Experiments	42
2.6. Multi-Facility Location Problems	46
2.7. Determining the “Right” Number of Clusters	50
References	51
3. Analysis of Regulatory and Interaction Networks from Clusters of Co-expressed Genes	53
<i>E. Yang, A. Misra, T. J. Maguire and I. P. Androulakis</i>	
3.1. Identification of Intervention Targets: Regulatory and Interaction Networks	54
3.2. Analysis of Regulatory Networks	59
3.3. Analysis of Interaction Networks	69
3.4. Intervention Strategies	75
References	76

4. Graph-based Approaches for Motif Discovery 83
E. Zaslavsky
 4.1. Introduction 83
 4.2. Graph-Theoretic Formulation 86
 4.3. Linear Programming-based Algorithms 88
 4.4. Maximum Density Subgraph-based Algorithm 92
 4.5. Subtle Motif Algorithms 93
 4.6. Discussion 95
 References 96

5. Statistical Clustering Analysis: An Introduction 101
H. Zhang
 5.1. Introduction 101
 5.2. Similarity (Dissimilarity) Measures 103
 5.3. Clustering Algorithm 109
 5.4. Determining the Number of Clusters 119
 References 125

Part 2 New Methods and Applications 127

6. Diversity Graphs 129
P. Blain, C. Davis, A. Holder, J. Silva and C. Vinzant
 6.1. Introduction 130
 6.2. Notation, Definitions and Preliminary Results 130
 6.3. Graphs That Support Diversity 135
 6.4. Algorithms and Solutions for the Pure Parsimony Problem 140
 6.5. Directions for Future Research 149
 References 150

7. Identifying Critical Nodes in Protein-Protein Interaction Networks 153
V. Boginski and C. W. Commander
 7.1. Introduction 153
 7.2. Protein-Protein Interaction Networks 154
 7.3. Optimization Approaches for Critical Node Detection 155
 7.4. Heuristic Approaches for Critical Node Detection 158
 7.5. Computational Experiments 160
 7.6. Conclusions 165
 References 165

8. Faster Algorithms for Constructing a Concept (Galois) Lattice 169
V. Choi
 8.1. Introduction 169
 8.2. Background and Terminology on FCA 172
 8.3. Basic Properties 173
 8.4. Algorithm: Constructing a Concept/Galois Lattice 176
 8.5. Variants of the Algorithm 179
 8.6. Discussion 181

References	182
Appendix	185
9. A Projected Clustering Algorithm and Its Biomedical Application	187
<i>P. Deng, Q. Ma and W. Wu</i>	
9.1. Introduction	188
9.2. Related Works	190
9.3. The IPROCLUS Algorithm	192
9.4. Empirical Results	199
9.5. Conclusion	204
References	205
10. Graph Algorithms for Integrated Biological Analysis, with Applications to Type 1 Diabetes Data	207
<i>J. D. Eblen, I. C. Gerling, A. M. Saxton, J. Wu, J. R. Snoddy and M. A. Langston</i>	
10.1. Overview	208
10.2. Description of Data	209
10.3. Correlation Computations	210
10.4. Clique and Its Variants	210
10.5. Statistical Evaluation and Biological Relevance	213
10.6. Proteomic Data Integration	215
10.7. Remarks	219
References	220
11. A Novel Similarity-based Modularity Function for Graph Partitioning	223
<i>Z. Feng, X. Xu, N. Yuruk and T. Schweiger</i>	
11.1. Introduction	223
11.2. Related Work	225
11.3. A Novel Similarity-based Modularity	227
11.4. A Genetic Graph Partitioning Algorithm	229
11.5. A Fast Agglomerative Algorithm	230
11.6. Evaluation Results	231
11.7. Conclusion	235
References	235
12. Mechanism-based Clustering of Genome-wide RNA Levels: Roles of Transcription and Transcript-Degradation Rates	237
<i>S. Ji, W. A. Chaovalitwongse, N. Fefferman, W. Yoo and J. E. Perez-Ortin</i>	
12.1. Introduction	238
12.2. Materials and Data Acquisition	240
12.3. Statistical Analysis	242
12.4. Experimental Results	247
12.5. Conclusion and Discussion	251
References	253

13. The Complexity of Feature Selection for Consistent Biclustering 257
O. E. Kundakcioglu and P. M. Pardalos
13.1. Introduction 257
13.2. Consistent Biclustering 259
13.3. Complexity Results 263
13.4. Closing Remarks 265
References 265

14. Clustering Electroencephalogram Recordings to Study Mesial Temporal Lobe Epilepsy 267
C.-C. Liu, W. Suharitdamrong, W. A. Chaovalitwongse, G. A. Ghacibeh and P. M. Pardalos
14.1. Introduction 268
14.2. Epilepsy as a Dynamical Brain Disorder 269
14.3. Data Information 270
14.4. Graph-Theoretic Modeling for Brain Connectivity 270
14.5. Results 276
14.6. Conclusion and Discussion 278
References 278

15. Relating Subjective and Objective Pharmacovigilance Association Measures 281
R. K. Pearson
15.1. Introduction 281
15.2. Aggregate Associations 282
15.3. Subjective Associations 286
15.4. Case-Specific Associations 287
15.5. Relations between Measures 288
15.6. Clustering Drugs 290
15.7. Interpreting the Clusters 298
15.8. Summary 302
References 305

16. A Novel Clustering Approach: Global Optimum Search with Enhanced Positioning 307
M. P. Tan and C. A. Floudas
16.1. Introduction 308
16.2. Methods 310
16.3. Results and Discussion 320
16.4. Conclusion 327
16.5. Computational Resources 327
References 328

Index 333