# Contents



Forward xiii

Preface xv

#### Acknowledgments xix

Introduction 1 Big Data Timeline 5 Why This Topic Is Relevant Now 8 Is Big Data a Fad? 9 Where Using Big Data Makes a Big Difference 12

### Part One The Computing Environment ......23

Chapter 1 Hardware 27 Storage (Disk) 27 Central Processing Unit 29 Memory 31 Network 33

Chapter 2 Distributed Systems 35 Database Computing 36 File System Computing 37 Considerations 39

Chapter 3 Analytical Tools 43 Weka 43 Java and JVM Languages 44 R 47 Python 49 SAS 50

Part Two Turning Data into Business Value53
Chapter 4 Predictive Modeling 55 A Methodology for Building Models 58 sEMMA 61
Binary Classification 64 Multilevel Classification 66
Interval Prediction 66
Assessment of Predictive Models 67
Chapter 5 Common Predictive Modeling Techniques 71 RFM 72
Regression 75 Generalized Linear Models 84
Neural Networks 90 Decision and Regression Trees 101
Support Vector Machines 107 Bayesian Methods Network Classification 113
Ensemble Methods 124
Chapter 6 Segmentation 127
Cluster Analysis 132 Distance Measures (Metrics) 133
Evaluating Clustering 134
Number of Clusters 135
K-means Algorithm 137 Hierarchical Clustering 138
Profiling Clusters 138
Chapter 7 Incremental Response Modeling 141
Building the Response Model 142 Measuring the Incremental Response 143
inducting the incremental response 145
Chapter 8 Time Series Data Mining 149
Reducing Dimensionality 150 Detecting Patterns 151
Time Series Data Mining in Action: Nike+ FuelBand 154

Chapter 9 Recommendation Systems 163 What Are Recommendation Systems? 163 Where Are They Used? 164

#### CONTENTS 📢 Xİ

How Do They Work? 165 Assessing Recommendation Quality 170 Recommendations in Action: SAS Library 171

Chapter 10 Text Analytics 175 Information Retrieval 176 Content Categorization 177 Text Mining 178 Text Analytics in Action: Let's Play Jeopardy! 180

## Part Three Success Stories of Putting It All Together ...... 193 Chapter 11 Case Study of a Large U.S.-Based Financial Services Company 197 Traditional Marketing Campaign Process 198 High-Performance Marketing Solution 202 Value Proposition for Change 203 Chapter 12 Case Study of a Major Health Care Provider 205 CAHPS 207 HEDIS 207 HOS 208 IRE 208 Chapter 13 Case Study of a Technology Manufacturer 215 Finding Defective Devices 215 How They Reduced Cost 216 Chapter 14 Case Study of Online Brand Management 221 Chapter 15 Case Study of Mobile Application Recommendations 225 Chapter 16 Case Study of a High-Tech Product Manufacturer 229 Handling the Missing Data 230 Application beyond Manufacturing 231 Chapter 17 Looking to the Future 233 Reproducible Research 234 Privacy with Public Data Sets 234 The Internet of Things 236

Software Development in the Future237Future Development of Algorithms238In Conclusion241

About the Author 243

Appendix 245

**References 247** 

index 253