# Analytics in a Big Data World

The Essential Guide to Data Science and Its Applications

**Bart Baesens** 



### **Contents**

#### Preface xiii

#### Acknowledgments xv

#### Chapter 1 Big Data and Analytics 1

Example Applications 2

Basic Nomenclature 4

Analytics Process Model 4

Job Profiles Involved 6

Analytics 7

Analytical Model Requirements 9

Notes 10

## Chapter 2 Data Collection, Sampling, and Preprocessing 13

Types of Data Sources 13

Sampling 15

Types of Data Elements 17

Visual Data Exploration and Exploratory
Statistical Analysis 17

Missing Values 19

Outlier Detection and Treatment 20

Standardizing Data 24

Categorization 24

Weights of Evidence Coding 28

Variable Selection 29

Segmentation 32

Notes 33

#### Chapter 3 Predictive Analytics 35

Target Definition 35

Linear Regression 38

Logistic Regression 39

Decision Trees 42

Neural Networks 48

Support Vector Machines 58

Ensemble Methods 64

Multiclass Classification Techniques 67

Evaluating Predictive Models 71

Notes 84

#### **Chapter 4 Descriptive Analytics 87**

Association Rules 87

Sequence Rules 94

Segmentation 95

Notes 104

#### Chapter 5 Survival Analysis 105

Survival Analysis Measurements 106

Kaplan Meier Analysis 109

Parametric Survival Analysis 111

Proportional Hazards Regression 114

Extensions of Survival Analysis Models 116

Evaluating Survival Analysis Models 117

Notes 117

#### Chapter 6 Social Network Analytics 119

Social Network Definitions 119

Social Network Metrics 121

Social Network Learning 123

Relational Neighbor Classifier 124

Probabilistic Relational Neighbor Classifier 125

Relational Logistic Regression 126

Collective Inferencing 128

Egonets 129

Bigraphs 130

Notes 132

#### Chapter 7 Analytics: Putting It All to Work 133

Backtesting Analytical Models 134

Benchmarking 146

Data Quality 149

Software 153

Privacy 155

Model Design and Documentation 158

Corporate Governance 159

Notes 159

#### **Chapter 8 Example Applications 161**

Credit Risk Modeling 161

Fraud Detection 165

Net Lift Response Modeling 168

Churn Prediction 172

Recommender Systems 176

Web Analytics 185

Social Media Analytics 195

Business Process Analytics 204

Notes 220

#### About the Author 223

#### Index 225