

Contents

| | |
|--|-------------|
| Foreword | xi |
| Preface to the Second Edition | xiii |
| Preface to the First Edition | xv |
| List of Case Studies | xix |
| 1 Fuzzy Sets | 1 |
| 1.1 Classical Sets: Relations and Functions | 1 |
| 1.2 Definition of Fuzzy Sets | 9 |
| 1.3 Basic Operations on Fuzzy Sets | 15 |
| 1.4 Fuzzy Numbers | 19 |
| 1.5 Triangular Fuzzy Numbers | 22 |
| 1.6 Trapezoidal Fuzzy Numbers | 24 |
| 1.7 Fuzzy Relations | 26 |
| 1.8 Basic Operations on Fuzzy Relations | 29 |
| 1.9 Notes | 32 |
| 2 Fuzzy Logic | 37 |
| 2.1 Basic Concepts of Classical Logic | 37 |
| 2.2 Many-Valued Logic | 41 |
| 2.3 What is Fuzzy Logic? | 43 |
| 2.4 Linguistic Variables | 44 |
| 2.5 Linguistic Modifiers | 46 |
| 2.6 Composition Rules for Fuzzy Propositions | 50 |
| 2.7 Semantic Entailment | 54 |
| 2.8 Notes | 56 |

| | | |
|----------|--|------------|
| 3 | Fuzzy Averaging for Forecasting | 61 |
| 3.1 | Statistical Average | 61 |
| 3.2 | Arithmetic Operations with Triangular and Trapezoidal Numbers | 62 |
| 3.3 | Fuzzy Averaging | 66 |
| 3.4 | Fuzzy Delphi Method for Forecasting | 71 |
| 3.5 | Weighted Fuzzy Delphi Method | 76 |
| 3.6 | Fuzzy PERT for Project Management | 77 |
| 3.7 | Forecasting Demand | 87 |
| 3.8 | Notes | 89 |
| 4 | Decision Making in a Fuzzy Environment | 91 |
| 4.1 | Decision Making by Intersection of Fuzzy Goals and Constraints | 92 |
| 4.2 | Various Applications | 95 |
| 4.3 | Pricing Models for New Products | 104 |
| 4.4 | Fuzzy Averaging for Decision Making | 110 |
| 4.5 | Multi-Expert Decision Making | 115 |
| 4.6 | Fuzzy Zero-Based Budgeting | 119 |
| 4.7 | Notes | 125 |
| 5 | Fuzzy Logic Control for Business, Finance, and Management | 127 |
| 5.1 | Introduction | 127 |
| 5.2 | Modeling the Control Variables | 129 |
| 5.3 | If ... and ... Then Rules | 133 |
| 5.4 | Rule Evaluation | 136 |
| 5.5 | Aggregation (Conflict Resolution) | 138 |
| 5.6 | Defuzzification | 144 |
| 5.7 | Use of Singletons to Model Outputs | 149 |
| 5.8 | Tuning of Fuzzy Logic Control Models | 150 |
| 5.9 | One-Input–One-Output Control Model | 152 |
| 5.10 | Notes | 155 |
| 6 | Applications of Fuzzy Logic Control | 157 |
| 6.1 | Investment Advisory Models | 157 |
| 6.2 | Fuzzy Logic Control for Pest Management | 164 |

| | | |
|----------|---|------------|
| 6.3 | Inventory Control Models | 170 |
| 6.4 | Problem Analysis | 177 |
| 6.5 | Potential Problem Analysis | 182 |
| 6.6 | Notes | 185 |
| 7 | Fuzzy Queries from Databases: Applications | 187 |
| 7.1 | Standard Relational Databases | 187 |
| 7.2 | Fuzzy Queries | 190 |
| 7.3 | Fuzzy Complex Queries | 196 |
| 7.4 | Fuzzy Queries for Small Manufacturing Companies | 199 |
| 7.5 | Fuzzy Queries for Stocks and Funds Databases | 206 |
| 7.6 | Notes | 215 |
| | References | 217 |
| | Index | 223 |