Preface

The complete work of this book is divided into five sections. In the first section titled “Consumer Analytics: Fuzzy Applications” which includes all the chapters related to consumer analytics with fuzzy applications. In the second section titled “Computational Intelligence: Business Analytics” contains all the chapters related to computational intelligent techniques and their applications in business analytics. In the third section titled “Consumer Analytics: Multi-Criteria (MCDM) Applications and Sentiment Analysis” contains all the chapters related to applications of multi-criteria decision making and sentiment analysis for consumer analytics. All chapters related to applications of marketing analytics in digital marketplace are in the fourth section titled “Marketing Analytics: Digital Market Place”. In the last section includes some authors’ chapters whose applied advanced modelling application in business analytics and titled “Advanced Modelling Applications: Business Analytics”. The brief description of each section as follows:

Consumer analytics using fuzzy applications, to facilitate this objective of the book, in Chapter 1, Mohammad Hasan Aghdaie and Parham Fami Tafreshi explain that nowadays, marketing becomes overly customer-oriented as customers are playing more and more critical role in strategic decisions of all companies. Furthermore, with the fast changing environment and fierce market competition, every organization needs to create a strong relationship with its own customers. As the customers are not equal and there are not unlimited resources to satisfy them, customer lifetime value (CLV) becomes a debatable topic for a host of companies. They propose a new RFM based model to CLV analysis, using fuzzy group step-wise weight assessment ratio analysis (FGSWARA) as a fuzzy group multiple attribute decision making (FGMADM), and fuzzy c-means clustering, as a data mining (DM) tool, to evaluate and segment customers. A case study in one of the most famous fast moving consumer goods (FMCG) companies in Iran is illustrated to show the applicability of the model.

To contribute the same section objective, in Chapter 2, Başar Öztayşi, Ugur Gokdere, Esra Nur Simsek, and Ceren Salkin Oner discuss customer segmentation and say that the traditional sources of data used for segmentation are demographics, the monetary value of transactions, types of product/service selected. Today, data gathered by location-based services can also be used for customer segmentation. In this chapter with the help of a real-world case study, they summarized that customers’ location data can provide a new perspective to customer segmentation.

In Chapter 3, Mashhour Baeshen, Malcolm J. Beynon, and Kate L. Daunt explain the importance of fuzzy clustering in mobile phone industry related to their service quality. They present a study of the development of the clustering methodology to data analysis, with particular attention to the analysis of a crisp environment to a fuzzy environment. An applied problem concerning service quality (using SERVQUAL) of mobile phone users, and subsequent loyalty and satisfaction forms the data set to dem-
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onstrate the clustering issue. Following details on both the crisp k-means and fuzzy c-means clustering
techniques, comparable results from their analysis are shown, on a subset of data, to enable both graphical
and statistical elucidation. Fuzzy c-means is then employed on the full SERVQUAL dimensions, and
the established results interpreted before tested on external variables, namely the level of loyalty and
satisfaction across the different clusters established.

In Chapter 4, Gaurav Kabra and A Ramesh, analyze of the interactions among the enablers of in-
formation communication technology in humanitarian supply chain management using fuzzy based
relationship modelling approach. They say that the rise in the occurrence of disasters has hampered
the development of many countries. Practitioners and academicians are making continuous demands
to enhance the utilization of information communication technologies (ICTs) in humanitarian supply
chain management (HSCM) in order to continue or enhance the pace of economic growth and develop-
ment of countries, as well as to reduce the impact of disaster on society. Identifying and analysing key
decision variables improving the utilization of ICT in HSCM is essential in trying to improve overall
performance. Therefore, to assist the organizations involved in HSCM, their study explores eleven en-
ablers to enhancing the utilization of ICTs, with a focus on the mutual relationship among them using an
integrated interpretive structural modeling (ISM) and fuzzy cross-impact matrix multiplication applied
to classification (F-MICMAC) analysis. This study seeks to advance the understanding on enablers of
ICTs in HSCM and to classify them, on the basis of driving and dependence power.

Section 2 contains all the chapters related to applications of computational intelligent in business ana-
lytics and entitled “Computational Intelligent: Business Analytics”. To follow this, in Chapter 5, Chandan
Gautam and Vadlamani Ravi examine auto associative extreme learning machine based hybrids for data
imputation. They presents three novel hybrid techniques for data imputation viz., (1) Auto-associative
Extreme Learning Machine (AAELM) with Principal Component Analysis (PCA) (PCA-AAELM),
(2) Gray system theory (GST) + AAELM with PCA (Gray+PCA-AAELM), (3) AAELM with Evolv-
ing Clustering Method (ECM) (ECM-AAELM). Our prime concern is to remove the randomness in
AAELM caused by the random weights with the help of ECM and PCA. This chapter also proposes local
learning by invoking ECM as a pre-processor for AAELM. The proposed methods are tested on several
regression, classification and bank datasets using 10 fold cross validation. The results, in terms of Mean
Absolute Percentage Error (MAPE,) are compared with that of K-Means+Multilayer perceptron (MLP)
imputation, K-Medoids+MLP, K-Means+GRNN, K-Medoids+GRNN, PSO-Covariance imputation,
and ECM-Imputation. It is concluded that the proposed methods achieved better imputation in most of
the datasets as evidenced by the Wilcoxon signed rank test.

To follow the same objective, in Chapter 6, Tapan Kumar Das says that most of the marketing problems
are complex and unstructured due to the business dynamics and considerable uncertainty involved in the
operating environments. Hence, decision making in marketing involves evaluation of several parameters
and thus multi-criteria decision makings are a good choice in most of the decision-making tasks like
supplier selection; market-places selection; target marketing etc... In his chapter, he begins with a brief
introduction of the theory of rough set which is an intelligent technique for handling uncertainty aspect
in the data. However, the notions of fuzzy rough set and intuitionistic fuzzy rough (IFR) sets are defined,
and its properties are studied. Thereafter rough set on two universal sets has been studied. In addition,
intuitionistic fuzzy rough set on two universal sets has been extensively studied. Furthermore, this chapter
shows that intuitionistic fuzzy rough set can be successfully practiced in decision-making problems.
Contribute to the same section objective, in Chapter 7, Gangishetti Pradeep and Vadlamani Ravi use evolutionary computation for fuzzy multi-objective association rule mining using and model association rule mining as a Fuzzy multi-objective global optimization problem by considering several measures of strength such as support, confidence, coverage, comprehensibility, leverage, interestingness, lift and conviction by utilizing various fuzzy aggregator operators. In this model, each measure has its own level of significance. Three fuzzy multi-objective association rule mining techniques viz., Fuzzy Multi-objective Binary Particle Swarm Optimization based association rule miner (FMO-BPSO), a hybridized Fuzzy Multi-objective Binary Firefly Optimization and Threshold Accepting based association rule miner (FMO-BFFOTA), hybridized Fuzzy Multi-objective Binary Particle Swarm Optimization and Threshold Accepting based association rule miner (FMO-BPSOTA) have been proposed. These three algorithms have been tested on various datasets such as book, food, bank, grocery, click stream and bakery datasets along with three fuzzy aggregate operators. From these experiments, we can conclude that Fuzzy-And outperforms all the other operators.

In Chapter 8, Kedar Pandurang Joshi and Nikhil Lohiya discuss about improved seating plans for movie theatre to improve revenue and used an integrated best worst method with EMSR-B. They say that Bollywood is not only one of the biggest film producers in India but also one of the largest centers of film production in the world. Seat occupancy rate and pricing of each seat are important parameters that determines the revenue of a cinema business. The objective of the chapter is to enable theater managers to determine the prices at the time of booking according to the occupancy rate so that the revenue is improved based on preferred demand for the respective seats. A multi criteria analysis is applied with seat occupancy rate as dependent variable and other factors as independent variables like Show time, Poster Size, Day of week and Timing of Release. Further, a predictive analysis can be carried out to determine the occupancy rate for the upcoming movies. Based on the occupancy rate, the managers at theatre can adopt variable pricing concept to improve the revenue. This work shows an integrated method to develop a seating plan based on occupancy rate to improve the revenue using EMSR-b heuristic with an illustrated example for a theatre.

Section 3 entitled “Consumer Analytics: Multi-Criteria (MCDM) Applications and Sentiment Analysis” contains all the chapters related to applications of multi-criteria decision making and sentiment analysis for consumer analytics. To support this in Chapter 9, Tadeusz Trzaskalik, Piotr Namieciński, Andrzej Bajdak, and Slawomir Jarek contribute to section objective about applications of the stochastic multi-criteria acceptability analysis method for consumer preference study. They explain that introducing a new product to the market is a complex, costly and time-consuming process which requires research on consumer preferences. On the basis of information on the characteristics of the new product and its competitors, as well as on the competitors and their market shares, the company has to estimate future market shares and to determine the profile of potential consumers inclined to purchase the new product. The purpose of their study is to present a method of consumer preference research when introducing a new product, using a multiple criteria method called Stochastic Multi-criteria Acceptability Analysis (SMMA). To apply this method, no information requiring tedious research is needed. SMMA allows to obtain essential information on the potential market power of the new product already at an early stage of its preparation. Furthermore, the flexibility of the SMMA method allows to easily expand the scope of the analysis by including additional information and various techniques of the modeling of the consumer selection process.
Contribute to the same section objective, in Chapter 10, Rohit Vishal Kumar discuss about modeling consumer opinion using ridit and grey relational analysis. They explain that in order to understand consumers, researchers are forced to gather primary data on Likert scale. Such data is usually considered as ordinal or at best interval scaled data. One key requirement in research is to identify components which have high individual contribution to understanding the research problem. Hence the concept of ranking of the components comes under consideration. Most of the ranking techniques are based on simplistic mean ranks or overtly complicated methods. In this chapter the authors highlight two techniques - Grey Relational Analysis (GRA) and RIDIT - for the purpose. In this chapter the authors explain the techniques of the two methods and then try to show the simplicity and efficiency of GRA and RIDIT algorithms in analyzing a commonly available dataset. The outcome of the GRA and RIDIT analysis is also compared with the commonly used techniques and the authors would examine if GRA and RIDIT does a better job at ranking data than the commonly used techniques.

Chapter 11 and 12, contribute to sentiment analysis part of the section, in Chapter 11, Nicola Capolupo, Gianpaolo Basile, and Giancarlo Scozzese examine that sentiment analysis as a tool to understand the cultural relationship between consumer and brand and said that One of the most relevant issues that companies, offices and marketing experts, sociologists and scholars must address studying a new brand or product launch is without any doubt the impact - in terms of feedback - on the consumer sentiment. The study of users opinion on a specific product or brand has changed with the advent of Web 2.0, which has overcome the old surveys model leading consumers in a too complex and not genuine area, reaching more sophisticated research or even better tracking their opinions directly “on the field”, i.e. in the community where this exchange of views and information happens naturally and not artificially. The analysis of consumers’ opinion on social media provides enormous opportunities for the public and the private spheres. Concerning the last on the reputation of a certain product/brand or firm is strongly influenced by the voices and negative opinions published and shared by users on social networks. Indeed, companies need to adapt their behaviour monitoring public opinion.

In Chapter 12, Vinay Kumar Jain and Shishir Kumar contribute about improving customer experience using sentiment analysis in e-commerce and said that in today’s world, millions of online users post their opinions on product features, services, quality, benefits and other values of the products. These opinions or sentiment data generated via different communication mediums often include vital data points that can be fruitful for businesses in understanding customer experiences, products quality and services. The E-commerce companies considered social media platform for new product launch, promotion of products and features or establishing a successful business to customer relationship which produces great results. Analytics on this Social media data helps in identifying the customers in the right demographic, psychographic and lifestyle group. This chapter identifying important characteristics of customer reviews which help businesses houses to improve their marketing strategies.

Section 4 contains all chapters related to application of marketing analytics techniques in digital platform entitled “Marketing Analytics: Digital Market Place”. The first chapter includes in section is “adoption of online marketing for service SMEs with multi-criteria decision-making approach” and position as Chapter 13. In this chapter, Lanndon Ocampo, Rosalin Merry Berdin Alarde, Dennis Anthony Kilongkilong, and Antonio Esmero attempts to fill in the gap of evaluating the viability of adopting online marketing for small and medium enterprises (SMEs) in service industries. As SMEs are generally characterized by shortage of resources, the use of online marketing strategies is apparently difficult. However, the current landscape of competition among SMEs in a global market economy prompts the
necessity of adopting online marketing. With these, the decision-making process of SMEs in this area becomes complex and the decisions must integrate complex and interrelating criteria and constructs in order to provide a more holistic solution. Thus, this work adopts a multi-criteria decision-making (MCDM) method particularly the analytic network process (ANP) in order to evaluate the practicability of using online marketing for service SMEs. It becomes highly relevant as it provides significant insights to decision-makers in SMEs regarding the use of online marketing strategy. The contribution of this chapter lies in the application of MCDM in evaluating viability of online marketing in service SMEs.

In Chapter 14, Zehra Kamisli Ozturk and Mehmet Alegoz explain concept of E-retailing from past to future definitions, analysis, problems and perspectives. Firstly, they provide some definitions and the advantages and disadvantages of e-retailing are given and the related literature about e-retailing is briefly explained in order to give a background to unfamiliar readers. Then, the qualitative and quantitative criteria which affect the e-retailer selection are determined and some e-retailers are evaluated by using a multi-phase, integrated Multi Criteria Decision Making (MCDM) approach. In first phase of proposed MCDM approach the weight of each criterion is determined. In second phase, a pre-evaluation is made and some of the e-retailers are eliminated. In last phase, the remaining retailers are evaluated and the best one is determined. Finally, the study is concluded by discussions, inferences and recommendations for future work.

To contribute the same section objective, in Chapter 15, Ali Karasan, İsmail Sevim, and Melih ÇINAR discuss about fuzzy time series-an application in e-commerce and firstly they do comparison between conventional Time Series Models and Fuzzy Time Series Models by an application in an e-commerce company. Future sales of furniture will be predicted. The performance of different models and forecasting periods are going to be analyzed to discuss advantages and disadvantages of each method. MAE is chosen as performance indicators of each model and forecasting period combination. As a conclusion to this chapter, generic strategies for prediction in an e-commerce company will be formulated in consideration of these indicators.

In Chapter 16, Geetika Jain and Sapna Rakesh contribute about understand the frequency of application usage by smartphone users - Door is open, but closes quickly. The authors say that smartphone users download the apps after the enormous popularity in this mobile world and then eventually delete those apps. There are various factors like frequency, relevance and space it consumes in the phone, which decide a user’s preference for an app. All the app provider companies are trying hard to fit into right place, so that they can increase the engagement with the users. Companies are upgrading their technology to make an app convenient and relevant based on user’s requirement. This study is trying to understand the frequency of application usage and the importance of various factors like time to complete transaction, relevance, space it consumes, features, User Index, and ease of use for a user which leads to purchase intention. The study has found that UX/UI is the most important factor followed by other factors. The output of the study has the practical implication for online retailer.

Section 5 includes some authors’ chapters those applied Advance modeling applications in business analytics and entitled “Advanced Modelling Applications: Business Analytics” In Chapter 17, António Carrizo Moreira, Monica Gouveia, and Pedro Macedo discuss about Car Safety: A Statistical Analysis for Marketing Management. They said that Car safety is an essential feature of marketing strategies for automobile companies. In this work, a statistical analysis on crash tests is conducted based on data available from European New Car Assessment Programme (Euro NCAP). The Euro NCAP carries safety tests to automobiles in order to support those who want to buy a car and encourage manufacturers to
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Invest in safety and equipment that reduce the likelihood of driver error, so that damage caused by a road accident can be avoided—or at least reduced. The research work developed in this chapter presents a statistical analysis of the information produced by Euro NCAP, using the SPSS and MATLAB software, and seeks to answer the following research questions: 1) are there statistically significant differences on adult occupant safety in the six years under study? 2) are there statistically significant differences among the best-selling car classes regarding safety in frontal collisions? 3) are electric and hybrid automobiles less secure than their traditional counterparts with respect to frontal collisions?. It is worth to mention that due to the increasing number of hybrid and electric vehicles on the roads and its expected growth in the next years, given the economic and environmental aspects of its use, the study on the safety of these vehicles is an important tool for marketers. In order to answer to these questions data were collected resulting from safety tests for the years 2010, 2011, 2012, 2013, 2014, and 2015 from the Euro NCAP site (www.euroncap.com). The sample consists of 236 vehicles from several brands, types of fuel and classes such as small family cars, small MPVs, small off-road 4x4, and hybrid and electric vehicles, among others. For each question, beyond the methodological details—such as, descriptive statistics, t-tests, analysis of variance, normality tests, among others—, a thorough discussion of the results is carried out.

In Chapter 18, Saroj Kant Jena, Anil Kumar, and Maheshwar Dwivedy talk about banking credit scoring assessment using predictive k-nearest neighbour (PKNN) classifier and said that Credit scoring models is a scientific methodology adopted by credit providers to assess the credit worthiness of applicants. The primary objective of such models has been to predict the potentiality of the loan applicant. A proper evaluation of the credit can help the service provider to determine whether to grant or to reject credit. Therefore, the objective of the study is to predict banking credit scoring assessment using Predictive K-Nearest Neighbour (PKNN) classifier. For the purpose of analysis two different credit approval datasets: Australian credit and German credit have been used. The results from the study show that the proposed model used for classification works better on credit dataset. Here, the study firstly attempted to find the optimal ‘K’ value of the neighbourhood so that the classifier is tuned to forecast the credit worthiness and secondly, validated our proposed model on two credit approval datasets by checking the performance of the proposed models on the basis of classification accuracy.

In Chapter 19, Carlos N. Bouza-Herrera, Sira M. Allende Alonso, Daniel C. Chen, Agustin Santiago-Moreno, and Jose M. Sutto-Vallejo contribute about prediction of the quality of fresh water in a basin. Derivatives play an important role in social and economic studies. They describe the behavior of conditional expectations. Once a phenomena is characterized by parametric specifications, the conditional expectation may be modeled by a regression function. Then, derivatives may be computed by fitting the regression function. In applications, parametric estimators are commonly used, because of the unknowledge of other more effective methods. The validity of a regression fitting approach depends on the knowledge of certain aspects related with the true functional form. In this paper, we develop a study on the usage of soft computing methods for providing an alternative to the use of non-parametric regression. We develop our modeling including neural networks and rough sets approaches. The studied problem is the eutrophication due to the growth of the population of algae. Real life data is provided by a study on a fresh water basin. They are used for developing a comparison of different approaches. A methodology is recommended for implementing a monitoring system of the water quality.
Chapter 20 is all about operating commodities market by automated traders, in this chapter, Fodil Laib, Mohammed Said Radjef, build a mathematical framework for a futures market with many producers and consumers represented by automated traders in the market platform. Then we suggest an automatic trading strategy for the automatons. This strategy takes into account the forecasts of supply and demand streams as well as the evolution of nominal price. Later, we recall a set of analytical criteria used to measure the performance of a trading strategy. Next, we illustrate our approach by showing a price pattern generated by the automatic strategy and calculate its performances. Finally, we exhibit a heuristic based on simulation allowing to compute a quasi-optimal parameters matrix for this automatic trading system.