STATISTICAL TECHNIQUES IN RESEARCH AND DEVELOPMENT

Dr. Bilal Ahmad

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Prof. (Dr.) Bilal Ahmad Bhat, hails from Rainawari Srinagar Kashmir, J&K is presently working as Professor (Statistics) and Head, Division of Social Sciences, Faculty of Fisheries, Rangil Ganderbal, SKUAST-Kashmir J&K. Dr. Bilal Ahmad was earlier working in Mathematics & Statistics Dept University of Kashmir and in SKUAST-Jammu as Assistant Professor (Statistics) before joining SKUAST-Kashmir. He is involved in teaching, research, extension activities, has participated and presented a number of research papers in various national/international conferences. Dr. Bilal has published more than 270 research papers in various National/International Journals of repute, published a number of book chapters and has published more than 400 popular articles. He has delivered a number of invited lectures, organized a number of national/international conferences and has good knowledge of statistical softwares like SPSS, MINITAB, SAS, R. Dr. Bilal has guided a number of research scholars for their Masters and Ph.D programme in his field of research i.e., probability theory, information theory and applied statistics. Dr. Bilal Ahmad has received many awards, delivered number of lectures at national/ international level and is a member of advisory board in some well known National and International journals of repute.

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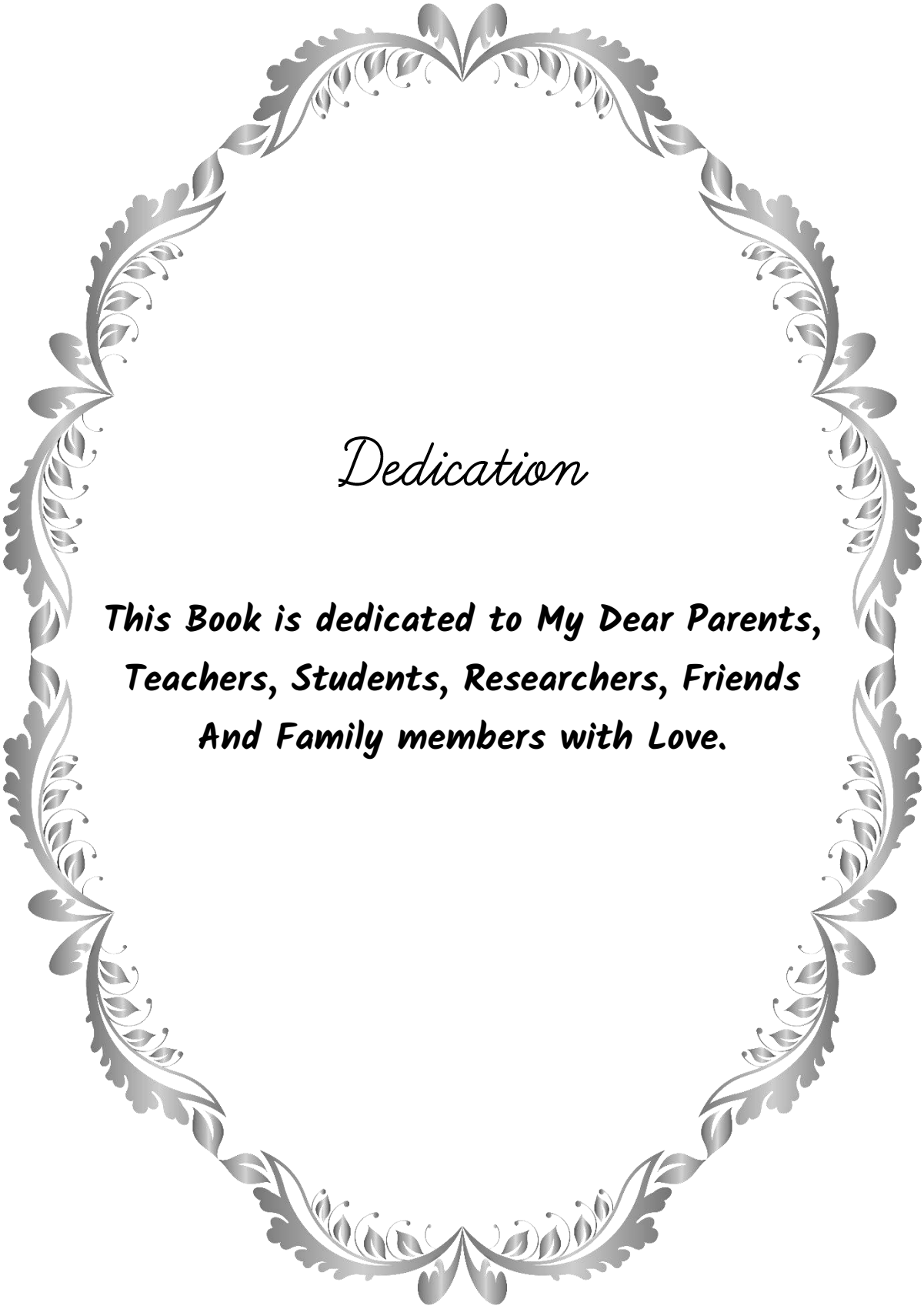
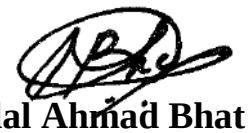


Dedication

This Book is dedicated to My Dear Parents, Teachers, Students, Researchers, Friends And Family members with Love.

About the Book

Statistics is the study and manipulation of data, including ways to gather, review, analyze, and draw conclusions from data. According to **Croxton and Cowden**, Statistics may be defined as the science of collection, presentation, analysis and interpretation of numerical data. The two major areas of statistics are descriptive and inferential statistics. The subject of Statistics has the most important role as this subject precisely is a tool which binds all fields of sciences, social sciences and humanities overtly as well as covertly and its applications empowers all field to face the challenges and provide solutions. This book is a compilation advocating usefulness of Statistics for scientists in the fields of Agricultural, Biological, Medical and Social Sciences. This book shall also be useful for researchers in all other fields as reading different papers which are presented in a quite simple language to be understandable to a beginner too, will provide inputs, motivation and innovative ideas on applications of Statistics for handling/solving their respective challenges/problems in research. Statistics is a scientific approach to analyze numerical data in order to enable us to maximise our interpretation, understanding and use. This means that statistics in real sense helps us to turn data into information. Statistical software allows researchers to avoid routine mathematical mistakes and produce accurate figures in their research if they correctly input all data. In this book statistical softwares with applications are also discussed. Renowned scientists in fields of Information Theory, Statistical Modelling, Bayesian Theory, Fisheries, Health and Medical Statistics, Biotechnology, Artificial Intelligence, Food and Nutrition, Horticulture, Pharmacology, Pharmaceuticals, Languages, Tourism and Sports have contributed significantly in this book and definitely this book is bound to guide researchers on significance of Statistics in development and growth of knowledge in their respective field besides would provide a platform from where they easily take off and reach meaningful solutions for their research challenges and contribute to well-being of the society.



Dr. Bilal Ahmad Bhat

Preface

Nowadays, statistics is playing a crucial role in developing the world. Statistics teaches people to use a limited sample to make intelligent and accurate conclusions about a greater population. The use of tables, graphs, and charts play a vital role in presenting the data being used to draw these conclusions. The role of statistics in research is to function as a tool in designing research, analysing its data and drawing conclusions there from. Infact, Statistics are everywhere we can't hide from statistics. Therefore, we need to know the importance of statistics before starting to learn statistics. To popularize the use of Statistics in everyday life, research and sensitize the public as to how Statistics helps in shaping and framing policies, we organize two day's multidisciplinary international conference on 20-21 October, 2021 with the theme "Applied Statistics in Biological, Agricultural, Social and Medical Sciences" in faculty of Fisheries, SKUAST-Kashmir. This book gathers a collection of high-quality research papers presented at the International Conference held in SKUAST-Kashmir, during 20-21 October, 2021. The book covers research papers in various fields. The book will be helpful for active researchers and practitioners in various fields. The first edition of Applied Statistics is truly a comprehensible book, emphasizing coverage on the main subjects of statistics with applications, i.e. collection/ presentation of data and descriptive/inferential statistics in analyzing the data for the benefit of our society. This book is specially written for the use of scholars from the wide range of backgrounds and also designed to equip them with hands on knowledge and experience in handling numerous statistical problems. Therefore, the statistics introduced in this textbook require basic knowledge of statistics at master's level. The layout of this book is designed in a way that it covers application of statistical techniques in various fields. It is no surprise that with the advancement of computers, statistics has found its wellspread application opportunities within the click/touch distance of the mouse or mobile devices. In the literature, we come across textbooks written on statistics and its applications. Yet there still exists challenging/increasing need in teaching/experiencing statistics and its hands-on applications with a quick and efficient way of learning and presentation. The main focus of this textbook is to educate the students in applied statistics with quick turn-around-learning time and get them started off using statistics on the solution of their own real-life problems. These goals are supported/enhanced

rather clearly and efficiently by using both traditional formulations as well as computer-aided statistical software, i.e., R and Minitab. All key applications are demonstrated on the carefully chosen example problems. This book shows the application of statistical tools for analysis. The book is intended for scholars interested in application of statistical methods in biological, agricultural, social and medical sciences. The first chapter of this entitled, A Review of the Generalized Information Measures in Information Theory by D.S. Hooda and M.S. Barak discusses Historical Development and basic concepts of Information Theory, a branch of mathematics. The second chapter entitled, Trend and Growth Analysis of Marine, Inland and Total Fish Production in India by Bilal Ahmad Bhat et al, discusses the current fishery scenario of India and used statistical models for forecasting fish production in India upto 2029-30. Chapter third entitled, Bayesian Analysis of Poisson Distribution by Using Various Priors in R by Uzma Jan, S.P. Ahmad and Bilal Ahmad Bhat discusses Bayesian analysis of Poisson distribution using different priors. Chapter 4, 7, 20 and 30 shows the application of statistical tools in data related to Fisheries field. The authors of these papers properly used statistical tools to defend their experimental findings. Chapter 5, entitled, On Fuzzy Matrix and Fuzzy Binary Relation Matrix by D.S. Hooda and Bilal Ahmad Bhat, describe fuzzy binary relation matrix and its application in a medical diagnosis model. Chapter 6, entitled, Consciousness of Youth Towards Animals During COVID-19 Pandemic: A Statistical Approach by Bilal A. Bhat, Massarat Khan et al., examines the consciousness of youth towards animals during COVID-19 pandemic in Kashmir. Chapter 8, entitled, Intrauterine Insemination as a Treatment Option for Unexplained Infertility: A Hospital Based Study by Shayesta Rahi, Iqra Riyaz and Qurat-ul-Ain is a hospital based study carried out in LD Hospital Srinagar in the couples with unexplained infertility attending OPD. The study found that IUI is an effective treatment to start with in couples with unexplained infertility as it is cost effective and easy to perform. Chapter 9, entitled, A Multi-tasking agricultural Drone for High-Density farming with an intelligent control system powered by a rechargeable Lithium-ion battery Itfaq Ahmad Mir, Anwaar Ahmad Wani and Lone Faisal discusses low-cost drone sprayers for multi-tasking purposes. Chapter 10, entitled, Nutrient Intake of Lactating Women in Kashmir by Uzma Ali and Hummara Azim, survey based study discusses the nutrient intake of lactating women in Kashmir. Chapter 11, entitled, A Study on Knowledge, Attitude and Practices of Family Planning Among Women in Kashmir During COVID-19 Pandemic by Shayesta Rahi et al., survey based study

discusses family planning, knowledge, attitude and practice among women during COVID-19 crisis in Kashmir. The authors nicely summed up the issues related family planning during COVID-19 crisis. Chapter 12, entitled, Gastrointestinal Helminthiasis of Poultry in Kashmir: An Overview by Ishrat Ara, Humira Rashid Khan and Syed Tanveer. This review paper sums up that gastrointestinal helminthiasis in poultry is predominant and is having good diversity of all helminths viz., trematodes, cestodes and nematodes in Kashmir valley leading to huge economic losses. The review provides valuable information regarding gastrointestinal helminthes and will essentially be helpful for both researchers and local veterinarians to develop strategies for both treatment and control of these parasites of poultry. Chapter 13, 16 and 17 discusses the impact of COVID-19 pandemic on food behavior by Tabasum Ara et al., impact of COVID-19 on Fisheris sector by Arizo Jan et al., and impact of COVID-19 crisis on sports activities of youth by Bilkees Nazir, Insha Nazir et al. Chapter 14, entitled, Applications of R in Data Analysis by S.P. Ahmad et al., discusses programming in R software. Chapter 15, entitled, A study on Kashmiri language and attitude among students of Kashmir towards mother tongue by Snober Shah et al., discusses Kashmiri language in historical perspective and examines attitude among students towards mother tongue. Chapter 19, entitled, India's Economic Relations With Afghanistan: With Special Reference To Trade and Investment by Mohammad Ibrahim and Samira Khan discusses in detail the economic relation between India and Afghanistan. Chapter 18, entitled, Green Technology- A Sustainable Approach Towards Aquaculture by Sayima Majeed et al., focused on the ways to mitigate or lessen the environmental impacts of aquaculture through the use of green technology as the use of green technology in aquaculture promotes sustainability. Chapter 21, entitled, Review of Adaptive Cluster Sampling by Arshid Ahmad Bhat and Dr. Manish Sharma gives in brief the review of Adaptive cluster sampling procedure. Chapter 22, entitled, Herbal Medicine and Attitude of Students Towards Forest Conservation in Kashmir valley by S.N.Z. Geelani et al., discusses forest conservation, use of herbal medicine and attitude of students towards forest conservation. Chapter 23, entitled, Kashmir With Special Emphasis On The Role of Great Sultan Zain-ul-Abidin in the Development of Arts, Crafts, Culture and Society of Kashmir discusses in detail role of Sultan Zain-ul-Abidin in different fields. We can learn through history how past societies, systems, ideologies, governments, cultures, technologies existed and how they have changed. Zain-ul-Abidin has made Kashmir the real paradise in which men of all religions and nationalities

mingled together and shared one another's joys and sorrows. The rich history of Kashmir can helps us to paint a detailed picture of where we stand today. Chapter 24, entitled, MINITAB software and its applications for data analysis by Bilal Ahmad Bhat, Parmil Kumar, T.R. Jan and Parvaiz Ahmad contains procedures for analyzing data in MINITAB using different statistical tools. Chapter 25, entitled, Role of Statistical Techniques in Sericulture and Allied Fields by Anupam Deka et al., discusses various statistical tools used in research studies. Chapter 26, entitled, Scenario of Indian silk industry with special reference to Jammu and Kashmir by Aabid Ahmad Bhat, Aabid Khaliq Tantray et al., discusses present and past silk industry in Kashmir. Chapter 27, entitled, A Study on the Role of Insects and Perception of Farmers on Significance of Insect Pollinators by Laraibah Hamid, Suhail Ahmad Mir, haziya Gull and Bilal Ahmad Bhat discusses role of insects and examines perception of farmers towards significance of insects. Chapter 28, entitled, Data analysis through MINITAB with special emphasis on Probit analysis by Snober Shah et al., explains concept of probit model and showed its application using MINITAB Software. Chapter 29, entitled, A study on Fish consumption pattern among the people of Poonch Region, Jammu, J&K by Rubia et al., examines fish consumption pattern among people of Poonch belt. Chapter 31, entitled, Climate change- A rising concern for Fisheries and Aquaculture by Uzma Nazir et al., was designed to highlight some of the most significant blowbacks of climate change and their effects on fisheries and aquaculture. Chapter 32, entitled, Present Status and significance of Wetlands of District Srinagar, Kashmir Valley by Shaikh Ghulam Rasoo1 et al., discusses in detail the current status and issues related wetlands of district Srinagar Kashmir. Chapter 33, entitled, Untapping Tourism Potential of District Kulgam by Mubashir Ahmad Aukhoon and Upasana Tyagi, explores the tourism potential of Kulgam district besides the economic benefits, employability and poverty eradication. Chapter 34, entitled, Perception of Climate change and Its impact on Food Production: A Statistical Approach by Sidrat-Ul-Muntaha Anees, Bilal Ahmad Bhat et al., discusses climate change and examines perception of climate among people and its impact on food production. Chapter 35 entitled, Coldwater resources and their potential by Farhat Zamir et al., discusses Coldwater fisheries potential and scope. Chapter 36, entitled, Factors shaping the Zooplankton fauna in Dal lake, Kashmir by Aliya Mehraj, Muni Parveen and Bilal Ahmad Bhat reported that during study carried out in four different basins of Dal lake Srinagar Kashmir, the concentration of different nutrients was high in all the study basins but was highest in Gagribal basin. Further, it was found

that that diversity of zooplankton was high in macrophyte rich sites however macrophytes cannot be considered as single most important factor for increase in the richness of zooplankton. Chapter 37, entitled, Architectural Journey of Kashmir from Ancient to Modern period by Mimoona Shah discusses the journey of architecture in Kashmir, started in the shape of monasteries during Budhhist rule till 4th century AD which continued during Hindu rule in the form of stone temples from 4th to 11th century AD. During the Muslim rule that started in 14th century stone architecture was replaced by wooden architecture. The Mughals who ruled Kashmir from 1586 until 1751 revived the stone architecture in Kashmir. Chapter 38, entitled, A Study on Health Benefits of Saffron by Keezia Khurshid et al., discusses the health benefits of saffron. Chapter 39, entitled, On Compounding of Zero-Inflated Poisson Distribution with Beta Distribution by Mohammad Kafeel Wani, Peer Bilal Ahmad and Anwar Hassan discusses a compound probability distribution by treating the zero-inflated Poisson distribution's zero-inflation parameter as a Beta-I Variate. Finally, suggested model is fitted to real-world data and results are compared to the fitting results of competing models. Chapter 40, entitled, Yield Enhancement of Mustard (*Brassica juncea*) Crop through Cluster Front Line Demonstrations (CFLDs) in Leh, Ladakh by H. L. Verma discusses the results obtained by conducting an experiment in Krishi Vigyan Kendra, Nyoma-Leh, Ladakh. The author conducted cluster frontline demonstrations on mustard to evaluate the outcome of technology interventions with the aim to increase the area, production, productivity and self-sufficiency. The study found that the adoption of improved production technologies of mustard by the farmers leads to boost the production, productivity, economically viable and feasible to local conditions as compared to the existing farmer's practice. Chapter 41, entitled, A Study on the Role of Social Media during the Covid-19 Crisis and its Persistence during Post Covid 19 Era by Ronika Yousuf, discusses role played by social media during and Post Covid 19 crisis. Chapter 42, entitled, COVID19: Bridging the Educational Digital Divide-Experiential Case Study of Union Territory of Jammu and Kashmir by Naveed Hamid, discusses role of tecnologis during COVID-19 crisis with special reference to UT, J and K. Chapter 43, entitled, A Study on Religious, Social and Economic Significance of Dargah Hazratbal in Srinagar, Kashmir by Bilal Ahmad Bhat et al., discusses in detail about Dargah Hazratbal and its significance. Chapter 44, entitled, Biodegradable Packaging: A Contribution to The Elimination of Plastic Waste in Landfills by Saima Andleeb et al., discusses in detail about Biodegradable Packaging. Chapter 45, entitled, Advances in

Biological Control of Plant Diseases by Baby Summuna et al., discusses in detail about advances in biological control of plant diseases. Chapter 46, entitled, A Study on Karnah Valley Kupwara and its Tourism Potential by Ensha Sani, Bilal Ahmad Bhat and Bilal Ahmad Bhat discusses significance of beautiful Karnah valley. Chapter 47, entitled, A Statistical Analysis on Students Attitude towards Teacher's Behavior in Kashmir Universities by Bilal Ahmad Bhat et al., discusses attitude of students towards teahers in higher educational institutes of Kashmir valley. Chapter 48, entitled, A Study on Sports in Kashmir and Behaviour of Students towards Physical Education by Bilal Ahmad Bhat et al., discusses sports in general and behaviour of students towards sports and physical education. The research papers are included in this book with the hope that the scholars working in different fields find it worthwhile in conducting their research. However, as always there is scope of improvement, the suggestions and constructive criticism of the matter to improve the quality of the book will be welcomed. We sincerely acknowledge the support of author(s) who contributed in this book. The author personally thank all faculty members of faculty of fisheries, Sher-e-Kashmir University of Agricultural Sciences & Technology – Kashmir and Jammu for their support in writing this book.

Dr. Bilal Ahmad Bhat
Editor
Professor (Statistics)

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Acknowledgement

"In the name of ALMIGHTY, the most beneficent and merciful". I would like to thank Almighty God with whose blessing I am able to see the success of my work. It gives me a great pleasure to organize the Two Day's Multidisciplinary International Conference, on "Applied Statistics in Biological, Agricultural, Social and Medical Sciences"via online on 20-21, October, 2021 with good presentations from different parts of the world. The editor thank Hon'ble Vice Chancellor, SKUAST-K, Prof. J.P.Sharma, Director Education (Professor M.N.Khan), Director Research (Professor Sarfaraz A. Wani,), Director Extension (Professor Dil Mohammad Makhdoomi), Director Planning & Monitoring (Professor Nazir A. Ganai, present Hon'ble Vice Chancellor, SKUAST-K), Registrar (Professor Gul Zaffar), Dean (Professor Massarat Khan, Faculty of Fisheries, SKUAST-K), Associate Director Research (Prof. Azmat Alam Khan), all heads of divisions of faculty of Fisheries and senior faculty members for their support and guidance. The organizer/editor thank from the core of his heart to all speakers especially Prof. D.S.Hooda, Prof. Tirupati Rao Padi, Dr. Farhat Umar, Dr. Amatul Muhee (SKUAST-K), Prof. Aquil Ahmad, Prof. Rashmi Bhardwaj, FIMA (UK), Professor Hameed Naseem Rafiabadi (CUK), Mr. Hemant Kumar Lohia (IPS), Professor Parmil Kumar and Dr. Bilal Ahmad for being keynote speaker(s)/resource persons in this conference. The organizer/editor specially thank to his colleagues of Division of Social Sciences, Dr. S.H.Baba, Dr. Nasir Husain, Dr. Rizwana Malik, Dr. Mudasir M. Kirmani, Dr. Bilal A. Zargar and Dr. H.L.Verma for making this program a big success. The editor would like to thank academicians from different institutions/faculties for their support especially to Professor Anwar Hassan (University of Kashmir), Professor M.S.Pukhta (SKUAST-K), Professor Manish Kumar (SKUAST Jammu), Professor Rahul Gupta (University of Jammu), Dr. Samira Khan (Arab), Dr. Ibraq Khurshid (CUK), Dr. Anupam Deka (Head Dept. of Statistics, Handique Girls's College, Guwahati Assam, India), Dr. Vikas Doshi (Medical College, Baroda, Anand, Gujrat, India), Dr. Tariq Rashid Jan (Kashmir University), Dr. Parvaiz Ahmad (Kashmir University), Dr. Peer Bilal A. (IUST), Dr. Mukhtar Ahmad (Kashmir University), Mr. Aadil (KU), Mr. M. Rajab Bhat, Mr. Tahir Khan, Mr M. Yunus, Mr. Arif, Mr. Hardeep Singh, Mr. Itfaq. The editor would like to thank all participants, contributors, committee members, teaching and non-teaching staff of faculty of fisheries and other institutions for their support. My parents (Mr. Gh. Qadir and Ms. Khatija), students as well as family members, Dr. Munazah Yaqoob, Dr. Najimaana Wani, Dr. S.N.Z. Geelani, Dr. Shaikh Gh. Rasool, Dr. Naveed Bhat, Dr. Syed Sabahat Ashraf, Mr, Ab. Rashid Bhat, Dr. Samira

Khan, Mr Najeeb Ur Rehman (Afghanistan), Mr. Asim Iqbal, Ms. Iqra Farooq, Ms. Arizo Jan, Ms. Asma Sultan, Ms. Bilkees Nazir, Mr. Abid, Ms. Lariabah, Ms. Ishrat Ara, Ms. Naveena Nazim, Ms. Asifa, Mr. Intizar, Mr. Altaf, Mr. M.Shafi , Mr. Rahil Rafiq, Mr. Inam, Mr. Aamil, Ms. Nusrat, Mr. Zehran, Ms. Naseema, Ms. Qamar un Nisa, Ms. Shabnum Ara, Ms. Snober Shah, Mr. Mubashir Ahmad, Ms. Uzma, Ms. Rumysa, Ms. Anisa, Ms. Nuzhat Jan, Ms. Lubna Altaf, Ms. Sabreena Bhat, Ms Ensha deserve special thanks for their continuous support and prayers. The main aim of organizing this conference was to popularize the use of Statistics in everyday life and sensitize the public as to how Statistics helps in shaping and framing policies. First, the editor would like to thank each one of the authors for their valuable contributions. Second, the editors wish to thank to every member of Bright MP Publisher Haryana, especially Mr. Manoj Singh who helped us so much in designing and publishing this book.

Dr. Bilal Ahmad Bhat

Editor

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Disclaimer

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The opinion and data presented in articles published in the book are the sole responsiblities of author(s). The issue of similarity on any part or whole of the article lies solely with author (s)

Key-Note Address

It gives me immense pleasure to extend a very warm welcome to all the scientists, scholars and other stakeholders, within and outside the country, participating in the Two Days Multidis-ciplinary International Conference on "Applied Statistics in Biological, Agricultural, Social and Medical Sciences". The theme of the Conference, Applied Statistics in Biological, Agricultural, Social and Medical Sciences, is truly relevant in the changing paradigm of shifting from theory and application. This conference under the novel theme has brought together statisticians and researchers from academia, industry and government to discuss ideas and advancements in the application of statistics to solve emerging agricultural and biological problems. This conference is unique in a way of its interdisciplinary nature which is need of today's research. To me, Statistics is the mathematical science involving the collection, analysis and interpretation of data. A number of specialties have evolved to apply statistical methods to various disciplines. I understand that Statistics forms an important part of most sciences, helping researchers test hypotheses, confirm (or reject) theories, and arrive at reliable conclusions. The data generated from experiments and studies is never straightforward-one has to take into account randomness and uncertainty, eliminate coincidences and arrive at the most accurate Findings. Statistical analysis helps reduce or eliminate errors so that researchers can confidently make conclusions that will then direct further research. During the COVID time, we often heard the term Clinical Trials, Reproduction number R. This too is one of the most important applications of statistical analysis which helped in designing the clinical trials for COVID vaccine. Biostatisticians can take on the task of performing a statistical analysis of the study, helping not only to design it but also analyse and determine the outcomes. Not only this Statistics provide answers to many queries related to day to day life. Like, Do people who go to the gym lead a healthier, happier life? How safe is the city of Srinagar? How effective is your HIV-awareness programme? Questions like these that cannot be answered without the help of statistical tools. To answer such queries one need to design a survey which require careful design and implementation. Data collected from surveys have to be carefully studied by statistical analysis experts who also use their own discretion and experience to derive the most meaningful information from a survey. Through surveys, governments can determine the effectiveness of an initiative, businesses can understand the response to a particular product, and social scientists can perform quantitative research. Another area where Statistics plays pivotal role is Epidemiological studies which help in determining the link between the cause and effect of a disease, especially in outbreaks and epidemics. Data visualization and statistical

analysis also played an important role in understanding the COVID pandemic across the globe. Statistical modelling involves building predictive models based on pattern recognition and knowledge discovery. It is used in environmental and geographical studies, predicting election outcomes, survival analysis of populations, and more. Meteorologists use statistical tools to help them predict the weather. Statistics is intimately related to and essentially dependent upon mathematics. Ever increasing role of mathematics into statistics has led to the development of a new branch of statistics called Mathematical Statistics. Thus, Statistics may be considered to be an important member of the mathematics family. Statistical education for agriculturists tries to give them a solid foundation in statistics. A wide use of statistical methods in order to allow the students to apply these techniques in many fields of agricultural science like: field crops production, vegetable crop production, horticulture, fruit growing, grape production, plant protection, livestock, veterinary medicine, agricultural mechanization, water resources, agricultural economics and other fields. Sampling Techniques and Estimation Theory are very powerful and indispensable tools for conducting any social survey, pertaining to any strata of society and then analysing the results and drawing valid inferences. The most important application of statistics in sociology is in the field of Demography for studying mortality (death rates), fertility (birth rates), marriages, population growth and so on. In this context Croxton and Cowden have rightly remarked: "Without an adequate understanding of the statistical methods, the investigators in the social sciences may be like the blind man groping in a dark room for a black cat that is not there. In brief methods of statistics are useful in an over-widening range of human activities in any field of thought in which numerical data may be had. I can accurately predict that deliberations going to be made in the conference will benefit every stakeholder. I wish organizers of the conference a great congratulations.

Professor J. P. Sharma
Vice Chancellor
SKUAST-J&K

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Forward

The New Education Policy (NEP), 2020 envisages introduction and development of Research Aptitude at an earlier level of Higher Education and aims at development of interdisciplinary and multidisciplinary fields of knowledge so that the end product can be skilled enough to contribute to social and economic development of the nation, in general and harbinger industry academia partnership, in particular, besides becoming fit to be employable/useful in the current changing global market requirements in all fields including Agriculture, Health/Medical and Life Biological) Sciences. To meet aims and objectives of NEP, 2020 the subject of Statistics has the most important role as this subject precisely is a tool which binds all fields of sciences, social sciences and humanities overtly as well as covertly and its applications empowers all fields to face the challenges and provide solutions. This book edited/authored by my dear friend Dr. Bilal Ahmad Bhat is a perfect compilation advocating usefulness of Statistics for scientists in the fields of Agricultural, Biological, Medical and Social Sciences. This compilation shall also be useful for researchers in all other fields as reading different papers which are presented in a quite simple language to be understandable to a beginner too, will provide inputs, motivation and innovative ideas on applications of Statistics for handling/solving their respective challenges/problems in research. Renowned scientists in fields of Information Theory, Statistical Modelling, Bayesian Theory, Fisheries, Health and Medical Statistics, Biotechnology, Artificial Intelligence, Food and Nutrition, Horticulture, Pharmacology, Pharmaceuticals, Languages, Tourism and Sports have contributed significantly in this output and definitely this book is bound to guide researchers on signficance of Statistics in development and growth of knowledge in their respective fields besides would provide a platform from where they easily take off and reach meaningful solutions for their research challenges and contribute to well-being of the society. Finally, I acknowledge the efforts of Dr. Bilal Ahmad Bhat for his efforts in bringing out this useful output with great admiration and congratulate him for setting up the stage for further research and development for the welfare of mankind and this civilization.

Professor Rahul Gupta
Dean, Faculty of Mathematical Sciences &
Rector, Bhaderwah Campus, University of Jammu, Jammu, J&K

Greeting Message

At the outset, many Congratulations to the Organizers for flawless conduct of Two days' multidisciplinary international conference on 20-21 October, 2021 with the theme “Applied Statistics in Biological, Agricultural, Social and Medical Sciences” in Faculty of Fisheries, SKUAST-Kashmir, J&K. The conference attracted widespread participation from researchers and scholars from different parts of the world. In the conference, about 150 Eminent Speakers participated, including presentation of research papers, (virtually) by 50 scholars, from different parts of the World, covering their respective research, in various Fields. It is expected that this book will be of immense help for active researchers and practitioners working in different fields. I specially congratulate the Editor Dr. Bilal Ahmad Bhat of the book, which is excellently written and thus will be a great gift to the user buyers. I sanguinely hope that this receives accolades and the appreciation it deserves, by Readers and Scholars, Globally.

Mr. Hemant Kumar Lohia
(IPS)
Commandant General,
VHsG, Civil Defence &
UTDRF, J&K

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