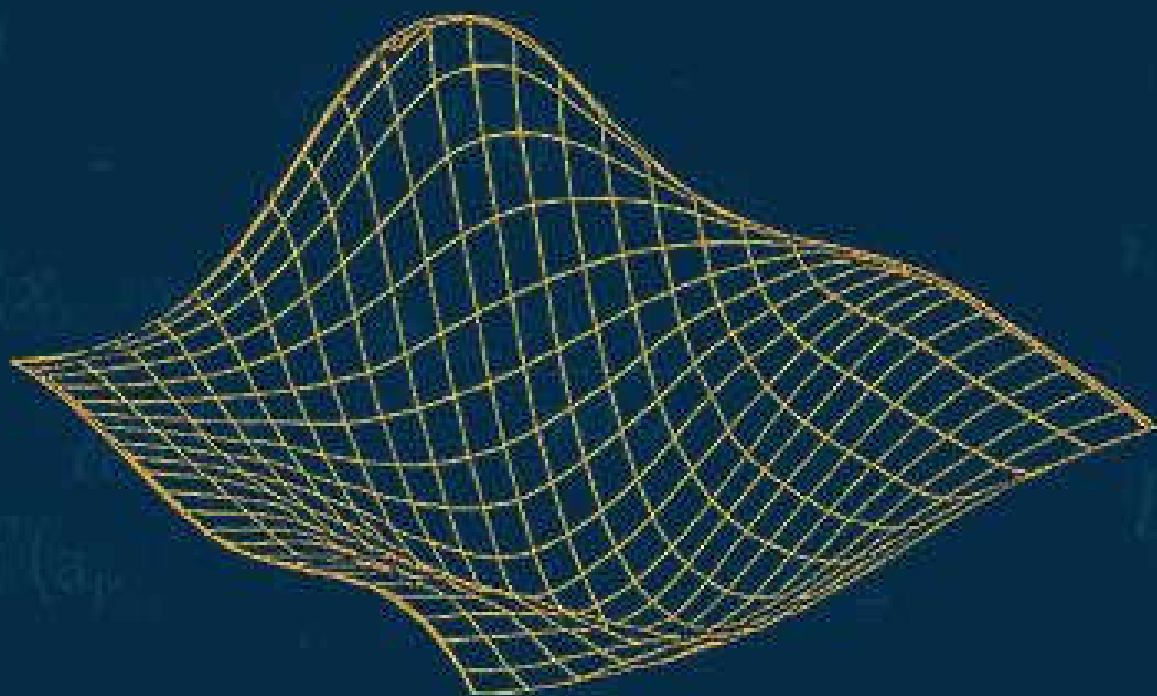


ADVANCED STUDIES IN MATHEMATICS AND STATISTICS

VOLUME-1



EDITOR

MOBIN AHMAD

ADVANCED STUDIES IN MATHEMATICS AND STATISTICS VOLUME-1

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Preface

The field of mathematics and statistics continues to evolve, bridging theoretical advancements with practical applications across diverse disciplines. *Advanced Studies in Mathematics and Statistics-I Volume – I* is a comprehensive volume that brings together cutting-edge research and foundational concepts in these fields, offering a rich resource for researchers, graduate students, and professionals seeking to deepen their understanding of advanced mathematical and statistical methodologies.

This book encompasses a broad spectrum of topics, carefully curated to reflect the dynamic interplay between pure and applied mathematics, as well as statistical theory. The chapters cover a range of subjects, from numerical methods for solving non-linear equations to the intricacies of graph theory, ring theory, and fuzzy optimization. Each chapter is designed to provide both theoretical rigor and practical insights, making the content accessible to those with a strong mathematical foundation while also serving as a reference for specialized research.

The book begins with an exploration of numerical solutions to non-linear equations, presenting classical and fast-convergent methods such as Newton's, Steffensen's, and Halley's approaches. These foundational techniques set the stage for subsequent discussions on optimization, including goal programming and fuzzy optimization models for production planning in uncertain environments. The inclusion of graph theory and fixed-point theory in metric spaces highlights the structural elegance of mathematics, while topics like ring theory, approximation theory, and hypersurfaces in metallic Riemannian manifolds delve into abstract and geometric frameworks.

Statistical methodologies are equally prominent, with a dedicated chapter on the fundamentals of statistics, complemented by advanced discussions on error analysis in interpolation methods and eigen value localization for quaternionic matrices. The book also addresses interdisciplinary applications, such as the study of magnetic field effects on rotating magneto-hydrodynamic (MHD) flows and hypergeometric transformations, which underscore the relevance of mathematics in physical and engineering contexts.

Our aim is to provide a cohesive yet diverse collection of topics that inspire further exploration and research. Each chapter is authored by experts in their respective fields, ensuring depth and clarity. Whether you are a mathematician, statistician, or practitioner in a related discipline, this book offers valuable insights into the theoretical underpinnings and practical applications of advanced mathematics and statistics.

We hope that *Advanced Studies in Mathematics and Statistics-I Volume-1* serves as a catalyst for intellectual curiosity and fosters a deeper appreciation for the beauty and utility of these disciplines. We invite readers to engage with the material, explore its applications, and contribute to the ongoing advancement of mathematical and statistical sciences.

Editor

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Fundamentals of Statistics

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Abstract

This chapter introduces the foundational concepts of statistics, focusing on data collection, classification, types of data, and essential measures of central tendency. It begins with definitions of population, sample, parameter, and statistic, and discusses methods for data collection including census and sampling techniques. A thorough classification of data into categorical and quantitative types is presented along with their subtypes. The chapter then explores scales of measurement and techniques for data organization such as frequency distributions. Emphasis is placed on measures of central tendency—mean, median, and mode—along with advanced concepts like geometric and harmonic means. Practical steps and formulas for calculating these measures in different data types (discrete, grouped, ungrouped) are also discussed. This foundation sets the stage for deeper statistical analysis and interpretation in various disciplines.

Keywords: Statistics, Population, Sample, Data Types, Frequency Distribution, Central Tendency, Arithmetic Mean, Median, Mode, Geometric Mean, Harmonic Mean, Sampling

Introduction

Statistics is the field of science that deals with collection, analysis, interpretation or explanation, and presentation of data. It is applicable to a wide variety of academic disciplines, from the natural and social sciences to the humanities, government, and business.

Population (Universe): Population means aggregate of all possible units. It need not be human population. It may be population of plants, population of insects, population of fruits, etc.