

# practical statistics for data scientists 50 essential concepts

Practical Statistics For Data Scientists 50 Essential Concepts Practical statistics for data scientists 50 essential concepts is a comprehensive guide designed to equip data scientists with the foundational and advanced statistical principles necessary for effective data analysis, modeling, and decision-making. Whether you are just starting your journey or seeking to deepen your understanding, mastering these 50 concepts will enhance your ability to interpret data accurately, build robust models, and communicate insights confidently. In this article, we will explore these essential ideas organized into key categories, providing practical explanations and examples to help you apply them in real-world scenarios.

1. Basic Descriptive Statistics Mean, Median, and Mode Mean: The average of a dataset, calculated by summing all values and dividing by the number of observations. Useful for understanding the central tendency when data are symmetric. Median: The middle value when data are ordered. It is less affected by outliers and skewed data, making it a robust measure of central tendency. Mode: The most frequently occurring value in a dataset. Useful for categorical data or identifying common values. Range, Variance, and Standard Deviation Range: Difference between the maximum and minimum values, providing a measure of data spread. Variance: The average of squared deviations from the mean, indicating how data points spread around the mean. Standard Deviation: The square root of variance, offering a measure of spread in the same units as the data.

2. Data Distribution and Probability Normal Distribution Symmetric, bell-shaped distribution where most data points cluster around the mean. Fundamental for many statistical tests and modeling assumptions.

2 Other Distributions Binomial Distribution: Used for binary outcomes (success/failure) over fixed trials. Poisson Distribution: Models count data over fixed intervals or space. Exponential Distribution: Describes time between events in a Poisson process. Probability Concepts

Conditional Probability: Probability of an event given that another event has occurred. Bayes's Theorem: A way to update probabilities based on new evidence. 3. Inferential Statistics Sampling and Sampling Distributions Understanding how samples represent populations and how sampling variability affects estimates. Hypothesis Testing Null Hypothesis ( $H_0$ ) and Alternative Hypothesis ( $H_1$ ): Formulating testable statements. p-value: Probability of observing data as extreme as the sample, assuming  $H_0$  is true. Type I and Type II Errors: False positives and negatives in testing. Confidence Intervals Range within which a population parameter is estimated to lie with a certain confidence level (e.g., 95%). 4. Correlation and Regression Correlation Coefficient Measures the strength and direction of linear relationships between two variables, typically using Pearson's  $r$ . Linear Regression Models the relationship between a dependent variable and one or more independent variables. 3 Includes concepts like slope, intercept, residuals, and R-squared. 5. Advanced Statistical Concepts ANOVA (Analysis of Variance) Tests for differences between means across multiple groups. Non-Parametric Tests Used when data do not meet assumptions of parametric tests, such as the Mann-Whitney U test or Kruskal-Wallis test. Bayesian Statistics Involves updating prior beliefs with new data to obtain posterior distributions. 6. Model Evaluation and Validation Overfitting and Underfitting Balancing model complexity to generalize well to unseen data. Cross-Validation Partitioning data into training and testing sets to evaluate model performance robustly. Metrics for Classification and Regression Classification: Accuracy, Precision, Recall, F1 Score. Regression: Mean Absolute Error (MAE), Mean Squared Error (MSE), R-squared. 7. Data Transformation and Feature Engineering Normalization and Standardization Methods to scale features for better model performance. Handling Skewed Data Transformations like log or Box-Cox to stabilize variance and make data more normally distributed. 4 8. Practical Tips for Applying Statistics Understanding Assumptions Always verify the assumptions underlying statistical tests (e.g., normality, independence). Interpreting Results Focus on effect sizes and confidence intervals rather than solely on p-values. Communicating Insights Use clear visualizations and summaries to convey statistical findings effectively. Conclusion Mastering these practical statistics for data scientists 50 essential concepts is crucial for

making informed decisions, building reliable models, and deriving meaningful insights from data. By understanding descriptive statistics, probability distributions, inferential techniques, regression analysis, and advanced methods, data scientists can elevate their analytical capabilities. Continuous learning and application of these core ideas will help you navigate complex datasets, ensure robust results, and communicate findings with confidence. Embrace these concepts as foundational tools in your data science toolkit to unlock the full potential of your data-driven projects.

**Question** What are the key concepts covered in 'Practical Statistics for Data Scientists' that are essential for data analysis? The book covers foundational topics such as descriptive statistics, probability theory, statistical inference, regression analysis, hypothesis testing, and more advanced concepts like Bayesian methods and time series analysis, all tailored for practical data science applications. How does 'Practical Statistics for Data Scientists' approach teaching statistical concepts compared to traditional textbooks? It emphasizes real-world application through practical examples, code snippets, and case studies, making complex statistical concepts accessible and directly applicable for data scientists working on actual data problems. Can this book help data scientists improve their predictive modeling skills? Yes, it covers essential statistical techniques such as regression, classification, and model validation, providing the theoretical background and practical guidance needed to build and evaluate robust predictive models.

**5** Are there any prerequisites needed to understand the concepts in 'Practical Statistics for Data Scientists'? Basic knowledge of programming (particularly in R or Python) and fundamental math skills such as algebra and basic probability are recommended, but the book also explains core concepts in a way accessible to those new to statistics. How does this book stay relevant with the rapidly evolving field of data science? The book focuses on essential statistical concepts that underpin many data science techniques, ensuring that readers gain a solid foundation adaptable to new methods and tools emerging in the field.

**Practical Statistics for Data Scientists: 50 Essential Concepts** is a comprehensive guide that serves as an invaluable resource for both aspiring and seasoned data scientists. This book distills the complex world of statistics into digestible, practical concepts that can be directly applied to real-world data analysis

challenges. In an era where data-driven decision-making is paramount, understanding these foundational principles is crucial for extracting meaningful insights, building robust models, and communicating results effectively. The book's structured approach ensures that readers not only learn theory but also understand how to implement statistical methods in their daily work, making it a must-have reference for anyone involved in data science.

--- Introduction to Practical Statistics in Data Science The importance of practical statistics in data science cannot be overstated. While theoretical knowledge provides the foundation, practical skills enable data scientists to navigate messy, real-world data, address common pitfalls, and produce reliable insights. This book emphasizes the application of 50 essential concepts, bridging the gap between theory and practice. It is particularly helpful for those who want to develop a solid statistical intuition that complements their programming and domain expertise.

--- Core Concepts Covered in the Book The 50 concepts are organized into logical sections, covering everything from exploratory data analysis to inferential statistics, and advanced modeling techniques. Below is a detailed review of key topics, highlighting their significance, practical application, and strengths.

--- Exploratory Data Analysis (EDA) 1. Descriptive Statistics Understanding the basic properties of data is fundamental. Descriptive statistics include measures like mean, median, mode, variance, and standard deviation. Features: – Summarize data quickly – Identify outliers – Detect skewness or symmetry Pros: – Easy to compute and interpret – Essential first step in data analysis Cons: – Does not infer Practical Statistics For Data Scientists 50 Essential Concepts 6 causality – Sensitive to outliers 2. Data Visualization Graphs such as histograms, boxplots, scatter plots, and heatmaps reveal underlying patterns and relationships. Features: – Visual inspection of data distribution – Spot anomalies and correlations Pros: – Intuitive understanding – Facilitates communication Cons: – Can be misleading if misused – Requires good visualization skills --- Probability and Distributions 3. Basic Probability Understanding the likelihood of events, foundational for inference. Features: – Rules like addition and multiplication – Conditional probability Pros: – Essential for modeling uncertainty – Underpins many statistical tests Cons: – Can be abstract without examples – Assumes independence sometimes incorrectly 4. Common Distributions

(Normal, Binomial, Poisson) Knowledge of distributions helps in modeling data. Features:

- Normal distribution models continuous data
- Binomial for success/failure trials
- Poisson for count data

Pros:

- Widely applicable
- Basis for many inferential procedures

Cons:

- Assumptions may not always fit real data
- Misuse can lead to incorrect conclusions

--- Inferential Statistics

### 5. Sampling and Sampling Distributions

Understanding how samples relate to populations is central in statistics. Features:

- Random sampling reduces bias
- Sampling distributions enable estimation

Pros:

- Foundation for confidence intervals
- Helps in designing experiments

Cons:

- Sampling bias can distort results
- Large samples are often needed for accuracy

### 6. Confidence Intervals

Estimate the range within which a population parameter lies with a certain confidence level. Features:

- Quantify uncertainty
- Used for parameter estimation

Pros:

- Intuitive interpretation
- Widely applicable

Cons:

- Depend on assumptions (normality, independence)
- Misinterpretation is common

### 7. Hypothesis Testing

Test assumptions about data using significance tests like t-tests, chi-square tests. Practical Statistics For Data Scientists 50 Essential Concepts

#### 7 Features:

- Null hypothesis vs alternative hypothesis
- p-values determine significance

Pros:

- Formal decision-making framework
- Widely accepted standards

Cons:

- p-hacking risks
- Does not measure effect size directly

--- Regression and Correlation

### 8. Correlation Coefficients

Measure the strength and direction of associations. Features:

- Pearson's  $r$  for linear relationships
- Spearman's  $\rho$  for rank correlations

Pros:

- Easy to compute
- Good initial indicator

Cons:

- Correlation does not imply causation
- Sensitive to outliers

### 9. Linear Regression

Model the relationship between a dependent variable and one or more independent variables. Features:

- Coefficient estimates
- Assumption of linearity, homoscedasticity

Pros:

- Interpretable
- Widely used in prediction

Cons:

- Sensitive to multicollinearity
- Assumes normality of residuals

--- Model Evaluation and Selection

### 10. Overfitting and Underfitting

Balance model complexity with performance to ensure generalization. Features:

- Overfitting captures noise
- Underfitting misses patterns

Pros:

- Critical for model robustness
- Guides regularization

Cons:

- Difficult to detect without validation
- Requires proper cross-validation

### 11. Cross-Validation

Partition data to evaluate model performance. Features:

- K-fold validation
- Helps prevent overfitting

Pros:

- Reliable

estimate of model performance – Widely applicable Cons: – Computationally intensive – Choice of K impacts results

12. Metrics (Accuracy, Precision, Recall, F1-score) Quantify classification performance. Features: – Handle class imbalance – Provide nuanced insights Pros: – Inform model improvements – Aid in selecting models Cons: – Metrics can be misleading alone – Must consider domain context --- Advanced Topics and Techniques

Practical Statistics For Data Scientists 50 Essential Concepts 8

13. Bayesian Statistics Incorporate prior knowledge with observed data. Features: – Probabilistic inference – Updating beliefs Pros: – Flexible – Handles small data well Cons: – Computationally demanding – Requires priors which can be subjective

14. Dimensionality Reduction (PCA, t-SNE) Reduce feature space for visualization or modeling. Features: – PCA captures variance – t-SNE visualizes high-dimensional data Pros: – Simplifies models – Reveals hidden structures Cons: – Can lose interpretability – Sensitive to parameters

15. Clustering Algorithms (K-Means, Hierarchical) Group similar data points. Features: – Unsupervised learning – Identifies natural groupings Pros: – Useful for segmentation – Easy to implement Cons: – Requires choosing number of clusters – Sensitive to initializations --- Features and Practical Considerations

The book's strength lies in its practical orientation. Each concept is accompanied by real-world examples, implementation tips, and common pitfalls, making it accessible for those who want to incorporate statistical thinking into their workflows. Its user-friendly explanations enable data scientists to communicate findings more effectively and make informed decisions about methodological choices. Features: – Clear, concise explanations – Real-world applications – Step-by-step guides Pros: – Suitable for self-study – Bridges theory and practice effectively Cons: – Might oversimplify complex topics for brevity – Less focus on deep mathematical proofs --- Conclusion: Is It Worth It?

Practical Statistics for Data Scientists: 50 Essential Concepts is an excellent resource for anyone looking to strengthen their statistical foundation with a focus on application. Its practical approach, supplemented with real-world examples, makes complex ideas approachable and actionable. Whether you're a beginner seeking to understand core principles or an experienced data scientist refreshing your knowledge, this book provides valuable insights that can elevate your analytical skills. It encourages a mindset of critical thinking

and continuous learning, which are essential traits in the fast-evolving field of data science. Pros: – Comprehensive coverage of essential concepts – Focus on real-world application – User-friendly and accessible Cons: – May lack depth in advanced topics – Not a substitute for more rigorous statistical theory when needed In summary, this book is a highly recommended addition to any data scientist's library. It helps demystify statistics and empowers practitioners to analyze data confidently, interpret results accurately, and Practical Statistics For Data Scientists 50 Essential Concepts 9 communicate findings effectively—skills that are indispensable in today's data-driven landscape. statistics, data science, data analysis, machine learning, probability, data visualization, hypothesis testing, regression, descriptive statistics, inferential statistics

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*Jarman Larry J. Kitchens Alan J. B. Anderson*

statistical methods are a key part of data science yet very few data scientists have any formal statistics training courses and books on basic statistics rarely cover the topic from a data science perspective this practical guide explains how to apply various statistical methods to data science tells you how to avoid their misuse and gives you advice on what is important and what is not many data science resources incorporate statistical methods but lack a deeper statistical perspective if you're familiar with the R programming language and have some exposure to statistics this quick reference bridges the gap in an accessible readable format with this book you'll learn why exploratory data analysis is a key preliminary step in data science how random sampling can reduce bias and yield a higher quality dataset even with big data how the principles of experimental design yield definitive answers to questions how to use regression to estimate outcomes and detect anomalies key classification techniques for predicting which categories a record belongs to statistical machine learning methods that learn from data unsupervised learning methods for extracting meaning from unlabeled data

a comprehensive guide to statistics with information on collecting measuring analyzing and presenting statistical data continuing the popular 101 series data is everywhere in the age of the internet and social media we're responsible for consuming evaluating and analyzing data on a daily basis from understanding the percentage probability that it will rain later today to evaluating your risk of a health problem or the fluctuations in the stock market statistics impact our lives in a variety of ways and are vital to a variety of careers and fields of practice unfortunately most statistics text books just make us want to take a snooze but with statistics 101 you'll learn the basics of statistics in a way that is both easy to understand and apply from learning the theory

of probability and different kinds of distribution concepts to identifying data patterns and graphing and presenting precise findings this essential guide can help turn statistical math from scary and complicated to easy and fun whether you are a student looking to supplement your learning a worker hoping to better understand how statistics works for your job or a lifelong learner looking to improve your grasp of the world statistics 101 has you covered

learn statistics without fear build a solid foundation in data analysis be confident that you understand what your data are telling you and that you can explain the results to others i ll help you intuitively understand statistics by using simple language and deemphasizing formulas this guide starts with an overview of statistics and why it is so important we proceed to essential statistical skills and knowledge about different types of data relationships and distributions then we move to using inferential statistics to expand human knowledge how it fits into the scientific method and how to design and critique experiments learn the fundamentals of statistics why is the field of statistics so vital in our data driven society interpret graphs and summary statistics find relationships between different types of variables understand the properties of data distributions use measures of central tendency and variability interpret correlations and percentiles use probability distributions to calculate probabilities learn about the normal distribution and the binomial distributions in depth grasp the differences between descriptive and inferential statistics use data collection methodologies properly and understand sample size considerations critique scientific experiments whether it s your own or another researcher s

this book covers basic concepts of business statistics data analysis and management science in a spreadsheet environment practical applications are emphasized throughout the book for business decision making a comprehensive database is developed with marketing financial and production data already formatted on excel worksheets this shows how real data is used and decisions are made using excel as the basic software and including such add ins as phstat2 crystal ball and treeplan this book covers a wide variety of topics related to business statistics statistical thinking in business displaying

and summarizing data random variables sampling regression analysis forecasting statistical quality control risk analysis and monte carlo simulation systems simulation modeling and analysis selection models and decision analysis optimization modeling and solving and analyzing optimization models for those employed in the fields of quality control management science operations management statistical science and those who need to interpret data to make informed business decisions

statistical methods are a key part of data science yet very few data scientists have any formal statistics training courses and books on basic statistics rarely cover the topic from a data science perspective this practical guide explains how to apply various statistical methods to data science tells you how to avoid their misuse and gives you advice on what is important and what is not many data science resources incorporate statistical methods but lack a deeper statistical perspective if you're familiar with the R programming language and have some exposure to statistics this quick reference bridges the gap in an accessible readable format with this book you'll learn why exploratory data analysis is a key preliminary step in data science how random sampling can reduce bias and yield a higher quality dataset even with big data how the principles of experimental design yield definitive answers to questions how to use regression to estimate outcomes and detect anomalies key classification techniques for predicting which categories a record belongs to statistical machine learning methods that learn from data unsupervised learning methods for extracting meaning from unlabeled data provided by publisher

this book provides an undergraduate introduction to analysing data for data science computer science and quantitative social science students it uniquely combines a hands on approach to data analysis supported by numerous real data examples and reusable R code with a rigorous treatment of probability and statistical principles where contemporary undergraduate textbooks in probability theory or statistics often miss applications and an introductory treatment of modern methods bootstrapping bayes etc and where applied data analysis books often miss a rigorous theoretical treatment this book provides an accessible but thorough introduction into data analysis using statistical

methods combining the two viewpoints the book further focuses on methods for dealing with large data sets and streaming data and hence provides a single course introduction of statistical methods for data science

taken literally the title all of statistics is an exaggeration but in spirit the title is apt as the book does cover a much broader range of topics than a typical introductory book on mathematical statistics this book is for people who want to learn probability and statistics quickly it is suitable for graduate or advanced undergraduate students in computer science mathematics statistics and related disciplines the book includes modern topics like nonparametric curve estimation bootstrapping and classification topics that are usually relegated to follow up courses the reader is presumed to know calculus and a little linear algebra no previous knowledge of probability and statistics is required statistics data mining and machine learning are all concerned with collecting and analyzing data for some time statistics research was conducted in statistics departments while data mining and machine learning research was conducted in computer science departments statisticians thought that computer scientists were reinventing the wheel computer scientists thought that statistical theory didn't apply to their problems things are changing statisticians now recognize that computer scientists are making novel contributions while computer scientists now recognize the generality of statistical theory and methodology clever data mining algorithms are more scalable than statisticians ever thought possible formal statistical theory is more pervasive than computer scientists had realized

this is the ebook of the printed book and may not include any media website access codes or print supplements that may come packaged with the bound book a pragmatic approach to statistics data analysis and decision modeling statistics data analysis decision modeling focuses on the practical understanding of its topics allowing readers to develop conceptual insight on fundamental techniques and theories evans dedication to present material in a simple and straightforward fashion is ideal for comprehension

statistics and data analysis for social science helps students to build a strong

foundational understanding of statistics by providing clarity around when and why statistics useful rather than focusing on the how to of statistics author eric j krieg simplifies the complexity of statistical calculations by introducing only what is necessary to understanding each concept every chapter is written around and applied to a different social problem or issues enabling students to broaden their imagination about the statistical tools that can be used to make sense of our world and maybe to make the world a better place

designed as a textbook for a one or two term introduction to mathematical statistics for students training to become data scientists foundations of statistics for data scientists with r and python is an in depth presentation of the topics in statistical science with which any data scientist should be familiar including probability distributions descriptive and inferential statistical methods and linear modelling the book assumes knowledge of basic calculus so the presentation can focus on why it works as well as how to do it compared to traditional mathematical statistics textbooks however the book has less emphasis on probability theory and more emphasis on using software to implement statistical methods and to conduct simulations to illustrate key concepts all statistical analyses in the book use r software with an appendix showing the same analyses with python the book also introduces modern topics that do not normally appear in mathematical statistics texts but are highly relevant for data scientists such as bayesian inference generalized linear models for non normal responses e g logistic regression and poisson loglinear models and regularized model fitting the nearly 500 exercises are grouped into data analysis and applications and methods and concepts appendices introduce r and python and contain solutions for odd numbered exercises the book s website has expanded r python and matlab appendices and all data sets from the examples and exercises alan agresti distinguished professor emeritus at the university of florida is the author of seven books including categorical data analysis wiley and statistics the art and science of learning from data pearson and has presented short courses in 35 countries his awards include an honorary doctorate from de montfort university uk and the statistician of the year from the american statistical association

chicago chapter maria kateri professor of statistics and data science at the rwth aachen university authored the monograph contingency table analysis methods and implementation using r birkh user springer and a textbook on mathematics for economists in german she has a long term experience in teaching statistics courses to students of data science mathematics statistics computer science and business administration and engineering the main goal of this textbook is to present foundational statistical methods and theory that are relevant in the field of data science the authors depart from the typical approaches taken by many conventional mathematical statistics textbooks by placing more emphasis on providing the students with intuitive and practical interpretations of those methods with the aid of r programming codes i find its particular strength to be its intuitive presentation of statistical theory and methods without getting bogged down in mathematical details that are perhaps less useful to the practitioners mintae lee boise state university the aspects of this manuscript that i find appealing 1 the use of real data 2 the use of r but with the option to use python 3 a good mix of theory and practice 4 the text is well written with good exercises 5 the coverage of topics e g bayesian methods and clustering that are not usually part of a course in statistics at the level of this book jason m graham university of scranton

for undergraduate and graduate level courses that combines introductory statistics with data analysis or decision modeling a pragmatic approach to statistics data analysis and decision modeling statistics data analysis decision modeling focuses on the practical understanding of its topics allowing readers to develop conceptual insight on fundamental techniques and theories evans dedication to present material in a simple and straightforward fashion is ideal for student comprehension the full text downloaded to your computer with ebooks you can search for key concepts words and phrases make highlights and notes as you study share your notes with friends ebooks are downloaded to your computer and accessible either offline through the bookshelf available as a free download available online and also via the ipad and android apps upon purchase you ll gain instant access to this ebook time limit the ebooks products do not have an expiry date you will continue to access your digital ebook products

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probability and statistics for data science math r data covers math stat distributions expected value estimation etc but takes the phrase data science in the title quite seriously real datasets are used extensively all data analysis is supported by r coding includes many data science applications such as pca mixture distributions random graph models hidden markov models linear and logistic regression and neural networks leads the student to think critically about the how and why of statistics and to see the big picture not theorem proof oriented but concepts and models are stated in a mathematically precise manner prerequisites are calculus some matrix algebra and some experience in programming norman matloff is a professor of computer science at the university of california davis and was formerly a statistics professor there he is on the editorial boards of the journal of statistical software and the r journal his book statistical regression and classification from linear models to machine learning was the recipient of the ziegel award for the best book reviewed in technometrics in 2017 he is a recipient of his university s distinguished teaching award

this one of a kind book offers a comprehensive almost encyclopedic presentation of statistical methods and analytic approaches used in science industry business and data mining written from the perspective of the real life practitioner consumer of these methods

get your statistics basics right before diving into the world of data scienceabout this book no need to take a degree in statistics read this book and get a strong statistics base for data science and real world programs implement statistics in data science tasks such as data cleaning mining and analysis learn all about probability statistics numerical computations and more with the help of r programswho this book is forthis book is intended for those developers who are willing to enter the field of data science and are looking for concise information of statistics with the help of insightful programs and simple explanation some basic hands on r will be useful what you will learn analyze the transition from a data developer to a data scientist mindset get acquainted with the

r programs and the logic used for statistical computations understand mathematical concepts such as variance standard deviation probability matrix calculations and more learn to implement statistics in data science tasks such as data cleaning mining and analysis learn the statistical techniques required to perform tasks such as linear regression regularization model assessment boosting svms and working with neural networks get comfortable with performing various statistical computations for data science programmatically in detail data science is an ever evolving field which is growing in popularity at an exponential rate data science includes techniques and theories extracted from the fields of statistics computer science and most importantly machine learning databases data visualization and so on this book takes you through an entire journey of statistics from knowing very little to becoming comfortable in using various statistical methods for data science tasks it starts off with simple statistics and then move on to statistical methods that are used in data science algorithms the r programs for statistical computation are clearly explained along with logic you will come across various mathematical concepts such as variance standard deviation probability matrix calculations and more you will learn only what is required to implement statistics in data science tasks such as data cleaning mining and analysis you will learn the statistical techniques required to perform tasks such as linear regression regularization model assessment boosting svms and working with neural networks by the end of the book you will be comfortable with performing various statistical computations for data science programmatically style and approach step by step comprehensive guide with real world examples

key message stats data and models second edition carries on a conversation with readers intriguing and challenging them to read the text and have fun learning statistics lauded by students and instructors alike for its readability and ease of comprehension stats data and models second edition focuses on statistical thinking and data analysis emphasizing how statistics helps us to understand our world the text incorporates compelling examples derived from the authors wealth of consulting experience and encourages readers to learn how to reason with data key topics exploring and

understanding data exploring relationships between variables gathering data randomness and probability from the data at hand to the world at large learning about the world modeling the world market for all readers interested in statistics

this textbook for graduate students in statistics data science and public health deals with the practical challenges that come with big complex and dynamic data it presents a scientific roadmap to translate real world data science applications into formal statistical estimation problems by using the general template of targeted maximum likelihood estimators these targeted machine learning algorithms estimate quantities of interest while still providing valid inference targeted learning methods within data science area critical component for solving scientific problems in the modern age the techniques can answer complex questions including optimal rules for assigning treatment based on longitudinal data with time dependent confounding as well as other estimands in dependent data structures such as networks included in targeted learning in data science are demonstrations with soft ware packages and real data sets that present a case that targeted learning is crucial for the next generation of statisticians and data scientists th is book is a sequel to the first textbook on machine learning for causal inference targeted learning published in 2011 mark van der laan phd is jiann ping hsu karl e peace professor of biostatistics and statistics at uc berkeley his research interests include statistical methods in genomics survival analysis censored data machine learning semiparametric models causal inference and targeted learning dr van der laan received the 2004 mortimer spiegelman award the 2005 van dantzig award the 2005 copss snedecor award the 2005 copss presidential award and has graduated over 40 phd students in biostatistics and statistics sherri rose phd is associate professor of health care policy biostatistics at harvard medical school her work is centered on developing and integrating innovative statistical approaches to advance human health dr rose s methodological research focuses on nonparametric machine learning for causal inference and prediction she co leads the health policy data science lab and currently serves as an associate editor for the journal of the american statistical association and biostatistics

a friendly and accessible approach to applying statistics in the real world with an emphasis on critical thinking the art of data analysis how to answer almost any question using basic statistics presents fun and unique examples guides readers through the entire data collection and analysis process and introduces basic statistical concepts along the way leaving proofs and complicated mathematics behind the author portrays the more engaging side of statistics and emphasizes its role as a problem solving tool in addition light hearted case studies illustrate the application of statistics to real data analyses highlighting the strengths and weaknesses of commonly used techniques written for the growing academic and industrial population that uses statistics in everyday life the art of data analysis how to answer almost any question using basic statistics highlights important issues that often arise when collecting and sifting through data featured concepts include descriptive statistics analysis of variance probability and sample distributions confidence intervals hypothesis tests regression statistical correlation data collection statistical analysis with graphs fun and inviting from beginning to end the art of data analysis is an ideal book for students as well as managers and researchers in industry medicine or government who face statistical questions and are in need of an intuitive understanding of basic statistical reasoning

with an emphasis on exploratory data analysis this title teaches students to identify trends in their data that may help them ask the right questions it develops students statistical intuition and nurtures the development of a statistical way of thinking

a grasp of the ways in which data can be collected summarised and critically appraised is fundamental to application of the commonly used inferential techniques of statistics by reviewing the criteria for the design of questionnaires planned experiments and surveys so as to minimise bias and by considering research methodology in general this book clarifies the basic requirements of data collection this introduction to statistics emphasizes the importance of data its collection summary and appraisal in the application of statistical techniques this book will be invaluable to first year students in statistics as well as to students from other disciplines on courses with a statistics module non numerated postgraduates embarking on research will also find much of the

content useful

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