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For Dynamic Treatment
Regimes Reinforcement
Learning Causal Inference And
Personalized Medicine
Statistics For Biology And
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*The statistics profession is at a
unique point in history. The need*

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for valid statistical tools is greater than ever; data sets are massive, often measuring hundreds of thousands of measurements for a single subject. The field is ready to move towards clear objective benchmarks under which tools can be evaluated. Targeted learning allows (1) the full generalization and utilization of cross-validation as an estimator selection tool so that the subjective choices made by humans are now made by the machine, and (2) targeting the fitting of the probability distribution of the data toward the target parameter representing the scientific question of interest. This book is aimed at both statisticians and

*Regimes Reinforcement
learning Causal Inference And
effect estimation for*

*observational and experimental
data. Part I is an accessible
introduction to super learning
and the targeted maximum
likelihood estimator, including
related concepts necessary to
understand and apply these
methods. Parts II-IX handle
complex data structures and
topics applied researchers will
immediately recognize from their
own research, including time-to-
event outcomes, direct and
indirect effects, positivity
violations, case-control studies,
censored data, longitudinal data,
and genomic studies.*

*The methods of statistical physics
have become increasingly*

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important in recent years for the treatment of a variety of diverse physical problems. Of principal interest is the microscopic description of the dynamics of dissipative systems. Although a unified theoretical description has at present not yet been achieved, we have assumed the task of writing a textbook which summarizes those of the most important methods which are self-contained and complete in themselves. We cannot, of course, claim to have treated the field exhaustively. A microscopic description of physical phenomena must necessarily be based upon quantum theory, and we have therefore carried out the treatment of dynamic processes strictly within a quantum-

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theoretical framework. For this learning alone it was necessary to omit a number of extremely important theories which have up to now been formulated only in terms of classical statistics. The goal of this book is, on the one hand, to give an introduction to the general principles of the quantum statistics of dynamical processes, and, on the other, to provide readers who are interested in the treatment of particular phenomena with methods for solving specific problems. The theory is for the most part formulated within the calculational frame work of Liouville space, which, together with projector formalism, has become an expedient mathematical tool in statistical

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physics.

This book provides an overview of the theories and applications on subgroups in the biopharmaceutical industry.

Drawing from a range of expert perspectives in academia and industry, this collection offers an overarching dialogue about recent advances in biopharmaceutical applications, novel statistical and methodological developments, and potential future directions.

The volume covers topics in subgroups in clinical trial design; subgroup identification and personalized medicine; and general issues in subgroup analyses, including regulatory ones. Included chapters present current methods, theories, and

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case applications in the diverse field of subgroup application and analysis. Offering timely perspectives from a range of authoritative sources, the volume is designed to have wide appeal to professionals in the pharmaceutical industry and to graduate students and researchers in academe and government.

The concepts of estimands, analyses (estimators), and sensitivity are interrelated. Therefore, great need exists for an integrated approach to these topics. This book acts as a practical guide to developing and implementing statistical analysis plans by explaining fundamental concepts using accessible language, providing technical

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details, real-world examples, and SAS and R code to implement analyses. The updated ICH guideline raises new analytic and cross-functional challenges for statisticians. Gaps between different communities have come to surface, such as between causal inference and clinical trialists, as well as among clinicians, statisticians, and regulators when it comes to communicating decision-making objectives, assumptions, and interpretations of evidence. This book lays out a path toward bridging some of these gaps. It offers □ **A common language and unifying framework along with the technical details and practical guidance to help statisticians meet the challenges**

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**□ A thorough treatment of
intercurrent events (ICEs), i.e.,
postrandomization events that
confound interpretation of
outcomes and five strategies for
ICEs in ICH E9 (R1) □ Details on
how estimands, integrated into a
principled study development
process, lay a foundation for
coherent specification of trial
design, conduct, and analysis
needed to overcome the issues
caused by ICEs: □ A perspective
on the role of the intention-to-
treat principle □ Examples and
case studies from various areas □
Example code in SAS and R □ A
connection with causal inference
□ Implications and methods for
analysis of longitudinal trials
with missing data Together, the
authors have offered the readers**

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*Regimes Reinforcement
Learning Causal Inference And
Industrial and Academic
perspective.*

*Hierarchical Modeling and
Inference in Ecology*

*Handbook of Statistical Methods
for Randomized Controlled Trials
Impact Evaluation*

*The Analysis of Data from
Populations, Metapopulations
and Communities*

*Variable Selection for Optimal
Dynamic Treatment Regimes and
Subgroup Detection*

*An R Companion to Applied
Regression*

In many disciplines of science it is vital to know the effect of a 'treatment' on a response variable of interest; the effect being known as the 'treatment

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effect". Here, the treatment can be a drug, an education program or an economic policy, and the response variable can be an illness, academic achievement or GDP. Once the effect is found, it is possible to intervene to adjust the treatment and attain a desired level of the response variable. A basic way to measure the treatment effect is to compare two groups, one of which received the treatment and the other did not. If the two groups are homogenous in all aspects other than their treatment status, then the difference between their response outcomes is the desired treatment effect. But if they differ in some aspects in addition to the treatment status, the difference

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In the response outcomes may be due to the combined influence of more than one factor. In non-experimental data where the treatment is not randomly assigned but self-selected, the subjects tend to differ in observed or unobserved characteristics. It is therefore imperative that the comparison be carried out with subjects similar in their characteristics. This book explains how this problem can be overcome so the attributable effect of the treatment can be found. This book brings to the fore recent advances in econometrics for treatment effects. The purpose of this book is to put together various economic treatments effect models in a coherent fashion,

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make it clear which can be parameters of interest, and show how they can be identified and estimated under weak assumptions. The emphasis throughout the book is on semi- and non-parametric estimation methods, but traditional parametric approaches are also discussed. This book is ideally suited to researchers and graduate students with a basic knowledge of econometrics. Statistical concepts provide scientific framework in experimental studies, including randomized controlled trials. In order to design, monitor, analyze and draw conclusions scientifically from such clinical trials, clinical investigators and statisticians should have a firm

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grasp of the requisite statistical
concepts. The Handbook of

Statistical Methods for

Randomized Controlled Trials

presents these statistical

concepts in a logical sequence

from beginning to end and can be

used as a textbook in a course or

as a reference on statistical

methods for randomized

controlled trials. Part I provides a

brief historical background on

modern randomized controlled

trials and introduces statistical

concepts central to planning,

monitoring and analysis of

randomized controlled trials. Part

II describes statistical methods for

analysis of different types of

outcomes and the associated

statistical distributions used in

testing the statistical hypotheses

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regarding the clinical questions. Part III describes some of the most used experimental designs for randomized controlled trials including the sample size estimation necessary in planning. Part IV describe statistical methods used in interim analysis for monitoring of efficacy and safety data. Part V describe important issues in statistical analyses such as multiple testing, subgroup analysis, competing risks and joint models for longitudinal markers and clinical outcomes. Part VI addresses selected miscellaneous topics in design and analysis including multiple assignment randomization trials, analysis of safety outcomes, non-inferiority trials, incorporating historical

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Regimes, Reinforcement
Learning, Causal Inference And
data, and validation of surrogate
outcomes.

The second edition features: a CD
with all of the book's Amos, EQS,
and LISREL programs and data
sets; new chapters on importing
data issues related to data editing
and on how to report research; an
updated introduction to matrix
notation and programs that
illustrate how to compute these
calculations; many more
computer program examples and
chapter exercises; and increased
coverage of factors that affect
correlation, the 4-step approach
to SEM and hypothesis testing,
significance, power, and sample
size issues. The new edition's
expanded use of applications
make this book ideal for
advanced students and

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researchers in psychology,
education, business, health care,
political science, sociology, and
biology. A basic understanding of
correlation is assumed and an
understanding of the matrices
used in SEM models is
encouraged.

Assembling a collection of very
prominent researchers in the
field, the Handbook of Spatial
Statistics presents a
comprehensive treatment of both
classical and state-of-the-art
aspects of this maturing area. It
takes a unified, integrated
approach to the material,
providing cross-references among
chapters. The handbook begins
with a historical intro
Dynamic Treatment Regimes

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Regimes Reinforcement
Handbook of Spatial Statistics
Bayesian Designs for Phase I-II
Clinical Trials

Statistics For Biology And
Health
Targeted Learning
Achievements and Opportunities

Missing data affect nearly every discipline by complicating the statistical analysis of collected data. But since the 1990s, there have been important developments in the statistical methodology for handling missing data. Written by renowned statisticians in this area, Handbook of Missing Data

Methodology presents many methodological advances and the latest applications of missing data methods in empirical research. Divided into six parts, the handbook begins by establishing notation and terminology. It reviews the general taxonomy of missing data mechanisms and their implications for analysis and offers a historical perspective on early methods for handling missing data. The following three parts cover various inference

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paradigms when data are missing, including likelihood and Bayesian methods; semi-parametric methods, with particular emphasis on inverse probability weighting; and multiple imputation methods. The next part of the book focuses on a range of approaches that assess the sensitivity of inferences to alternative, routinely non-verifiable assumptions about the missing data process. The final part discusses special topics, such as

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missing data in clinical trials and sample surveys as well as approaches to model diagnostics in the missing data setting. In each part, an introduction provides useful background material and an overview to set the stage for subsequent chapters. Covering both established and emerging methodologies for missing data, this book sets the scene for future research. It provides the framework for readers to delve into research and

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**practical applications of
missing data methods.**

**Reliably optimizing a new
treatment in humans is a
critical first step in
clinical evaluation since
choosing a suboptimal
dose or schedule may
lead to failure in later
trials. At the same time,
if promising preclinical
results do not translate
into a real treatment
advance, it is important
to determine this quickly
and terminate the clinical
evaluation process to
avoid wasting resources.
Bayesian Designs for**

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Phase I-II Clinical Trials
describes how phase I-II
designs can serve as a
bridge or protective
barrier between
preclinical studies and
large confirmatory
clinical trials. It
illustrates many of the
severe drawbacks with
conventional methods
used for early-phase
clinical trials and
presents numerous
Bayesian designs for
human clinical trials of
new experimental
treatment regimes.
Written by research

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**leaders from the
University of Texas MD
Anderson Cancer Center,
this book shows how
Bayesian designs for
early-phase clinical trials
can explore, refine, and
optimize new
experimental treatments.
It emphasizes the
importance of basing
decisions on both efficacy
and toxicity.**

**The world is becoming
increasingly complex,
with larger quantities of
data available to be
analyzed. It so happens
that much of these "big**

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data" that are available are spatio-temporal in nature, meaning that they can be indexed by their spatial locations and time stamps. Spatio-Temporal Statistics with R provides an accessible introduction to statistical analysis of spatio-temporal data, with hands-on applications of the statistical methods using R Labs found at the end of each chapter. The book: Gives a step-by-step approach to analyzing spatio-temporal data, starting with

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**visualization, then
statistical modelling, with
an emphasis on
hierarchical statistical
models and basis
function expansions, and
finishing with model
evaluation Provides a
gradual entry to the
methodological aspects
of spatio-temporal
statistics Provides broad
coverage of using R as
well as "R Tips"
throughout. Features
detailed examples and
applications in end-of-
chapter Labs Features
"Technical Notes"**

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**throughout to provide
additional technical detail
where relevant
Supplemented by a
website featuring the
associated R package,
data, reviews, errata, a
discussion forum, and
more The book fills a void
in the literature and
available software,
providing a bridge for
students and researchers
alike who wish to learn
the basics of spatio-
temporal statistics. It is
written in an informal
style and functions as a
down-to-earth**

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**introduction to the
subject. Any reader
familiar with calculus-
based probability and
statistics, and who is
comfortable with basic
matrix-algebra
representations of
statistical models, would
find this book easy to
follow. The goal is to give
as many people as
possible the tools and
confidence to analyze
spatio-temporal data.
This volume covers
classic as well as cutting-
edge topics on the
analysis of clinical trial**

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data in biomedical and psychosocial research and discusses each topic in an expository and user-friendly fashion. The intent of the book is to provide an overview of the primary statistical and data analytic issues associated with each of the selected topics, followed by a discussion of approaches for tackling such issues and available software packages for carrying out analyses. While classic topics such as survival data analysis, analysis of

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diagnostic test data and assessment of measurement reliability are well known and covered in depth by available topic-specific texts, this volume serves a different purpose: it provides a quick introduction to each topic for self-learning, particularly for those who have not done any formal coursework on a given topic but must learn it due to its relevance to their multidisciplinary research. In addition, the chapters on these classic

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topics will reflect issues particularly relevant to modern clinical trials such as longitudinal designs and new methods for analyzing data from such study designs. The coverage of these topics provides a quick introduction to these important statistical issues and methods for addressing them. As with the classic topics, this part of the volume on modern topics will enable researchers to grasp the statistical methods for addressing these

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emerging issues
Learning Causal Inference And
underlying modern
Personalized Medicine
clinical trials and to apply
Statistics For Biology And
them to their research
Health
studies.

**Adaptive Treatment
Strategies in Practice:
Planning Trials and
Analyzing Data for
Personalized Medicine
Design and Analysis of
Subgroups with
Biopharmaceutical
Applications
Spatio-Temporal
Statistics with R
Innovative Strategies,
Statistical Solutions and
Simulations for Modern**

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Clinical Trials Handbook of Environmental and Ecological Statistics Data and Safety

Monitoring Committees in Clinical Trials

There is a huge amount of literature on statistical models for the prediction of survival after diagnosis of a wide range of diseases like cancer, cardiovascular disease, and chronic kidney disease. Current practice is to use prediction models based on the Cox proportional hazards model and to present those as static models for remaining lifetime after diagnosis or treatment. In contrast, Dynamic Prediction in

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Clinical Survival Analysis focuses on dynamic models for the remaining lifetime at later points in time, for instance using landmark models. Designed to be useful to applied statisticians and clinical epidemiologists, each chapter in the book has a practical focus on the issues of working with real life data. Chapters conclude with additional material either on the interpretation of the models, alternative models, or theoretical background. The book consists of four parts: Part I deals with prognostic models for survival data using (clinical) information available at baseline, based on the Cox model Part II is about prognostic models for survival data

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using (clinical) information
available at baseline, when the
proportional hazards assumption of
the Cox model is violated Part III is

dedicated to the use of time-
dependent information in dynamic
prediction Part IV explores dynamic
prediction models for survival data
using genomic data Dynamic
Prediction in Clinical Survival
Analysis summarizes cutting-edge
research on the dynamic use of
predictive models with traditional
and new approaches. Aimed at
applied statisticians who actively
analyze clinical data in collaboration
with clinicians, the analyses of the
different data sets throughout the
book demonstrate how predictive

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models can be obtained from proper
data sets.

Model a Wide Range of Count Time
Series Handbook of Discrete-Valued
Time Series presents state-of-the-art
methods for modeling time series of
counts and incorporates frequentist
and Bayesian approaches for
discrete-valued spatio-temporal data
and multivariate data. While the
book focuses on time series of
counts, some of the techniques
discussed ca

This Elibron Classics title is a
reprint of the original edition
published by the Macmillan
Company in New York, 1920.
Forecasting is required in many
situations. Stocking an inventory

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may require forecasts of demand
months in advance.

Telecommunication routing requires
traffic forecasts a few minutes
ahead. Whatever the circumstances
or time horizons involved,
forecasting is an important aid in
effective and efficient planning.
This textbook provides a
comprehensive introduction to
forecasting methods and presents
enough information about each
method for readers to use them
sensibly.

Micro-econometrics for Policy,
Program, and Treatment Effects
A Non-Asymptotic Viewpoint
Handbook of Missing Data
Methodology

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High-Dimensional Statistics
Learning Causal Inference And
Causal Inference for Observational
Personalized Medicine
and Experimental Data

Statistics For Biology And
Forecasting: principles and practice
Health

A guide to data

*collection, modeling and
inference strategies for*

biological survey data

using Bayesian and

classical statistical

methods. This book

describes a general and

flexible framework for

modeling and inference in

ecological systems based

on hierarchical models,

with a strict focus on the

use of probability models

and parametric inference.

Hierarchical models

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represent a paradigm shift
in the application of
statistics to ecological
inference problems because
they combine explicit
models of ecological
system structure or
dynamics with models of
how ecological systems are
observed. The principles
of hierarchical modeling
are developed and applied
to problems in population,
metapopulation, community,
and metacommunity systems.
The book provides the
first synthetic treatment
of many recent
methodological advances in
ecological modeling and

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unifies disparate methods and procedures. The authors apply principles of hierarchical modeling to ecological problems, including * occurrence or occupancy models for estimating species distribution * abundance models based on many sampling protocols, including distance sampling * capture-recapture models with individual effects * spatial capture-recapture models based on camera trapping and related methods * population and metapopulation dynamic

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models * models of
learning Causal Inference And
biodiversity, community
Personalized Medicine *
structure and dynamics *
Statistics For Biology And
Wide variety of examples
Health
involving many taxa
(birds, amphibians,
mammals, insects, plants)
* Development of
classical, likelihood-
based procedures for
inference, as well as
Bayesian methods of
analysis * Detailed
explanations describing
the implementation of
hierarchical models using
freely available software
such as R and WinBUGS *
Computing support in
technical appendices in an

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online companion web site
Statistical Methods for
Dynamic Treatment
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Learning, Causal

Inference, and

Personalized

Medicine Springer Science &
Business Media

The high-level language of
R is recognized as one of
the most powerful and
flexible statistical
software environments, and
is rapidly becoming the
standard setting for
quantitative analysis,
statistics and graphics. R
provides free access to
unrivalled coverage and

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cutting-edge applications, enabling the user to apply numerous statistical methods ranging from simple regression to time series or multivariate analysis. Building on the success of the author's bestselling *Statistics: An Introduction using R*, *The R Book* is packed with worked examples, providing an all inclusive guide to R, ideal for novice and more accomplished users alike. The book assumes no background in statistics or computing and introduces the advantages of the R environment,

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detailing its applications in a wide range of disciplines. Provides the first comprehensive reference manual for the R language, including practical guidance and full coverage of the graphics facilities. Introduces all the statistical models covered by R, beginning with simple classical tests such as chi-square and t-test. Proceeds to examine more advance methods, from regression and analysis of variance, through to generalized linear models, generalized mixed models,

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*Regimes Reinforcement
time series, spatial
Learning Causal Inference And
statistics, multivariate
Personalized Medicine
statistics and much more.*

*The R Book is aimed at
undergraduates,
postgraduates and
professionals in science,
engineering and medicine.
It is also ideal for
students and professionals
in statistics, economics,
geography and the social
sciences.*

*This book illustrates
numerous statistical
practices that are
commonly used by medical
researchers, but which
have severe flaws that may
not be obvious. For each*

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example, it provides one
or more alternative
statistical methods that

avoid misleading or
incorrect inferences being
made. The technical level
is kept to a minimum to
make the book accessible
to non-statisticians. At
the same time, since many
of the examples describe
methods used routinely by
medical statisticians with
formal statistical
training, the book appeals
to a broad readership in
the medical research
community.

Targeted Learning in Data
Science

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*Handbook of Discrete-
Valued Time Series*
Learning Causal Inference And
Personalized Medicine
*Solving the Curse of
Dimensionality*

*New Statistical Methods
for Precision Medicine*
Dyadic Data Analysis
*Statistical Methods for
Dynamic Treatment Regimes*

"This is truly an outstanding book. [It] brings together all of the latest research in clinical trials methodology and how it can be applied to drug development.... Chang et al provide applications to industry-supported trials. This will allow statisticians in the industry community to take these

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methods seriously." Jay Herson,
Johns Hopkins University The
pharmaceutical industry's

approach to drug discovery and
development has rapidly
transformed in the last decade
from the more traditional
Research and Development (R &
D) approach to a more
innovative approach in which
strategies are employed to
compress and optimize the
clinical development plan and
associated timelines. However,
these strategies are generally
being considered on an
individual trial basis and not as
part of a fully integrated overall
development program. Such

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optimization at the trial level is somewhat near-sighted and does not ensure cost, time, or development efficiency of the overall program. This book seeks to address this imbalance by establishing a statistical framework for overall/global clinical development optimization and providing tactics and techniques to support such optimization, including clinical trial simulations. Provides a statistical framework for achieve global optimization in each phase of the drug development process. Describes specific techniques to support optimization including adaptive

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designs, precision medicine, survival-endpoints, dose finding and multiple testing. Gives practical approaches to handling missing data in clinical trials using SAS. Looks at key controversial issues from both a clinical and statistical perspective. Presents a generous number of case studies from multiple therapeutic areas that help motivate and illustrate the statistical methods introduced in the book. Puts great emphasis on software implementation of the statistical methods with multiple examples of software code (both SAS and R). It is important for statisticians

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to possess a deep knowledge of the drug development process beyond statistical considerations. For these reasons, this book incorporates both statistical and "clinical/medical" perspectives.

An R Companion to Applied Regression is a broad introduction to the R statistical computing environment in the context of applied regression analysis. John Fox and Sanford Weisberg provide a step-by-step guide to using the free statistical software R, an emphasis on integrating statistical computing in R with the practice of data analysis, coverage of generalized linear models, and

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substantial web-based support materials. The Third Edition has been reorganized and includes a new chapter on mixed-effects models, new and updated data sets, and a de-emphasis on statistical programming, while retaining a general introduction to basic R programming. The authors have substantially updated both the car and effects packages for R for this edition, introducing additional capabilities and making the software more consistent and easier to use. They also advocate an everyday data-analysis workflow that encourages reproducible research. To this end, they

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provide coverage of RStudio, an interactive development environment for R that allows readers to organize and document their work in a simple and intuitive fashion, and then easily share their results with others. Also included is coverage of R Markdown, showing how to create documents that mix R commands with explanatory text. Interpersonal phenomena such as attachment, conflict, person perception, learning, and influence have traditionally been studied by examining individuals in isolation, which falls short of capturing their truly interpersonal nature. This book offers state-of-

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the-art solutions to this age-old problem by presenting methodological and data-analytic approaches useful in investigating processes that take place among dyads: couples, coworkers, parent and child, teacher and student, or doctor and patient, to name just a few. Rich examples from psychology and across the behavioral and social sciences help build the researcher's ability to conceptualize relationship processes; model and test for actor effects, partner effects, and relationship effects; and model and control for the statistical interdependence that can exist

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between partners. The companion website provides clarifications, elaborations, corrections, and data and files for each chapter.

In recent years the number of innovative medicinal products and devices submitted and approved by regulatory bodies has declined dramatically. The medical product development process is no longer able to keep pace with increasing technologies, science and innovations and the goal is to develop new scientific and technical tools and to make product development processes more efficient and effective.

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Statistical Methods in Healthcare focuses on the application of statistical methodologies to evaluate promising alternatives and to optimize the performance and demonstrate the effectiveness of those that warrant pursuit is critical to success. Statistical methods used in planning, delivering and monitoring health care, as well as selected statistical aspects of the development and/or production of pharmaceuticals and medical devices are also addressed. With a focus on finding solutions to these challenges, this book: Provides a comprehensive, in-depth

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treatment of statistical methods in healthcare, along with a reference source for practitioners and specialists in health care and drug development. Offers a broad coverage of standards and established methods through leading edge techniques. Uses an integrated, case-study based approach, with focus on applications. Looks at the use of analytical and monitoring schemes to evaluate therapeutic performance. Features the application of modern quality management systems to clinical practice, and to pharmaceutical development and production processes. Addresses the use of

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modern Statistical methods such as Adaptive Design, Seamless Design, Data Mining, Bayesian networks and Bootstrapping that can be applied to support the challenging new vision.

Practitioners in healthcare-related professions, ranging from clinical trials to care delivery to medical device design, as well as statistical researchers in the field, will benefit from this book.

A Beginner's Guide to Structural Equation Modeling

The Quantum Statistics of Dynamic Processes

Reinforcement Learning, Causal Inference, and Personalized Medicine

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Researchers

Personalized Medicine
Statistical Methods in the
Statistics For Biology And
Atmospheric Sciences

Health
Statistical Methods in Healthcare

***In recent years,
interest in rigorous
impact evaluation has
grown tremendously in
policy-making,
economics, public
health, social sciences
and international
relations. Evidence-
based policy-making has
become a recurring theme
in public policy,
alongside greater
demands for***

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**accountability in public
policies and public
spending, and requests
for independent and
rigorous impact
evaluations for policy
evidence. Frlich and
Sperlich offer a
comprehensive and up-to-
date approach to
quantitative impact
evaluation analysis,
also known as causal
inference or treatment
effect analysis,
illustrating the main
approaches for
identification and
estimation: experimental**

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**studies, randomization
inference and randomized
control trials (RCTs),
matching and propensity
score matching and
weighting, instrumental
variable estimation, dif
ference-in-differences,
regression discontinuity
designs, quantile
treatment effects, and
evaluation of dynamic
treatments. The book is
designed for economics
graduate courses but can
also serve as a manual
for professionals in
research institutes,
governments, and**

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**international
organizations,
evaluating the impact of
a wide range of public
policies in health,**

**environment, transport
and economic
development.**

**Statistical Methods in
the Atmospheric
Sciences, Third Edition,
explains the latest
statistical methods used
to describe, analyze,
test, and forecast
atmospheric data. This
revised and expanded
text is intended to help
students understand and**

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**communicate what their
data sets have to say,
or to make sense of the
scientific literature in
meteorology,**

**climatology, and related
disciplines. In this new
edition, what was a
single chapter on
multivariate statistics
has been expanded to a
full six chapters on
this important topic.
Other chapters have also
been revised and cover
exploratory data
analysis, probability
distributions,
hypothesis testing,**

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statistical weather forecasting, forecast verification, and time series analysis. There is now an expanded treatment of resampling tests and key analysis techniques, an updated discussion on ensemble forecasting, and a detailed chapter on forecast verification. In addition, the book includes new sections on maximum likelihood and on statistical simulation and contains current references to original research.

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Students will benefit from pedagogical features including worked examples, end-of-chapter exercises with separate solutions, and numerous illustrations and equations. This book will be of interest to researchers and students in the atmospheric sciences, including meteorology, climatology, and other geophysical disciplines. Accessible presentation and explanation of techniques for atmospheric data

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Personalized Medicine
Many worked examples, End-
of-chapter exercises,
with answers provided
Personalized medicine is
a medical paradigm that
emphasizes systematic
use of individual
patient information to
optimize that patient's
health care,
particularly in managing
chronic conditions and
treating cancer. In the
statistical literature,
sequential decision
making is known as an
adaptive treatment

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**strategy (ATS) or a
dynamic treatment regime
(DTR). The field of DTRs
emerges at the interface
of statistics, machine
learning, and biomedical
science to provide a
data-driven framework
for precision medicine.
The authors provide a
learning-by-seeing
approach to the
development of ATSS,
aimed at a broad
audience of health
researchers. All
estimation procedures
used are described in
sufficient heuristic and**

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*technical detail so that
less quantitative
readers can understand
the broad principles
underlying the*

*approaches. At the same
time, more quantitative
readers can implement
these practices. This
book provides the most
up-to-date summary of
the current state of the
statistical research in
personalized medicine;
contains chapters by
leaders in the area from
both the statistics and
computer sciences
fields; and also*

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**contains a range of
practical advice,
introductory and
expository materials,
and case studies.**

**In an age where the
amount of data collected
from brain imaging is
increasing constantly,
it is of critical
importance to analyse
those data within an
accepted framework to
ensure proper
integration and
comparison of the
information collected.
This book describes the
ideas and procedures**

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**that underlie the
analysis of signals
produced by the brain.**

**The aim is to understand
how the brain works, in
terms of its functional
architecture and
dynamics. This book
provides the background
and methodology for the
analysis of all types of
brain imaging data, from
functional magnetic
resonance imaging to
magnetoencephalography.
Critically, Statistical
Parametric Mapping
provides a widely
accepted conceptual**

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**framework which allows
treatment of all these
different modalities.**

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**This rests on an
understanding of the
brain's functional
anatomy and the way that
measured signals are
caused experimentally.**

**The book takes the
reader from the basic
concepts underlying the
analysis of neuroimaging
data to cutting edge
approaches that would be
difficult to find in any
other source.**

**Critically, the material
is presented in an**

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***incremental way so that
the reader can
understand the
precedents for each new
development. This book
will be particularly
useful to
neuroscientists engaged
in any form of brain
mapping; who have to
contend with the real-
world problems of data
analysis and
understanding the
techniques they are
using. It is primarily a
scientific treatment and
a didactic introduction
to the analysis of brain***

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imaging data. It can be used as both a textbook for students and scientists starting to use the techniques, as well as a reference for practicing neuroscientists. The book also serves as a companion to the software packages that have been developed for brain imaging data analysis. An essential reference and companion for users of the SPM software Provides a complete description of the concepts and

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*procedures entailed by
the analysis of brain
images Offers full
didactic treatment of
the basic mathematics
behind the analysis of
brain imaging data
Stands as a compendium
of all the advances in
neuroimaging data
analysis over the past
decade Adopts an easy to
understand and
incremental approach
that takes the reader
from basic statistics to
state of the art
approaches such as
Variational Bayes*

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**Structured treatment of
data analysis issues
that links different
modalities and models
Includes a series of
appendices and tutorial-
style chapters that
makes even the most
sophisticated approaches
accessible**

**Concepts and Methods
Modern Clinical Trial
Analysis**

**Handbook of Dynamic
System Modeling
Dynamic Prediction in
Clinical Survival
Analysis**

An Introduction to

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**Statistical Methods for
Precision Medicine**

Dynamic Treatment Regimes:
Statistical Methods for
Precision Medicine

provides a comprehensive
introduction to
statistical methodology
for the evaluation and
discovery of dynamic
treatment regimes from
data. Researchers and
graduate students in
statistics, data science,
and related quantitative
disciplines with a
background in probability
and statistical inference
and popular statistical

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modeling techniques will be prepared for further study of this rapidly evolving field. A dynamic treatment regime is a set of sequential decision rules, each corresponding to a key decision point in a disease or disorder process, where each rule takes as input patient information and returns the treatment option he or she should receive. Thus, a treatment regime formalizes how a clinician synthesizes patient information and selects treatments in practice. Treatment regimes are of

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obvious relevance to precision medicine, which involves tailoring treatment selection to patient characteristics in an evidence-based way. Of critical importance to precision medicine is estimation of an optimal treatment regime, one that, if used to select treatments for the patient population, would lead to the most beneficial outcome on average. Key methods for estimation of an optimal treatment regime from data are motivated and described in detail. A dedicated

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companion website presents full accounts of application of the methods using a comprehensive R package developed by the authors. The authors' website www.dtr-book.com includes updates, corrections, new papers, and links to useful websites.

The Handbook of Computational Statistics - Concepts and Methods (second edition) is a revision of the first edition published in 2004, and contains additional comments and updated information on the

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existing chapters, as well as three new chapters addressing recent work in the field of computational

statistics. This new edition is divided into 4 parts in the same way as the first edition. It begins with "How Computational Statistics became the backbone of modern data science" (Ch.1): an overview of the field of Computational Statistics, how it emerged as a separate discipline, and how its own development mirrored that of hardware and software, including a discussion of

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current active research.

The second part (Chs. 2 -

15) presents several

topics in the supporting

field of statistical

computing. Emphasis is

placed on the need for

fast and accurate

numerical algorithms, and

some of the basic

methodologies for

transformation, database

handling, high-dimensional

data and graphics

treatment are discussed.

The third part (Chs. 16 -

33) focuses on statistical

methodology. Special

attention is given to

smoothing, iterative

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visualization of
multivariate data. Lastly,

a set of selected
applications (Chs. 34 -

38) like Bioinformatics,
Medical Imaging, Finance,

Econometrics and Network
Intrusion Detection

highlight the usefulness
of computational

statistics in real-world
applications.

Statistical Methods for
Dynamic Treatment Regimes

shares state of the art of
statistical methods

developed to address
questions of estimation

and inference for dynamic

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Regimes, Reinforcement Learning, Causal Inference And Personalized Medicine. This volume demonstrates these methods with their conceptual underpinnings and illustration through analysis of real and simulated data. These methods are immediately applicable to the practice of personalized medicine, which is a medical paradigm that emphasizes the systematic use of individual patient information to optimize patient health care. This is the first single source to provide an overview of

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methodology and results gathered from journals, proceedings, and technical reports with the goal of orienting researchers to the field. The first chapter establishes context for the statistical reader in the landscape of personalized medicine. Readers need only have familiarity with elementary calculus, linear algebra, and basic large-sample theory to use this text. Throughout the text, authors direct readers to available code or packages in different statistical languages to

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facilitate implementation. In cases where code does not already exist, the authors provide analytic approaches in sufficient detail that any researcher with knowledge of statistical programming could implement the methods from scratch. This will be an important volume for a wide range of researchers, including statisticians, epidemiologists, medical researchers, and machine learning researchers interested in medical applications. Advanced graduate students in

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statistics and
biostatistics will also
find material in

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to be a critical part of
their studies.

"Precision medicine seeks
to use data to construct
principled, i.e., evidence-
based, treatment
strategies that dictate
where, when, and to whom
treatment should be
applied. This book
provides an accessible yet
comprehensive introduction
to statistical methodology
for dynamic treatment
regimes"--

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Programming

Statistical Parametric
Statistics For Biology And
Mapping: The Analysis of

Functional Brain Images

The Behavioral and Social
Sciences

The R Book

Longitudinal Data Analysis

A Textbook for College

Students, a Manual for

Statisticians and Business

Executives

This volume explores the scientific
frontiers and leading edges of
research across the fields of
anthropology, economics, political
science, psychology, sociology,
history, business, education,
geography, law, and psychiatry, as
well as the newer, more

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specialized areas of artificial intelligence, child development, cognitive science, communications, demography, linguistics, and management and decision science.

It includes recommendations concerning new resources, facilities, and programs that may be needed over the next several years to ensure rapid progress and provide a high level of returns to basic research.

Praise for the first edition: "Given the author's years of experience as a statistician and as a founder of the first DMC in pharmaceutical industry trials, I highly recommend this book--not only for experts because of its cogent and organized presentation, but more importantly for young investigators who are seeking

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learning Causal Inference And
information about the logistical and
philosophical aspects of a DMC."

-S. T. Ounpraseuth, The American
Statistician In the first edition of
this well-regarded book, the author
provided a groundbreaking and
definitive guide to best practices in
pharmaceutical industry data
monitoring committees (DMCs).
Maintaining all the material from
the first edition and adding
substantial new material, Data and
Safety Monitoring Committees in
Clinical Trials, Second Edition is
ideal for training professionals to
serve on their first DMC as well as
for experienced clinical and
biostatistical DMC members,
sponsor and regulatory agency
staff. The second edition guides
the reader through newly
emerging DMC responsibilities

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brought about by regulations
emphasizing risk vs benefit and the
emergence of risk-based

monitoring. It also provides the
reader with many new statistical
methods, clinical trial designs and
clinical terminology that have
emerged since the first edition.

The references have been updated
and the very popular end-of-
chapter Q&A section has been
supplemented with many new
experiences since the first edition.

New to the Second Edition:
Presents statistical methods,
tables, listings and graphs
appropriate for safety review,
efficacy analysis and risk vs
benefit analysis, SPERT and
PRISMA initiatives. Newly added
interim analysis for efficacy and
futility section. DMC

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responsibilities in SUSARs
(Serious Unexpected Serious
Adverse Reactions), basket trials,
umbrella trials, dynamic treatment
strategies /SMART trials,
pragmatic trials, biosimilar trials,
companion diagnostics, etc. DMC
responsibilities for data quality and
fraud detection (Fraud Recovery
Plan) Use of patient reported
outcomes of safety Use of meta
analysis and data outside the trial
New ideas for training and
compensation of DMC members
Jay Herson is Senior Associate,
Biostatistics, Johns Hopkins
Bloomberg School of Public Health
where he teaches courses on
clinical trials and drug
development based on his many
years experience in clinical trials
in academia and the

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pharmaceutical industry.

Although many books currently
Learning Causal Inference And
available describe statistical
Basics For Biology And
models and methods for analyzing
Health
longitudinal data, they do not
highlight connections between
various research threads in the
statistical literature. Responding to
this void, Longitudinal Data
Analysis provides a clear,
comprehensive, and unified
overview of state-of-the-art
theory and applications. It also
focuses on the assorted challenges
that arise in analyzing longitudinal
data. After discussing historical
aspects, leading researchers
explore four broad themes:
parametric modeling,
nonparametric and semiparametric
methods, joint models, and
incomplete data. Each of these

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sections begins with an introductory chapter that provides useful background material and a broad outline to set the stage for subsequent chapters. Rather than focus on a narrowly defined topic, chapters integrate important research discussions from the statistical literature. They seamlessly blend theory with applications and include examples and case studies from various disciplines. Destined to become a landmark publication in the field, this carefully edited collection emphasizes statistical models and methods likely to endure in the future. Whether involved in the development of statistical methodology or the analysis of longitudinal data, readers will gain new perspectives on the field.

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A coherent introductory text from a groundbreaking researcher, focusing on clarity and motivation to build intuition and understanding.

Causal Inference for Complex
Longitudinal Studies

Handbook of Computational
Statistics

Estimands, Estimators and
Sensitivity Analysis in Clinical
Trials

This handbook focuses on the enormous literature applying statistical methodology and modelling to environmental and ecological processes. The 21st century statistics community has become increasingly interdisciplinary, bringing a large collection of modern tools to all areas of application in environmental

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processes. In addition, the environmental community has substantially increased its scope of data collection including observational data, satellite-derived data, and computer model output. The resultant impact in this latter community has been substantial; no longer are simple regression and analysis of variance methods adequate. The contribution of this handbook is to assemble a state-of-the-art view of this interface. Features: An internationally regarded editorial team. A distinguished collection of contributors. A thoroughly contemporary treatment of a substantial interdisciplinary interface. Written to engage both statisticians as well as quantitative environmental researchers. 34 chapters covering

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methodology, ecological processes,
environmental exposure, and statistical
methods in climate science.

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The topic of dynamic models tends to
be splintered across various
disciplines, making it difficult to
uniformly study the subject. Moreover,
the models have a variety of
representations, from traditional
mathematical notations to
diagrammatic and immersive
depictions. Collecting all of these
expressions of dynamic models, the
Handbook of Dynamic System
Modeling explores a panoply of
different types of modeling methods
available for dynamical systems.
Featuring an interdisciplinary,
balanced approach, the handbook
focuses on both generalized dynamic

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knowledge and specific models. It first introduces the general concepts, representations, and philosophy of dynamic models, followed by a section on modeling methodologies that explains how to portray designed models on a computer. After addressing scale, heterogeneity, and composition issues, the book covers specific model types that are often characterized by specific visual- or text-based grammars. It concludes with case studies that employ two well-known commercial packages to construct, simulate, and analyze dynamic models. A complete guide to the fundamentals, types, and applications of dynamic models, this handbook shows how systems function and are represented over time and

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space and illustrates how to select a particular model based on a specific area of interest.

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

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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 o 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

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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

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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.