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Biomedical Data Science

A Step-by-Step Guide to Analysis and Interpretation

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Biomedical Data Science: A Step-by-Step Guide to Analysis and Interpretation is a practical roadmap for transforming complex biomedical data into reliable insights. Designed for readers at the crossroads of biology, medicine, and computation, the book walks readers through the entire lifecycle of analysis, from formulating clear questions to designing robust studies, quantifying uncertainty, building and validating models, and interpreting results responsibly.

Instead of overwhelming the reader with derivations, it emphasises *conceptual clarity, reproducibility,* and *interpretability*, linking key ideas with Python workflows using widely adopted libraries. Core statistical tools (estimation, confidence intervals, hypothesis testing, multiple testing) are integrated with essential machine-learning practices (cross-validation, metrics, baseline vs. null models, sanity checks, and model explanation).

An *end-to-end clinical case study* ties everything together—demonstrating how design decisions, preprocessing, statistical analysis, and predictive modelling collectively influence conclusions and clinical significance. As the first volume of the River Series, this book establishes a practical, open, and interdisciplinary approach to data-driven biomedicine, guiding readers to “get it right” from the outset.

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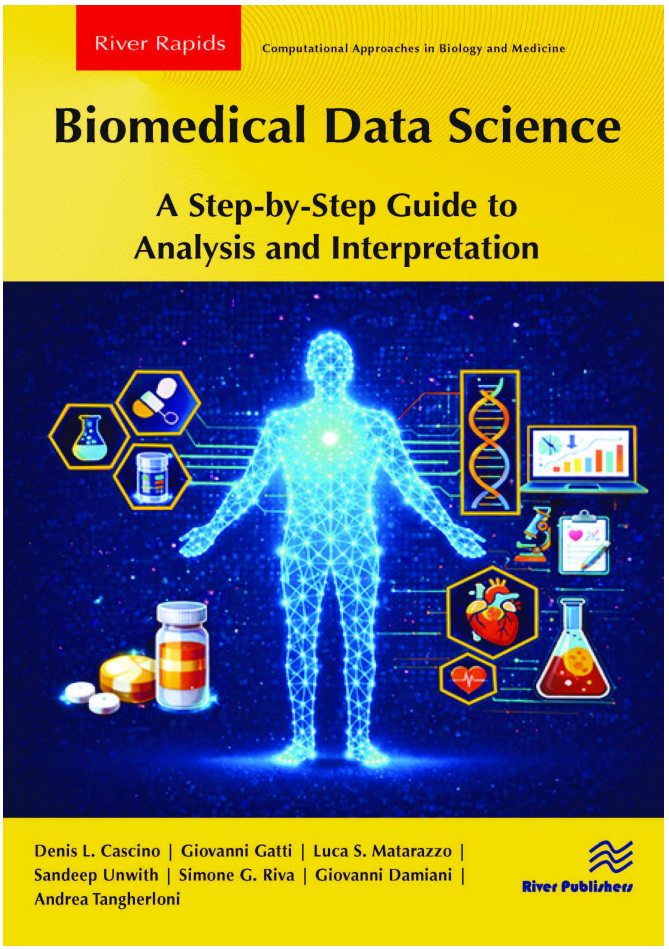

River Publishers Series in Computational Approaches in Biology and Medicine

ISBN: 9788743812463
e-ISBN: 9788743812470
Available From: September 2026
Price:

KEYWORDS:
Biomedical data science; experimental design; hypothesis testing; statistical analysis; machine learning; cross-validation; baseline and null models; data analysis; interpretability; reproducibility.

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