Predictive Analytics for Business using R

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ABOUT THE BOOK

The fields of mathematical statistics, statistical graphics, computer science and operations research have created the rich set of methods now called Analytics. Often analytics is characterized along three poles: descriptive analytics (what do data tell us), predictive analytics (what can be forecast based on the data, and with what certainty), and prescriptive analytics (how can the data inform changes to improve system performance).

This book focuses on the second pole, predictive analytics. The areas of predicting a number, a class, and dynamic behavior are distinct, with different methods. This text has three parts based on these areas. Topics in predicting a number include simple and multiple linear regression, transformation of variables, analysis of observational data via cross-validation, the generalized linear model, designed experiments, and Gaussian process and neural network regression. Classification methods include neural networks, logistic regression, k-nearest neighbor, and linear discriminant analysis. Methods for predicting dynamic behavior include trend analysis, time series analysis and discrete-event dynamic simulation.

Characterizing prediction uncertainty is a key focus of this text. The text provides analytic methods appropriate to each area, with an explicit process for applying such methods. Case data with corresponding R code are used to illustrate each method.

Predictive Analytics for Business using R is designed for a hybrid class structure. Class sessions can be a blend of lecture format and flipped classroom case analyses. In a two-meetings-per-week fifteen-week structure, one day per week would be devoted to explaining methodology and presenting a case study, with the second day focused on coaching. Given the case structure, the text does not contain homework problems. Instead, at the end of each chapter there are links to cases posted online.

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READERSHIP

Advanced undergraduates, Master's students in business, accounting, engineering, statistics or computer science, as well as practitioners in business analytics, business consulting, industrial engineering and operations research.

ABOUT THE AUTHOR

Russell Barton is Distinguished Professor of Supply Chain and Information Systems in the Smeal College of Business and a Certified Analytics Professional. He received his PhD in operations research from Cornell University. He began his career as an analytics consultant at RCA, followed by similar roles at Econ, Inc., The Mentoris Company, and Mathtech, before returning to RCA for eight years. Projects included predicting the impact of telecommuting on urban structure, modeling exoffender post-release behavior, analyzing workers' compensation claims for hundreds of thousands of records, constructing risk models for self-insurance options, simulating semiconductor manufacturing operations, predicting satellite communications reliability, measuring videodisc quality, characterizing image errors in video monitors, and visual representations of experiment results.

His academic career began at Cornell University as a Visiting Associate Professor in the School of Operations Research and Industrial Engineering, and Laboratory Director for the Cornell Computational Optimization Project. Following Cornell, he was Professor of Industrial Engineering at Penn State. From 1998–1999 he was a Visiting Professor at Ècole Centrale Paris in the Production and Logistics Research Laboratory. He moved to Penn State's Smeal College of Business in 2002, and served as Associate Dean for Research and MS/PhD Programs, Co-Director of the Master's of Manufacturing Management degree program, and as Senior Associate Dean for Research and Faculty. served as Program Director for Manufacturing Enterprise Systems and Service Enterprise Systems at the US National Science Foundation from 2010–2012, and as an analytics consultant to firms including Fluke, Ford, GE, GM, Kodak, Lockheed-Martin, Textron, and Xerox.