

Jonathon D. Brown

Linear Models in Matrix Form

A Hands-On Approach for the Behavioral Sciences

This textbook is an approachable introduction to statistical analysis using matrix algebra. Prior knowledge of matrix algebra is not necessary. Advanced topics are easy to follow through analyses that were performed on an open-source spreadsheet using a few built-in functions. These topics include ordinary linear regression, as well as maximum likelihood estimation, matrix decompositions, nonparametric smoothers and penalized cubic splines. Each data set (1) contains a limited number of observations to encourage readers to do the calculations themselves, and (2) tells a coherent story based on statistical significance and confidence intervals. In this way, students will learn how the numbers were generated and how they can be used to make cogent arguments about everyday matters. This textbook is designed for use in upper level undergraduate courses or first year graduate courses.

The first chapter introduces students to linear equations, then covers matrix algebra, focusing on three essential operations: sum of squares, the determinant, and the inverse. These operations are explained in everyday language, and their calculations are demonstrated using concrete examples. The remaining chapters build on these operations, progressing from simple linear regression to mediational models with bootstrapped standard errors.

Statistics / Social Sciences

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