**Introduction to Sports Analytics using R**

Ryan Elmore & Andrew Urbaczewski

**Chapter 1: Introduction**

* 1. Why Sports Analytics
	2. What is Sports Analytics
	3. Careers in Sports Analytics
	4. Off-The-Field Analytics
	5. How this Book is Organized

**Chapter 2: Introduction to R**

2.1 Background

2.2 R Software

2.3 RStudio

2.4 Getting Your Machine Ready To Follow Along With This Book

2.5 R Packages

2.6 Programming in R

2.7 Data Storage in R

2.8 Coding Techniques

2.9 Exploratory Data Analysis in R

2.10 R Markdown or Quarto

2.11 R Markdown File

2.12 Introduction to the Tidyverse

2.13 Getting Help

2.14 Conclusion

2.15 Lab: Introduction to R with Lahman

2.16 Exercises

**Chapter: 3 Web Scraping**

3.1 R Packages

3.2 Getting Sports Data

3.3 Web Scraping and Ethics

3.4 Web Document Structure

3.5 Web Scraping in R

3.6 Scraping NHL Data

3.7 Writing a Custom Function

3.8 Conclusion

3.9 Lab Three: Web Scraping Hockey Data

3.10 Exercises

**Chapter 4: Baseball 80**

4.1 R Packages

4.2 Introduction

4.3 If You Don’t Know Anything about Baseball

4.4 Sabermetrics

4.5 Basic Baseball Metrics

4.6 Linear Regression

4.7 Player Comparisons using Runs Above Average

4.8 Runs Above Average: Mike Trout (2018)

4.9 Analyzing Defense – Pitching

4.10 Statcast

4.11 Research Block: Did the Houston Astros Cheat Their Way to the 2017 World Series Title?

4.12 Strike Zones

4.13 Estimating Probabilities

4.14 Logistic Regression Model

4.15 Swing Probability

4.16 Summary

4.17 Lab Four: Calculating Baseball Metrics

4.18 Case Study: Adjusting to Baseball in Colorado

4.19 Exercises

**Chapter 5: Basketball**

5.1 R Packages

5.2 If You Don’t Know Anything About Basketball

5.3 Basic Basketball Metrics

5.4 Four Factors

5.5 Densities, Percentiles, and Z Scores

5.6 Specifc Game Evaluation

5.7 Computing Estimated Probabilities

5.8 Z-Scores

5.9 Using the Four Factors to Predict Wins and Losses

5.10 Research Block: Is the season over after 20 games in the NBA?

5.11 Shot Charts

5.12 Lab Five: NBA Shots and Animation

5.13 Case Study: Should We Trust The Process? Evaluating Talent in the NBA Before They Arrive

5.14 Exercises

**Chapter 6: Football**

6.1 R Packages

6.2 If you don’t know anything about Football

6.3 Why Football Analytics?

6.4 The Coach’s Dilemma: What to do on Fourth Down?

6.5 Expected Points

6.6 Play-by-Play Data

6.7 Field Goal Success vs. Distance

6.8 Decision Making and Expected Points

6.9 Simulation

6.10 Research Block: Using analytics for evaluating defensive players

6.11 Win Probabilities

6.12 Simulation with NFLSimulatoR

6.13 Conclusion

6.14 Case Study: Overtime Strategy in the NFL

6.15 Exercises

**Chapter 7: Hockey**

7.1 R Packages

7.2 If you don’t know anything about hockey

7.3 What you will need to complete this chapter

7.4 Exploring Ice Hockey through Basic and Advanced Statistics

7.5 Corsi and Fenwick metrics

7.6 Time On Ice (TOI) by Positions

7.7 Evaluating Players

7.8 Research Block: Fighting in the NHL

7.9 Accessing the NHL API

7.10 Shiny Application

7.11 Case Study: Pulling the goaltender

7.12 Exercises

**Chapter 8: Soccer**

8.1 R Packages

8.2 If you don’t know anything about soccer

8.3 Soccer Data

8.4 Clustering

8.5 Research Block: When and How to Pass the Ball?

8.6 Hierarchical Clustering

8.7 Gaussian Mixtures

8.8 Case Study: Soccer Roster Economics

8.9 Lab: Goalkeeper Styles in the EPL

8.10 Exercises

**Chapter 9: Golf**

9.1 R Packages

9.2 If you don’t know anything about golf

9.3 The Evolution of Golf Analytics

9.4 Advanced Golf Metrics

9.5 Exploring Golf through Basic and Advanced Statistics

9.6 Cluster Analysis

9.7 Research Block: Does Par on a Hole Matter?

9.8 Lab: Simulating the Cut

9.9 Case Study: Ranking Golfers from Diferent Tours Against Each Other

9.10 Exercises

**Chapter 10: Sport Wagering and Daily Fantasy Sports**

10.1 R Packages

10.2 If you don’t know anything about Sports Wagering

10.3 Sports Wagering and Morality

10.4 Sports Wagering and Legality

10.5 Basics of Sports Wagering

10.6 The role of the bookmaker

10.7 Popular Types of Wagers

10.8 Using Analytics to Set Market Prices

10.9 Displaying and Calculating Market Prices

10.10 Straight Wagers vs. Parlays

10.11 Research Block

10.12 Kelly Criterion

10.13 Case Study: Stevin Smith, Tim Donaghy, and the issues of sports fixing

10.14 Daily Fantasy Sports

10.15 Lab: Scraping Odds Data to Build Models

10.16 Conclusion

10.17 Exercises