Proposal

Handbook of

**Statistical Methods for Design and Analysis in Sports**

1. Co-Editors
   * James H. Albert
   * Mark E. Glickman
   * Tim B. Swartz
   * Ruud H. Koning
2. Outline
   * Background

In the past decade, researchers and sports professionals have seen an explosion in the proliferation of data collected on a variety of aspects of sports. Motion-tracking technology has permitted the accumulation of detailed information on player-level dynamics, and large data archives for sports have become much more accessible world-wide. The opportunities for statistical research in sports have correspondingly grown immensely, as reflected in dedicated journals to the subject area. Two examples are the Journal of Quantitative Analysis in Sports founded in 2006 and the Journal of Sports Analytics founded in 2014. Monographs such as “Statistical Thinking in Sports” (2007, ed. Albert and Koning) consist of a general array of statistical articles, but are not designed to provide the reader with a complete survey of the state-of-the-art methods in statistics in sports. Despite the existence of outlets for scholarly research in statistics in sports, we are unaware of any basic reference for statistical researchers and students with an interest in sports applications to learn about the fundamental background, problems and ongoing challenges in statistical methods in sports.

* Aims

This handbook will provide both overviews of statistical methods in sports and in-depth treatment of critical problems and challenges confronting statistical research in sports. The material in the handbook will be organized by major sport (baseball, football, hockey, basketball, and soccer) followed by a section on other sports and general statistical design and analysis issues that are common to all sports. This proposed monograph has the potential to become the standard reference for obtaining the necessary background to conduct serious statistical analyses for sports applications and to appreciate scholarly work in this expanding area.

* Intended Readership

This proposed handbook has three potential audiences. First, the handbook can serve as the basis for a graduate course or seminar in statistical methods in sports. Using the handbook in this fashion can take advantage of connections between the methods typically used in a sports context with methods that graduate students are learning in coursework less focused on a specific application. Second, the handbook can serve as a reference for statistical practitioners in professional sports who may not be aware of the breadth of statistical issues and problems in their area, or who may simply want a refresher in the problem areas they are likely to encounter. Finally, the handbook can provide statistical researchers who are interested in delving more into sports applications the requisite background to produce sound scholarly work that is set in a proper context.

* Timeline
  + January 1 – January 31, 2015: Proposal reviewed by CRC. Co-editors produce guidelines for authors, including notation, style, level, approach, definitions, and so on. Co-editors approach potential authors.
  + February 1 – March 31, 2015: Co-editors invite tentative authors for all chapters and finalize chapter list, assuming CRC accepts the handbook proposal.
  + September 30, 2015: First drafts are due.
  + October 1 – December 31, 2015: Co-editors review assigned chapters and provide feedback to contributing authors.
  + January 31, 2016: Final drafts are due.
  + February 1 – February 28, 2016: Co-editors make final edits, and the finalized chapters are submitted to CRC.
  + April 1, 2016: Book in print prior to the 2016 Joint Statistical Meetings in Chicago, IL.

1. Table of Contents

The handbook is divided into seven parts, the first five by sport. Each of the first five sections will include an introductory chapter that provides an overview of the sport and the general statistical issues relevant for critical understanding of the ensuing chapters in that section.

Part I : Statistical Issues in Baseball (Jim Albert will coordinate)

* Evaluation of batters and base runners
* Evaluation of fielding
* Pitching expertise and evaluation
* Situational effects, clutch ability, and streakiness

Part II: Statistical Issues in Basketball (Mark Glickman will coordinate)

* Player performance evaluation through scoring margins i.e., adjusted plus/minus and related ideas
* Evaluating player performance using spatio-temporal information
* Modeling within-game progress in basketball
* Experimental design in basketball
* Referee effects in basketball
* Might replace one of the above with “hot hand” analysis (e.g., within-game progress)

Part III: Statistical Issues in Hockey (Tim Swartz will coordinate)

* Referee effects in ice hockey
* Improvements of plus-minus systems for measuring player performance
* Modeling and prediction of game results
* Evaluating goaltenders

Part IV: Statistical Issues in Soccer (Ruud Koning will coordinate)

* Measuring players’ abilities
* Measuring team abilities (home advantage, individual teams in national leagues; teams in international leagues, national teams)
* Models for the outcomes of scores in soccer games
* Refereeing and rough play (incidence and consequence of yellow/red cards))
* Effectiveness of within-season coach dismissal
* Match fixing and betting on soccer matches

Part V: Statistical Issues in American Football (Jim Albert and Mark Glickman will coordinate)

* Measuring performance of quarterbacks and kickers
* Predicting career success of players
* Optimal strategies in kickoffs and 4th downs or more generally optimal within-game strategy
* In-game win probabilities and prediction of game results

Part VI: Statistical Issues in Other Sports (Tim Swartz and Ruud Koning will coordinate)

* Research Directions in Cricket
* Handicapping and the Use of Shotlink Data in Golf
* Olympics: determining the best Olympic performances and measuring the gender gap in performance improvement, development of records
* Tennis: relation of player performance and ranking