Notes from the Court: Some Practical Ideas for Doing Analytics

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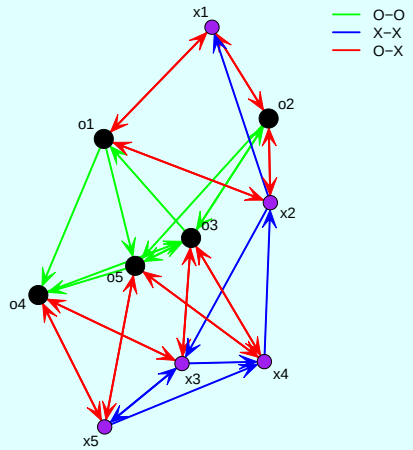

Overview

1. Who is this person?
2. What do we mean by "Analytics?"
3. Analysis Tips to Consider
4. Sports Statistics: Culture, Projects and Data Management

Introduction

- PhD candidate in the statistics department.
- Actually came to UCLA as a PhD student in political science; Switched to statistics after my adviser left UCLA.
- Study network methods, sampling and model selection.
- Interested in applications in politics, culture and sports.
- Hold degrees in economics, public policy and philosophy. (Ahhh ... student debt!)
- Taught English in a small town near Nagasaki, Japan.
- Worked for the LA Lakers as the primary data analyst for 3 years.
- Club athlete in college (water polo).
- Husband and father.

On Analytics

Main Ideas

- Analytics could be defined as the application of scientific techniques to produce results communicated to decision-makers.
- Projects work well when the goals are clearly understood by the analyst and the final consumer of the research.
- The method(s) chosen should depend upon the goal of the research, type of data available and time horizon.
- Role of an analyst can vary greatly between institutions.
  - Does your supervisor know much about statistics?
  - Do you work on a specific problem or a variety of projects?
  - Is the data difficult to access, store and manipulate?

- Designing Experiments and Surveys: examples include randomized trials, conjoint analysis, opinion research.
- Collecting Data: survey implementation, web scraping, field work, case study.
- Database Management: Design system to efficiently store, query, explore, and manipulate data.
- Creating Visualizations and Data Tables: dashboards, reports, apps, exploratory analysis.

- Building Models: estimate return on some attribute, power rankings for team sports, find expected time to injury for a player.
- Hypothesis Testing (Answer questions posed by decision-makers):
- Forecasting: predict some quantity of interest each quarter, compute counterfactual circumstances, Draft preparation models.
- Strategy (Decision Theory/Game Theory/Statistical Mechanics): when to foul, how far is too far for threes, geometry and play success.
- Communicate analysis to various audiences in written and oral format in meetings and presentations.

On Analytics

My Personal Bias

Play Pause

- Subject Matter Knowledge Matters
  - Must know what to study.
  - Cannot evaluate assumptions without some degree of knowledge.
  - Do you have competing theories to explain your data?
- Focus on exploratory analysis of complex data sets
  - Do simple things and visualize the results.
  - Use dimension reduction techniques.
- Use causal methods when appropriate and interpret them as such.
- Do not rely on the same set of procedures: If a computer can do your job, you may not have it for very long.
- *Parsimony* and *interpretability* are desirable, but may be unrealistic.
- Proudly report null results when they arise.

On Analytics

My Personal Bias

- Preprocess complex data to aid analysis.
- Implement several methods to check robustness of results.
- Use model selection techniques (preferably Bayesian) when no single data-generating mechanism is evident.
- Take responsibility for your analysis: You ARE partially responsible for actions taken based upon your work.
- Follow principles of data ethics.
- Data does NOT *speak for itself*: the world has never told us anything about how it works.
- Use qualitative information. The quantitative/qualitative distinction should not limit you.

TNT on Analytics in Sports

- Actual quote from a meeting, "Look, none of us have much faith in academic research, but ..."
- Analysts need to work well with non-technical staff to generate and implement ideas.
- Statistics is one of many ways to learn from experience. Be humble - your presence may threaten others.
- Is scouting a form of analytics? (Question asked to crowd at MIT Sloan Sports Analytics Conference by Mike Zarren of the Celtics).

Statistics in Sports

What do Analytics Staffers do?

- Quantitatively scout opponents
- Study the draft
- Construct and evaluate trades
- Analyze lineups
- Suggest roster changes
- Assess risk of injury to players
- Model league standings
- Adjusting strategy
- Collect data from practices
- Design player development plans
- And much more ...

Statistics in Sports

Managing and Using SportVu Data

- Spatio-temporal information from sports contests: soccer, hockey and basketball.
- Six cameras in the rafters.
- Contains id codes for players, location (x, y coordinates) of all players and the location of the ball (x, y, z) at intervals of .04 seconds (25 times per second).
- Camera records data continuously so analysts must be careful not to include observations from timeouts or intermission.
- Length of data varies (overtime, lots of free throws, player injuries, delay in game), but typically 200,000 observations per game.
- Could use SQL within R to develop with the data. In general, it was easier to load a single game or quarter at a time.
- Competitors such as Second Spectrum are working on improving the camera-generated data (shorter time intervals, z coordinate for players).

- Data arrives early each morning (4 AM) in XML format (JSON also common).
- An automated script loads the new data into Hadoop.
- A processing script loads the new data and creates a set of processed files in table form.
- These processed files are aggregated at the possession, game or season level.
- Examples include: identifying drives, computing workloads (acceleration over time), analyzing passes, computing geometric quantities such as the area of a convex hull, etc ...
- An analysis script runs on the processed data and produces a written report.

- Start doing analytics by publishing results on a blog.
- Attend meetings such as the MIT Sloan conference and the New England Symposium on Statistics in Sports (NESSIS).
- Volunteer to work for a high school or college team.
- Apply for a job at a sports analytics or media company.
- Network, network, network.
- The truth is that most jobs with teams are very hard to get as teams tend to hire people they know over outsiders.
- There is a need for theory to make better use of the data - this is the focus of some of my work.

Statistics in Sports

Emerging Opportunities

- Professional, College, High School and AAU teams.
- Sports Analytics and Finance.
- Sports Analytics and the Media.
- Academic Positions.

Thank you!