BradleyTerry2: Flexible Models for Paired Comparisons

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There are many situations where a binary choice is made between two objects—two sports teams compete against each other to win a match, for example, or survey participants are asked to indicate their preference given two options, say. In such situations, the Bradley-Terry model may be used to model the odds of one object, or 'player', beating the other. The model assumes that each player has some 'ability' and that the odds of one player beating another are given by the ratio of the corresponding abilities.

The standard Bradley-Terry model estimates a separate ability parameter for each player, however the model can be modified in several ways. For example, it may not be reasonable to assume constant ability in situations where players gain in experience or the outcome of a contest can depend on the conditions under which the contest occurs. In such cases, contest-specific variables should be included in the model. Another possibility is that the substantive interest lies in the dependence of player ability on covariates. In this case, the player abilities may be modeled by a linear predictor rather than individual parameters, however random effects should then be added to allow for variability between players with the same covariate values.

This talk presents the **BradleyTerry2** package, an extended version of the **BradleyTerry** package (Firth, 2005) with a more flexible interface. The facilities for model specification allow variables that vary by contest, player, judge, or any other relevant index and also allow specification of random effects. An implementation of the Penalised Quasi-Likelihood algorithm (Breslow and Clayton, 1993) is provided for mixed models. In the talk, a number of applications will be presented that illustrate the main features of the new package and future developments will also be discussed.

References

Breslow, N. E. and Clayton, D. G. (1993). *JASA*, 88(421), 9–25.

Firth, D (2005). Bradley-Terry Models in R. *JSS*, 12(1).