

Abstract

Title: New data-driven rating systems for association football

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In this thesis we discuss, analyse, develop and evaluate the methods for building accurate team ratings in sports with a particular focus on association football. We present several well-founded baseline approaches and how they can be optimised to yield even better results in terms of match outcome prediction accuracy. Further, we also present a bottom-up approach which is based on deriving team ratings via individual player ratings. We demonstrate that this approach constitutes an accurate rating system, provided that the player ratings are of good quality. We also present the theory underlying the prominent Elo model. This serves as an inspiration for developing new, accurate as well as interpretable rating systems. We propose several such schemes in which the ratings are updated after consecutive matches using transparent update rules. Finally, different models are compared on a quantitative basis via extensive simulation experiments.

As a further development of the bottom-up approach toward accurately measuring player skills, we propose a new model for player movements. The model is estimated using positional data that describe exact player positions during a match at a high frequency. It serves as a basis for match situation analysis, for which deriving zones of control is one of the most important applications. We show that the model possesses intuitive properties and evaluate it against standard approaches based on physical models of movement. In turn, it can be used to devise player and, in the next step, team ratings.

As for applications, we discuss how team rating models can be used to evaluate different league formats. This is an important issue in tournament design as domestic league formats vary significantly from country to country and can change from year to year. Using team rating systems as the true measurement of team strengths we compute objective metrics for tournament efficacy based on the agreement between the theoretical ranking and final league table. This study may help decision makers in sports to choose the optimal design that produces the most accurate team rankings.