



Thesis Proposal at the Chair of Sports Analytics @ Saarland University

Chair of Sports Analytics, Saarland University

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1 Expected Goals Based ELO Rating for Team Strength Estimation in Football (ID: xG_ELO_Rating)

Traditional ELO rating systems are widely used in football to estimate latent team strength and to forecast match outcomes [1, 2, 3, 4]. Their main advantage lies in their simplicity and interpretability: after each match, the rating of both teams is updated based on the expected result and the observed match result. However, classical ELO approaches are strongly dependent on final outcomes such as win, draw, or loss, and in some extensions on goal difference [1, 3]. This creates an important limitation, since football results are often heavily influenced by randomness, finishing variance, red cards, penalties, refereeing decisions, and other short-term stochastic events.

Recent research has shown that betting market expectations often contain more predictive information than the observed match result itself [5], because betting odds reflect collective expert judgment and a broader underlying probability distribution rather than a single noisy realization. Similarly, the concept of Expected Goals (xG) provides a richer representation of team performance by evaluating the quality of created and conceded chances rather than relying only on scored goals.

This thesis aims to develop and evaluate an xG-based ELO rating system, where post-match expected goals are incorporated into the ELO updating mechanism instead of (or in addition to) traditional match results. The central idea is that xG difference may provide a more stable and informative signal of true team quality than binary outcomes or raw goal differences.

The student will investigate whether replacing the classical result-based update with an xG-based update improves:

- team strength estimation,
- probabilistic forecasting of future matches,

- robustness against short-term randomness,
- and interpretability of long-term team development.

Possible model extensions include:

- pure xG-ELO updates,
- hybrid models combining Result + Goal Difference + xG,
- comparison with betting-odds-based ELO models,
- and validation against league tables and market expectations.

The empirical analysis will be conducted using football match data from major European leagues across multiple seasons. Match-level data should include final results, goals scored, and expected goals values from StatsBomb open-source dataset. The predictive quality of the proposed model will be evaluated using probabilistic forecasting methods such as ordered logit regression and statistical measures including informational loss (log-loss) and proper statistical testing.

A further objective is to analyze whether xG-based ratings provide more realistic assessments of team quality than traditional ELO systems, particularly in special cases where final results may be misleading (for example overperforming or underperforming teams across a season).

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Scope: Master Thesis

Recommended pre-requisite: Programming skills

References

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