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Analysis of Player Performance and Transfer Values with Machine Learning

Abstract

Probably one of the most important problems in professional football is to forecast with high accuracy the transfer value of the players, which is done using subjective valuations and simple statistical methods. The project tries to introduce machine learning into the valuation of the players by using a dataset extracted from Football Manager 2024 and Transfermarkt, including technical, physical, mental, and general performance metrics. In this respect, four machine learning algorithms have been realized and evaluated with the key performance indicators of Linear Regression, Random Forest, Gradient Boosting, and Support Vector Regression. Among these, Gradient Boosting had the best predictive performance, with a 15.50 million € MAE and 0.25 R². Feature importance analysis done indicated that the most important technical features driving transfer value were finishing and passing, with strength and endurance being the relatively unimportant physical features. These findings confirm the potential of machine learning for improvement in data-driven decision-making within sports analytics and football clubs with regard to player recruitment and mitigation of possible financial risks.

Introduction

The correct valuation of football players' performance and the forecast of their transfer values are the crucial tasks of modern football management. Traditional approaches using subjective valuations and simple statistics often fail to capture the complexity of player attributes and market dynamics. As the economic stakes in football increase, data-driven approaches have become crucial for clubs to optimize their recruitment and minimize financial risks.

Machine learning offers an advanced set of tools for analysis that can be performed on player performance, making use of big datasets of technical, physical, and general attributes. The following case study takes a closer look at the application of four machine learning algorithms-namely Linear Regression, Random Forest, Gradient Boosting, and Support Vector Regression-on predicting transfer values using data from Football Manager 2024 and Transfermarkt. It is aimed at finding the best algorithm while studying the impact of key player metrics on transfer predictions.

The findings contribute to sports analytics by showing how machine learning can be used to improve decision-making processes with actionable insights that will help improve player valuation and financial planning in football..

Background and Related Work

Background

Machine learning integrated into sports analytics has changed the game in player performance evaluation and transfer value predictions in professional football. In essence, traditional approaches based on subjective assessment and simple statistical models usually lack the accuracy and objectivity that the complexity of player performance and market dynamics requires. As a contrast, machine learning allows the analysis of big amounts of data to uncover patterns and relationships which otherwise would not be noticed.

Using machine learning models based on data of individual player stats, match performance, historical transfer values, and current player form, the insights provided are real-time and post-match. This enables managers, analysts, and scouts to make evidence-based decisions on player recruitment, transfers, and performance improvement. Emerging technologies like computer vision and wearable devices extend player evaluation to endurance, sprint speed, and positional tracking. With their help, machine learning, combined with other advanced technologies, has become irreplaceable in contemporary sports analytics.

Related Work

Substantial steps have been taken to apply machine learning in predicting the performance of players and their transfer values. For instance, (Cao et al., 2023) developed an action-evaluator model for visualizing the performance of soccer players that improved decision-making in tactical and recruitment contexts. Similarly, (Sun et al., 2022) proposed an intelligent optimization algorithm for tracking player movements in order to allow more precise performance evaluations. In fact, (Wang et al., 2021) considered machine learning models to forecast World Cup results as an application and extension of different approaches for carrying out football-related analyses.

Although there have been several studies about player evaluation in the past, previous research is deficient in the