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Swimming performance prediction of elite swimmers

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As a result of technological advances, there is an abundance of game performance data available in several sports. Accordingly, performance prediction models also have become increasingly popular in sports science. These models help to plan and improve their training activities. In this study, two different machine learning approaches were used to predict the performance time of elite swimmers for the 100 m freestyle and butterfly swimming events. Physiological features and performance times of 100 m freestyle and butterfly stroke on 1235 swimmers were obtained from World Olympic games database. After analyzing and pre-processing the dataset, Multiple Linear Regression (MLR) and Artificial Neural Networks (ANN) models were optimized using k-fold cross-validation and hyperparameter tuning. The performance of models was compared using accuracy metrics (Mean Absolute Percentage Error (MAPE), R-squared (R^2), root mean square error (RMSE), Median Absolute Deviation (MAD)). The models were deployed in the same data segmentation for consistency. A multi-layer perception (MLP)-based ANN was trained to predict the performance times of swimmers. The obtained results indicated that the MLP-based ANN model achieves a higher accuracy (97.89%) when compared to the MLR model (97.76%). Moreover, the results showed that the age, height, weight, reaction time and types of swimming styles have a significant effect on the performance times of the elite swimmers. Overall, the ANN model outperformed the MLR model in predicting the performance times of elite swimmers for 100 m freestyle and butterfly events. The results also show that ANN perform well due to large number of data used in the study.

Keywords*:* Artificial Neural Network, k-fold cross-validation, multiple layer perception, multiple linear regression

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