The Olympic Games is a global sporting event where countries display their prowess. The prediction of the medal table has been one of the hot topics in the field of sports research and public attention, because the results of the medal table are affected by many factors, including the influence of famous coaches on the country's awards. Predicting the medal table is a challenging task, for which two models are developed: **the LightGBM prediction model for Olympic medals** and the **Multivariate linear regression** **model for the “great coach” effect**.

For Task 1, based on the LightGBMmodel. First, We filtered the features such as NOC, sport, Event, **athletes\_number ,**Year and **Host** for model training. The **R^2** values of the model were 0.9885 for the number of gold medals, 0.9872 for the number of silver medals, 0.9804 for the number of bronze medals, and 0.9916 for the total number of medals. The model was used to predict the awards of all countries and to count the countries that were likely to win their first medal.A confidence interval of 90% was set and the upper and lower limits of the prediction interval were calculated. **Scores were assigned to the different medals**, and the total country 2024 and 2028 medal scores were calculated to compare the advancing and retreating countries. Finally, we use Analytic Hierarchy Process to calculate weights for the number of gold medals, silver medals, and bronze medals and calculate weighted scores based on the number of medals a country has won in a particular sport, to analyze which sports are most important for different countries.

For Task 2, first, we searched for some of the time points when coaches changed nationality and processed the provided data to draw images to find evidence of the “great coach” effect.Based on Multiple linear regression, we **considered the lag of coaches' coaching**, so we added short-term (1-2 terms) and long-term (3-5 terms) coach\_lag1-2 and coach\_lag3-5 as features, calculated the **Pearson correlation coefficient** of each feature with the score, and screened a total of 10 features, and trained the short-term and long-term models usingMultiple linear regression model, and the **R^2** value of the model was 0.853. Finally, we chose three countries, the United States, Japan, and Great Britain, to derive in which sports it is recommended to hire a famous coach by comparing the historical average scores and the scores of the last three Olympic Games on each sport.

For Task 3, we mined unique findings related to the Olympic medal standings from the two models, analyzed the relationship between medal distribution and event participation, medal standings and **economic development level**, as well as the training system and scientific research support behind the medals, and gave recommendations for the Olympic Committee to refer to. Finally, we conducted a **sensitivity analysis** on the parameters year and total\_event of the Olympic medal LightGBM prediction model. The high sensitivity of these parameters helps to capture the potential impact of subtle changes on the number of medals, leading to more accurate predictions.