Gymnastic Report

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Contents

1 Rules Reminder

1.1 Apparatus

women(6): team all-around, individual all-around, vault, uneven bars, balance beam, and floor exercise
men (8): team all-around, individual all-around, floor exercise, pommel horse, still rings, vault, parallel bars, and high bar

Specifically,
For women: (4 apparatus)
BB = Balanced Beam
VT = Vault
FX = Floor Exercise
UB = Uneven Bars
For men: (6 apparatus)
VT = Vault
SR = (Still) Rings
PH = Pommel Horse
PB = Parallel Bars
HB = Horizontal Bars
FX = Floor Exercise

Note: VT indicates that only 1 vault was performed VT1 may indicate that only 1 vault was performed OR it could indicate the 1 st of 2 vaults that were performed

1.2 Initial Setting

Category	Men	Women
Total Athletes	96	96
Number of Teams	12	12
Athletes per Team	5	5
Total Athletes in Team Events	60 (12 teams x 5 athletes)	60 (12 teams x 5 athletes)
Individual Athletes (from countries without full teams)	36 (Max 3 per country)	36 (Max 3 per country)

1.3 Rules Summary

Phase	Rule
Team Composition	Each team consists of 5 athletes, but only 4 compete on each apparatus during the qualifying round.
Qualifying Round (4 up, 3 count)	4 out of the 5 athletes on each team compete on each apparatus. The top 3 scores on each apparatus are summed for team placement.
Team Finals (3 up, 3 count)	Top 8 teams from the qualifying round compete. Scores are based on the "3 up, 3 count" rule, meaning all 3 athletes' scores on each apparatus count towards the team total.
Individual All-Around Finals	Athletes must compete on all apparatuses in the qualifying round to be eligible. The top 24 athletes qualify, with a max of 2 gymnasts per country.
Apparatus Finals	The top 8 athletes on each apparatus from the qualifying round advance, with a maximum of 2 gymnasts per country.

1.4 Note: Qualifying Round

Individual Qualification: Countries that do not have a full team can qualify a maximum of 3 individual athletes per gender. These individual gymnasts are allowed to compete in the qualifying round to get into apparatus final.

Apparatus Participation: The individual gymnasts representing countries without a full team can participate on all apparatuses in the qualifying round. This allows them to be considered for both the individual all-around and apparatus finals.

1.5 Rules by Event

1.5.1 Team All-Around Event

Event	Rule
Qualifying Round	- Each team has 5 athletes. - 4 out of the 5 athletes compete on each apparatus. - Top 3 scores on each apparatus are summed for the team's total. - Top 8 teams based on this total advance to the final.
Team All-Around Final	- Qualifying scores are discarded; teams start fresh. - Each team can use any of its 5 athletes on each apparatus. - Scores of 3 athletes on each apparatus count (" 3 up, 3 count"). - Team with the highest total across all apparatuses wins.

1.5.2 Individual All-Around Event

Phase	Rule
Qualifying	- Athletes must compete on all apparatuses in the qualifying round to be eligible. - The top 24 athletes based on their combined scores across all apparatuses advance. - Maximum of two gymnasts per country can qualify for the individual all-around final.
Final	- Qualifying scores are discarded; gymnasts start fresh. - Gymnasts compete on all apparatuses. - Combined scores across all apparatuses determine final placements. - The gymnast with the highest total score is the winner.

1.5.3 Each Apparatus Event

Phase	Rule
Qualifying	- Athletes compete on their chosen apparatuses during the qualifying round. - The top 8 athletes on each apparatus advance to the final for that apparatus. - Maximum of two gymnasts per country can qualify for each apparatus final.
Final	- Qualifying scores for the apparatus are discarded; gymnasts start fresh. - Gymnasts compete on the specific apparatus for which they qualified. - The athlete with the highest score on that apparatus is the winner.

2 Data Organization

2.1 Basis Classes and Objects

Method	Description
Data Class	
initialize	Initializes the class with specified parameters.
set_load_dir	Sets the load directory.
load_all_data	Loads all CSV files from a directory.
get_load_dir	Returns the load directory.
check_data_name	Checks if a data name exists.
data_loader	Loads data from a directory.
add_or_replace_data	Adds or replaces data in the instance.
data_copier_fetcher	Fetches data with an option for deep copy.
group	Groups data by specified column(s).
append_items	Appends items to the data.
drop_items	Drops items based on specified conditions.
replace_items	Replaces items based on specified conditions.
filter	Filters data based on a user-defined function.
cleaner	Cleans data by handling specific conditions.
split_by_attribute	Splits data based on a specified attribute.
Gymnastic_Data_Analyst Class	
initialize	Initializes the class and performs additional data cleaning.
summary_for_each_athlete	Generates a summary for each athlete.
cleaner	Overrides the cleaner method for gymnastic data.
group	Overrides the group method for direct grouping by columns.

Table 1: Summary of Methods in Data and Gymnastic_Data_Analyst Classes

3 Predicting Model

In this section, we present an overview of the prediction model developed to analyze and forecast gymnastic performances. The model utilizes a combination of data processing and random simulations to predict outcomes in gymnastic events.

3.1 Simulation of Qualification and Final Rounds

The model simulates the qualification and final rounds for individual and team events. It employs random matrices to represent gymnast participation in various apparatuses, where 1 means participation and 0 otherwise, with scores generated based on real-world performance data. These simulations provide insights into possible outcomes in both team and individual events.

3.2 Predictive Analysis

For each apparatus and all-around events, the model predicts performances by analyzing scores given in history data and adding a random Gaussian noise factor to simulate qualification and final round performances. The model ensures a realistic distribution of medals among countries and athletes.

3.3 Medal Count and Summary

Finally, the model aggregates the results from simulations to predict medal counts for each country. This part of the model provides a comprehensive overview of potential medal distributions across different events.

4 Result

4.1 Medal Count

The simulations reveal the total number of medals won by each country for each of 1000 runs. We can do further analysis on this data to find its distribution based on 1000 runs, which would suggest the potential strength and consistency of various national teams in gymnastics.

4.2 Top Performing Countries

In men's gymnastics, Great Britain (GBR) and Japan (JPN) are among the top performers, consistently achieving high medal counts. In women's gymnastics, Italy (ITA) and Great Britain (GBR) emerge as leading countries, again indicated by their high average medal counts.

4.3 Comparative Analysis

The simulations indicate that the competition is intense among the top-ranking countries. By printing out the final scoring at each simulation, we can see that small differences in performance scoring can lead to relatively larger changes in medal distribution, show large variations in predicting final medal count outcomes.

Remark

We would like to express that translating Python code to R code is indeed a challenging task. We sincerely apologize for the projects written in Python; however, we would like to mention that we have dedicated several days to translating them. We kindly request future students in this course to refrain from attempting this, as it will ultimately result in a significant waste of time.

References