Optimizing Medal Count for the US Artistic Gymnastics Teams at the Paris 2024 Olympics

By: Anusha Bhat, Sarah Li, Shivani Ramalingam
Project Advisor: Ron Yurko

Introduction

- 2024 United States Olympic & Paralympic Committee Data Challenge Competition:
  - Objective: Determining the highest scoring combination of 5 male and 5 female gymnasts
- Goals:
  1. Exploring the relationship and correlation between different apparatuses
  2. Creating a model for generating medal outcomes for all competition events
  3. Using the model to pick the best teams

Data

- Data from 39 competitions held between 2022-2023 for 109 countries and 1,917 individuals
  - Athlete’s score for an apparatus in a round in a competition
- Men’s Apparatuses (6):
  - Floor Exercise, Pommel Horse, Still Rings, Vault, Parallel Bars, High Bar
- Women’s Apparatuses (4):
  - Floor Exercise, Uneven Bars, Balance Beam, Vault
- Important Variables: Name, Country, Apparatus, Round, and Scores
- Score triad: total score, execution score, difficulty score
- 3 data groups: US data, 11 other qualifying countries, remaining countries
- 3 finals: individual apparatuses, individual all around, team all around

Methods

- Predict medal outcomes for a certain US team given historical data and other fixed nations
- Fixed nations by assuming the top 4 athletes from each country
- Simulation using random sampling to model competition rounds
- For one round of the simulation:
  1. Qualifying: For all 96 athletes, randomly sample the score triad
     - From the athlete’s score distribution or their country’s if individual data is not available
  2. Determine which players advance to final rounds
     - 2 athletes/country for individual apparatuses & all around
     - 3 athletes for team all around; top 8 teams
  3. For each final event, sample scores for qualifying athletes
  4. Determine winners
  5. Count USA medals
- Model Outcome: Average medal count over 1000 rounds of simulation

Flowchart of the simulation model and the total number of medal winners for each event.

Results

- Positive correlation explained by individual athlete clusters.
- The apparatuses are positively correlated with each other.
- Team 6 resulted in the highest expected medal count, winning 7 out of 11 possible medals.
- The US team won 4 medals in Individual Apparatus, 2 medals in Individual All-Around, and 1 medal in Team All-Around.
- Average medal count over 1000 rounds of simulation
- Best women’s team: Simone Biles, Skye Blakely, Jordan Chiles, Shiles Jones, and 1 alternative player.
- Future works: mixed effects linear regression, weighted medal counts, and penalties in model

References

2. UCSAS 2024: UCSAS 2024 USOPC Data Challenge, statds.org/events/ucsas2024/challenge.html
3. UCSAS. GitHub, github.com/ucsas/gym2024data/tree/main