



Optimizing Success 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:
 - Exploring the relationship and correlation between different apparatuses
 - Creating a model for generating medal outcomes for all competition events
 - Using the model to pick the best teams

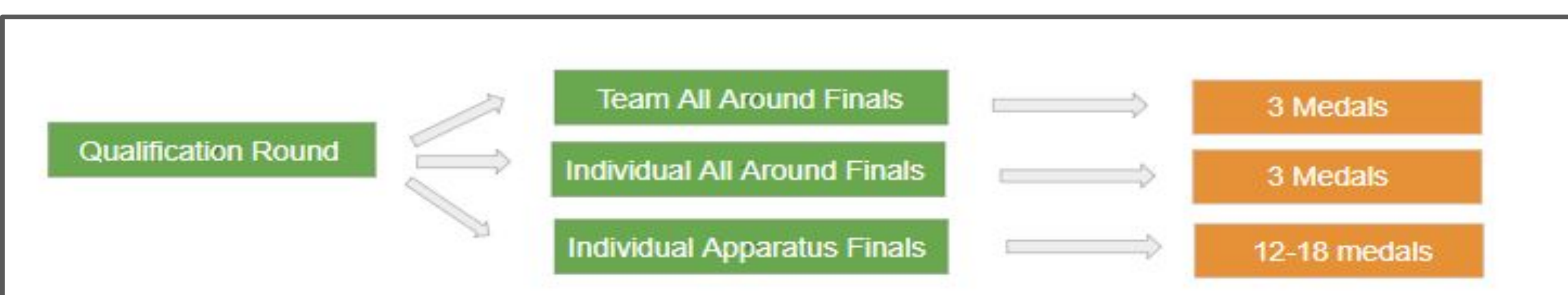
Data

- 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
- 3 finals:** individual apparatuses, individual all around, team all around
- The 12 countries that qualified have been determined
- Important Variables:** Name, Country, Apparatus, Round, and Total Scores
- Simulated Data:** Simulated scores using linear mixed effects regression (LMER)
 - $Score \sim (1|FullName) + (1|Country) + (1|Gender) + Apparatus$

Methods

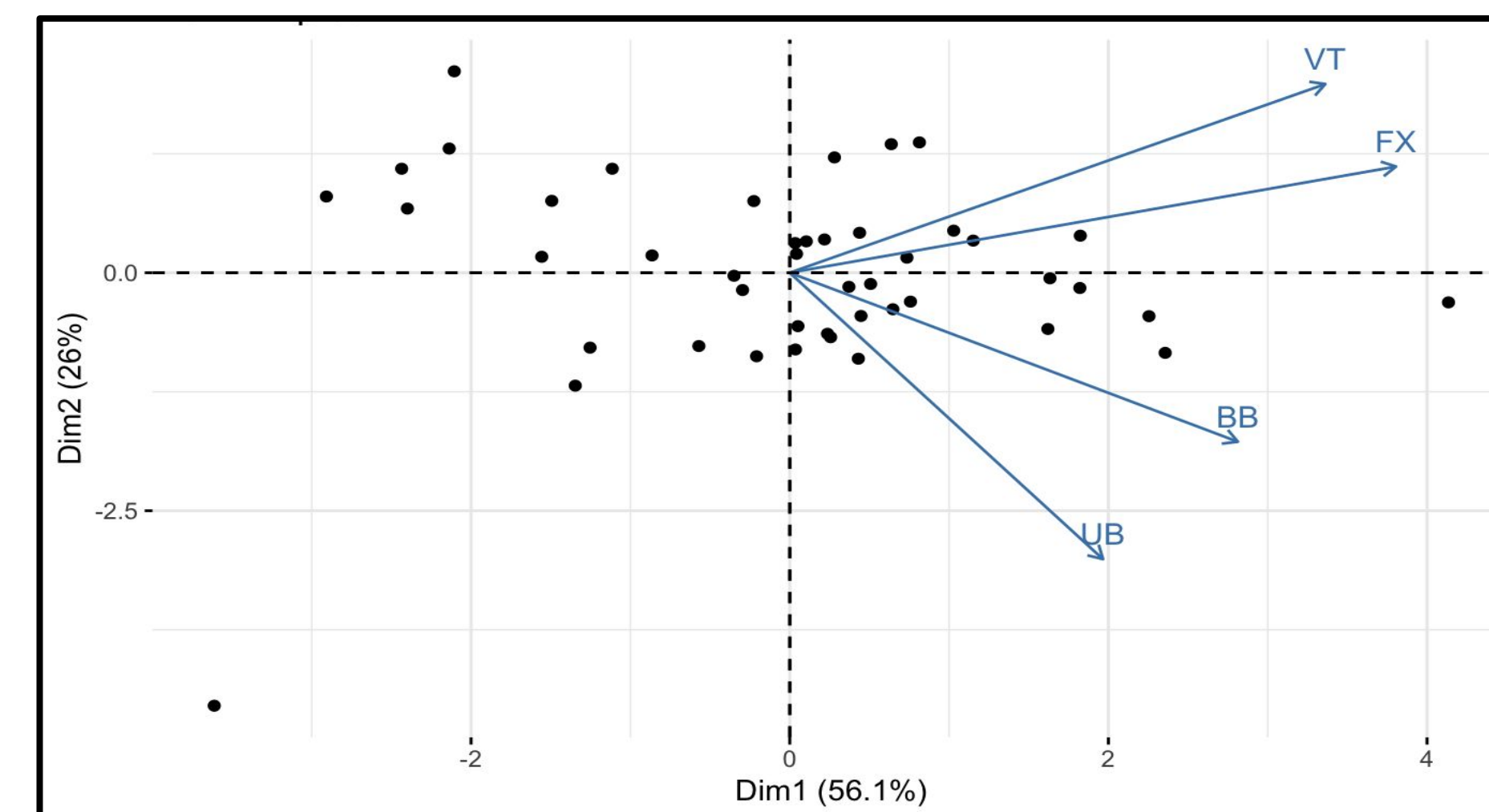
- Predict weighted medal outcomes for a certain US team given historical data and other fixed nations
- For one round of the simulation:**
 - Qualifying: For all 84 athletes, randomly sample the score from the LMER data
 - From the athlete's score distribution or their country's if individual data is not available
 - Determine which players advance to final rounds
 - 2 athletes/country for individual apparatuses & all around
 - 3 athletes for team all around; top 8 teams
 - For each final event, sample scores using from the LMER data for qualifying athletes
 - The name, country, and gender are fixed effects; the apparatus is a random effect
 - Determine winners
 - Count USA medals
 - 3 points for gold, 2 points for silver, 1 point for bronze
- Model Outcome:** Average weighted medal count over 100 rounds of simulation

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

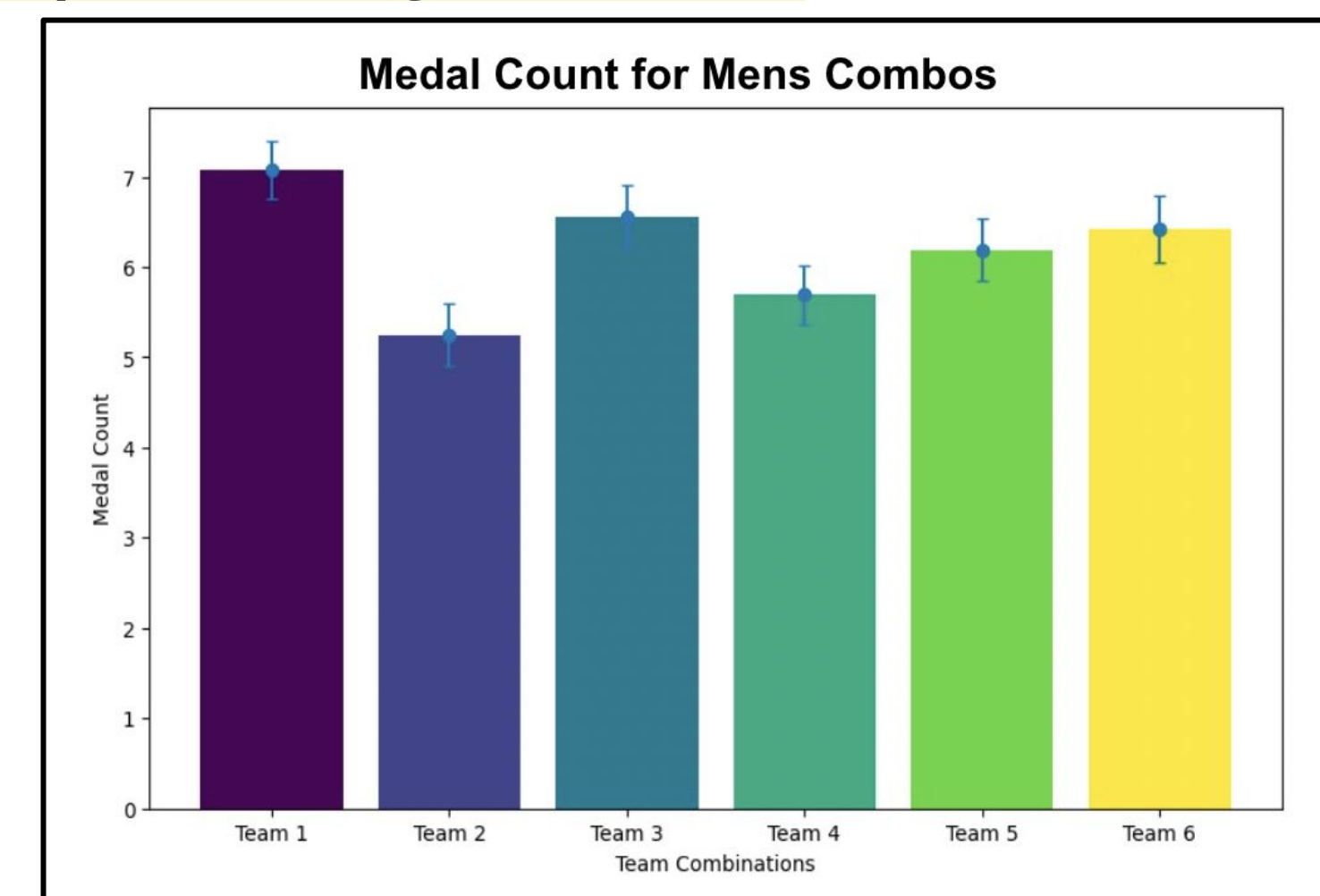


Results

The apparatuses are positively correlated with each other.



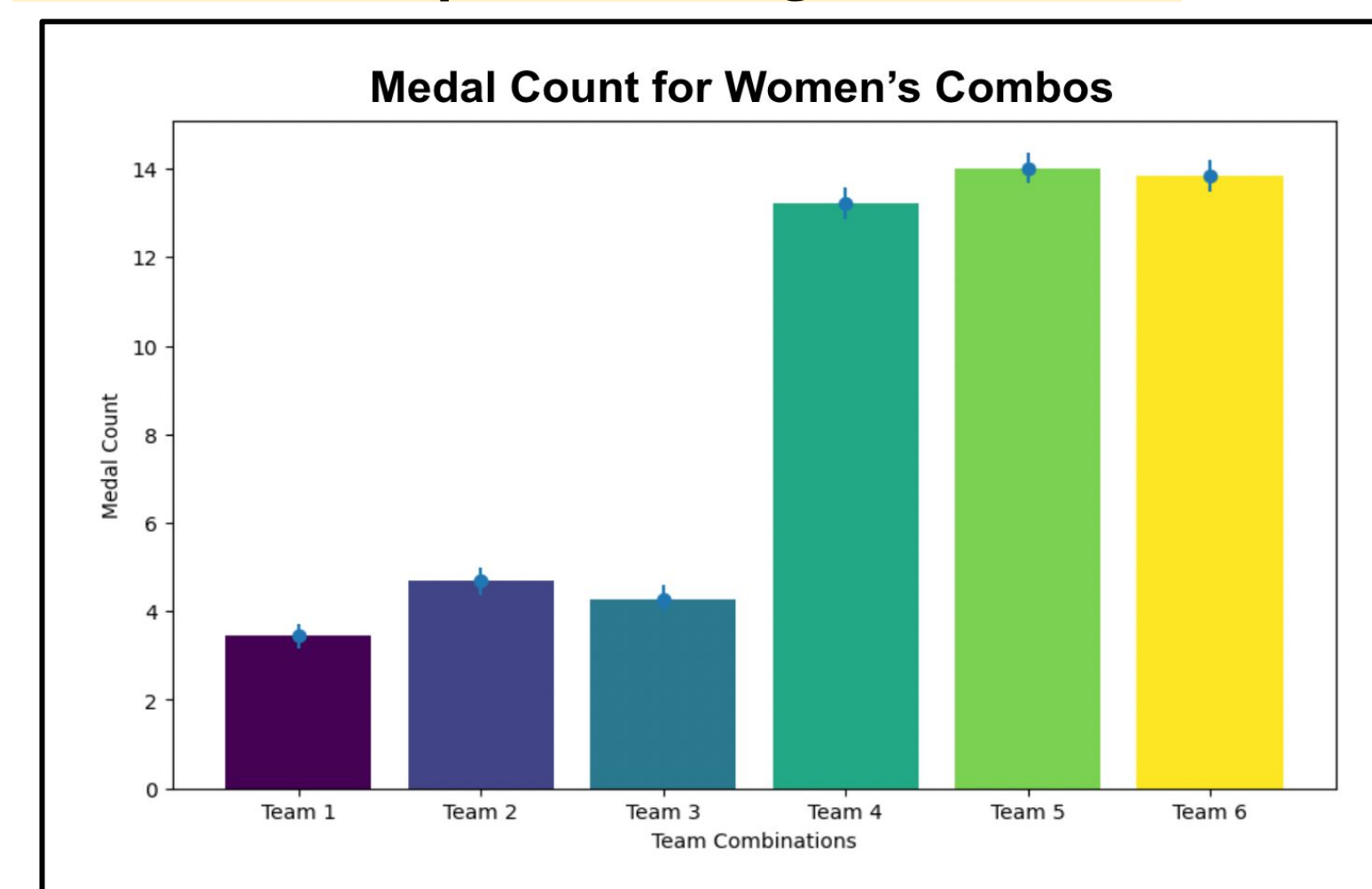
Team 1 resulted in an expected medal count of ~7.08 out of 38 possible weighted medals.



Top Mens Team

Curran Phillips, Brody Malone, Paul Juda, Frederick Richard

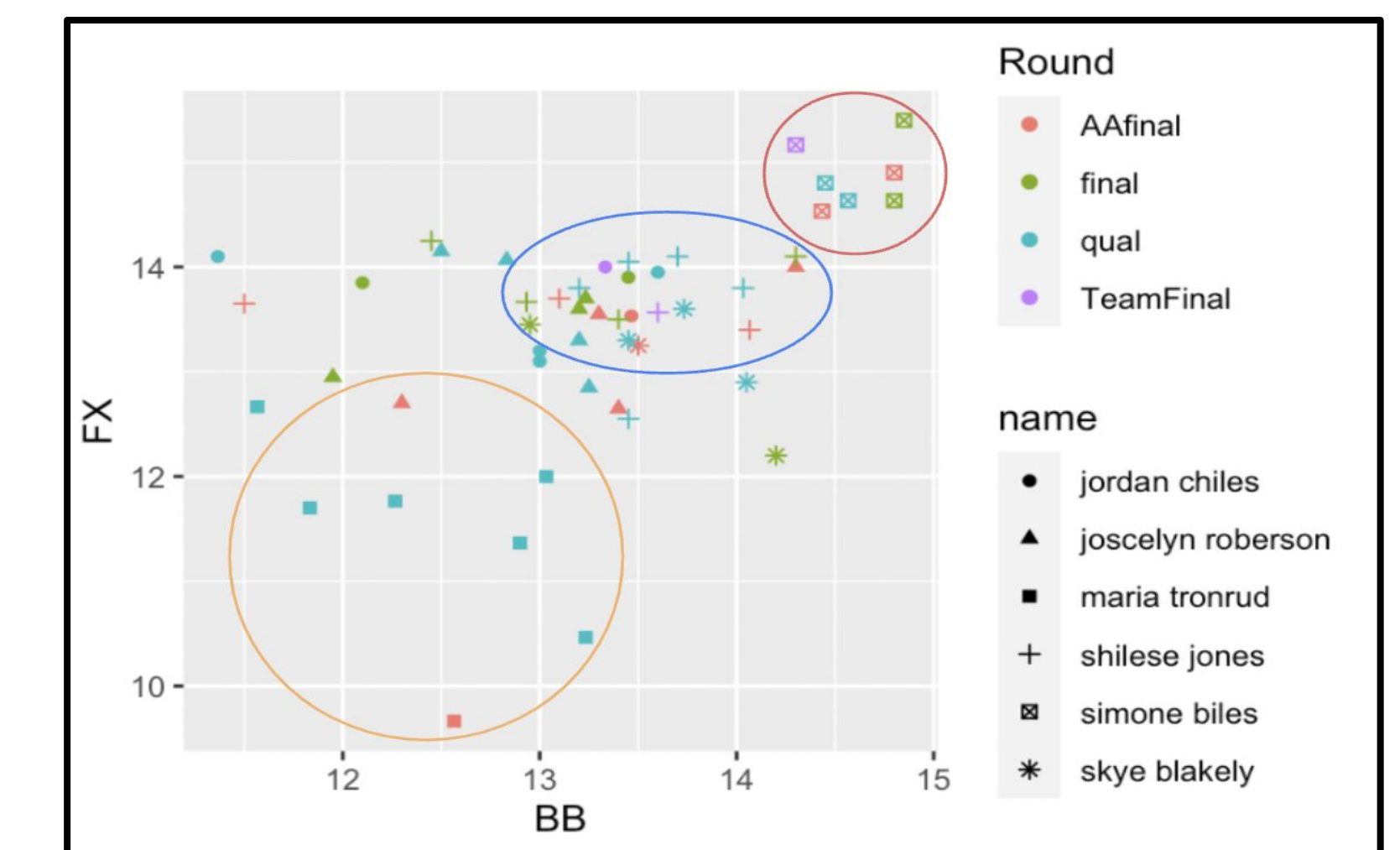
Team 5 resulted in an expected weighted medal count of ~13.8 out of 28 possible weighted medals.



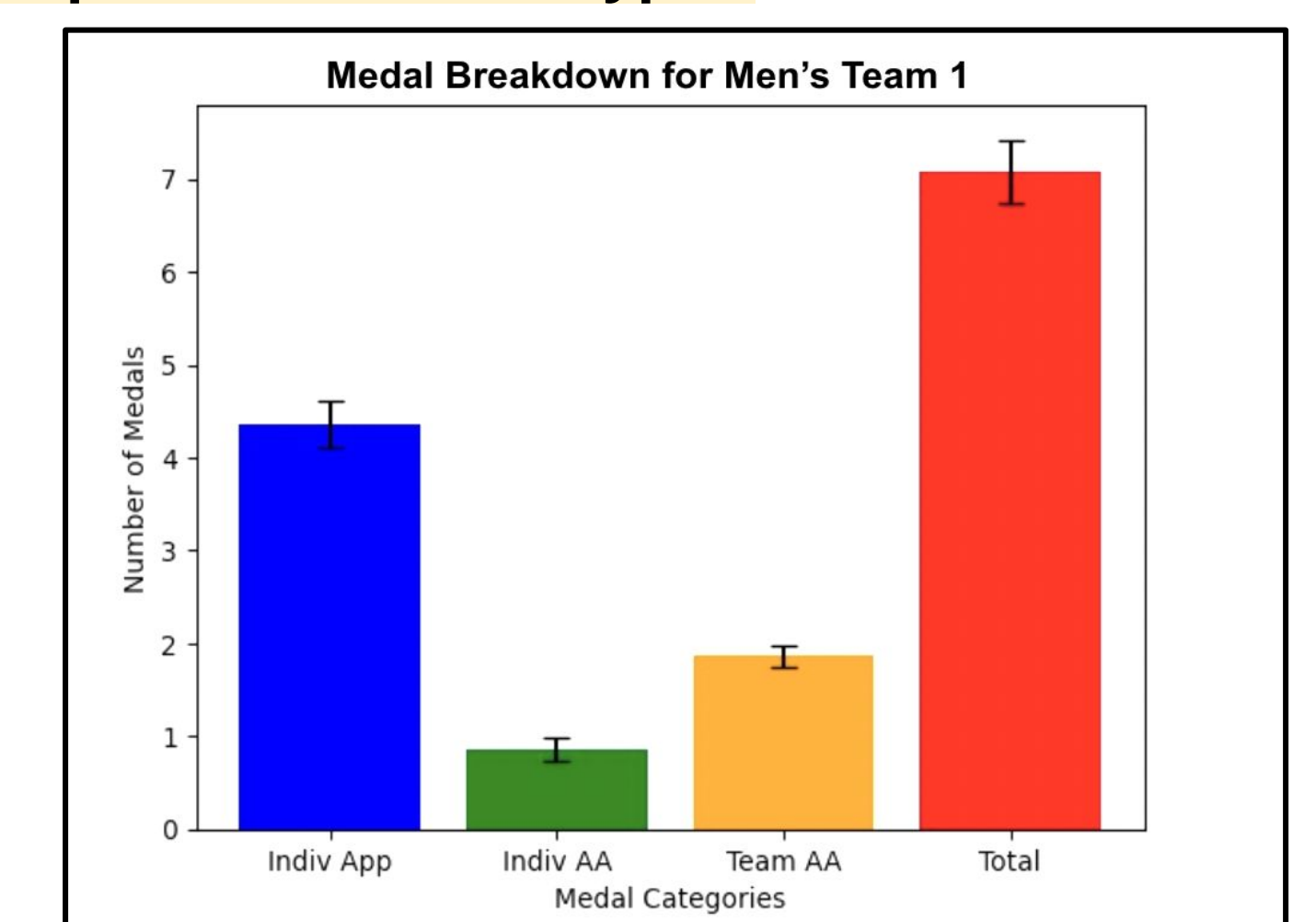
Top Women's Team

Simone Biles, Shilese Jones, Jade Crey, Konnor McClain

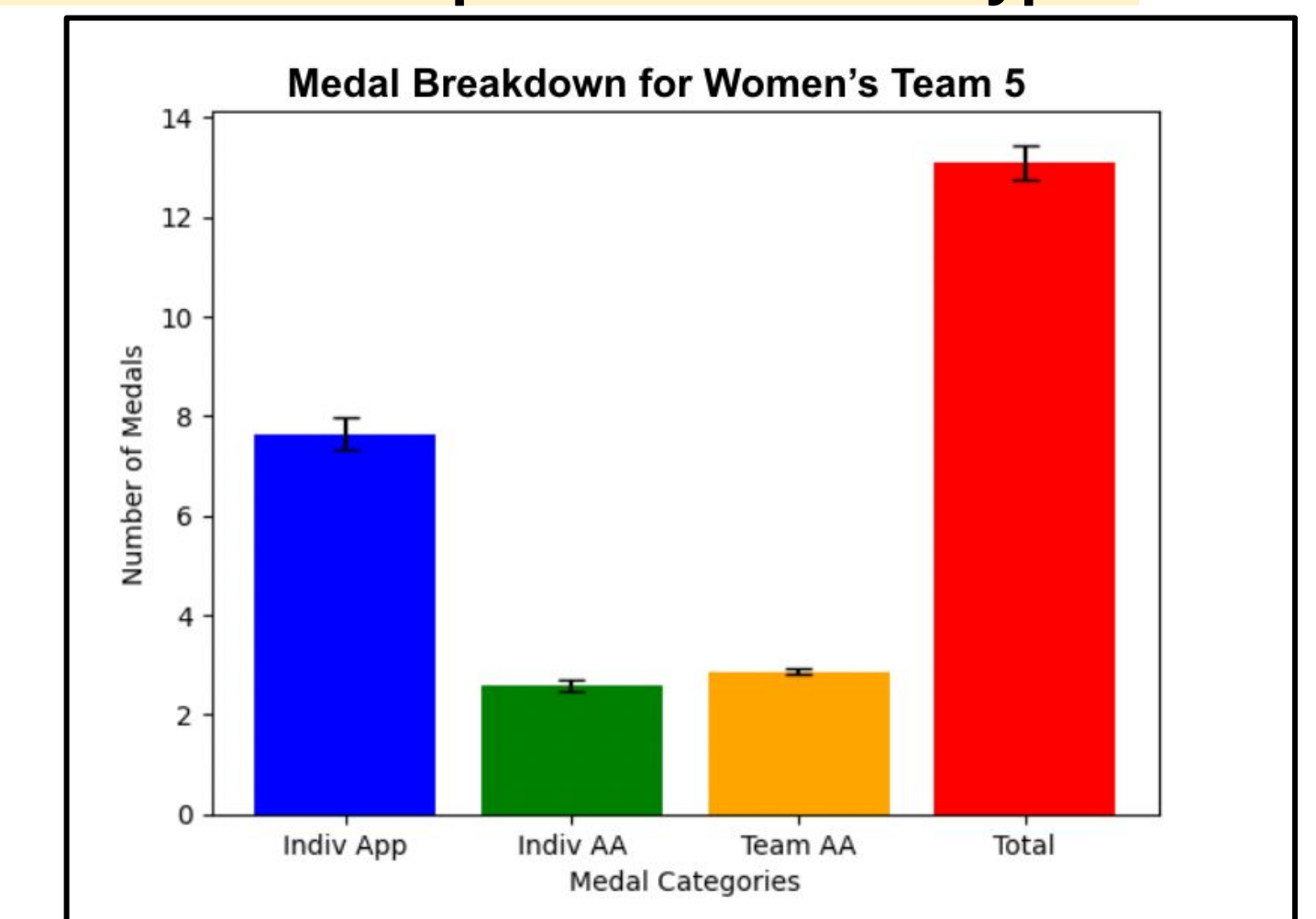
Positive correlation explained by individual athlete clusters.



The men's team is expected to win Silver for All-Around and place in all event types.



The women's team is expected to win Gold in Team All-Around and place in all event types.



Discussion

- Optimal women's team: Simone Biles, Shilese Jones, Jade Carey, Konnor Macclain
- Optimal men's team: Curran Phillips, Brody Malone, Paul Juda, Frederick Richard
- Skye Blakely and Asher Hong as alternative members

References

- "2022-2024 Code of Points World Artistic Gymnastics." Federation Internationale De Gymnastique, FIG Executive Committee, www.gymnastics.sport/publicdir/rules/files/en_2022-2024%20RG%20Code%20of%20Points.pdf. Accessed 6 Dec. 2023.
- UCSAS 2024 : UCSAS 2024 USOPC Data Challenge, stats.org/events/ucsas2024/challenge.html
- UCSAS. *GitHub*. github.com/ucsas/gym2024data/tree/main