

# School of Computer Science and Engineering

(Computer Science & Engineering)
Faculty of Engineering & Technology

Jain Global Campus, Kanakapura Taluk - 562112 Ramanagara District, Karnataka, India

**2023-2024** (VIII Semester)

A Project Report on

### "CAPSTONE PROJECT"

Submitted in partial fulfilment for the award of the degree of

# BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING

Submitted by

Ashwin B, BLN Wajith Ali, Mohd Zaid 22BTRAD006, 22BTRAD009, 22BTRAD025

Under the guidance of

Mr. Arnab Roy
Project Practice Head and Mentor
Futurense Technology



## Department of Computer Science and Engineering

School of Computer Science & Engineering
Faculty of Engineering & Technology
Jain Global Campus, Kanakapura Taluk - 562112
Ramanagara District, Karnataka, India

## **CERTIFICATE**

This is to certify that the project work titled "CAPSTONE PROJECT" is carried out by Ashwin B (22BTRAD006), BLN Wajith Ali (22BTRAD009), Mohd Zaid (22BTRAD025), a bonafide student(s) of Bachelor of Technology at the School of Engineering & Technology, Faculty of Engineering & Technology, JAIN (Deemed-to-be University), Bangalore in partial fulfillment for the award of completion of the Final Project of the First (1st) internship at Futurense Technologies 2023-2024.

Mr. Arnab Roy	Mr. Akash Das
Project Practice Head and Mentor	AVP and Project Manager at Futurense Technologies
Date:	Date:
Signature	

2.

1.

## **DECLARATION**

I/We, Ashwin B (22BTRAD006), BLN Wajith Ali (22BTRAD009), Mohd Zaid (22BTRAD025) student of 4<sup>th</sup> semester B.Tech in Computer Science and Engineering – AI & Data Engineering, at School of Engineering & Technology, Faculty of Engineering & Technology, JAIN (Deemed to-be University), hereby declare that the internship work titled "Capstone Project" has been carried out by us and submitted in partial fulfilment for the award of degree in Bachelor of Technology in Computer Science and Engineering – AI & Data Engineering during the academic year 2023-2024. Further, the matter presented in the work has not been submitted previously by anybody for the award of any degree or any diploma to any other University, to the best of our knowledge and faith.

Name1:	Signatur
Name 1.	Signatur

USN:

Name2: Signature

USN:

Name3: Signature

USN:

Place: Bangalore

Date:

#### **ACKNOWLEDGEMENT**

It is a great pleasure for me to acknowledge the assistance and support of a large number of individuals who have been responsible for the successful completion of this project work.

First, I take this opportunity to express my sincere gratitude to Faculty of Engineering & Technology, JAIN (Deemed to-be University) for providing me with a great opportunity to pursue my Bachelors / Master's Degree in this institution.

I am deeply thankful to several individuals whose invaluable contributions have made this project a reality. I wish to extend my heartfelt gratitude to **Dr. Chandraj Roy Chand, Chancellor**, for his tireless commitment to fostering excellence in teaching and research at Jain (Deemed-to-be-University). I am also profoundly grateful to the honorable **Vice Chancellor**, **Dr. Raj Singh, and Dr. Dinesh Nilkant, Pro Vice Chancellor**, for their unwavering support. Furthermore, I would like to express my sincere thanks to **Dr. Jitendra Kumar Mishra, Registrar**, whose guidance has imparted invaluable qualities and skills that will serve us well in our future endeavors.

I extend my sincere gratitude to **Dr. Hariprasad S A, Director** of the Faculty of Engineering & Technology, and **Dr. Geetha G, Director** of the School of Computer Science & Engineering within the Faculty of Engineering & Technology, for their constant encouragement and expert advice. Additionally, I would like to express my appreciation to **Dr. Krishnan Batri, Deputy Director (Course and Delivery), and <b>Dr. V. Vivek, Deputy Director (Students & Industry Relations),** for their invaluable contributions and support throughout this project.

It is a matter of immense pleasure to express my sincere thanks to **Dr. Aditya Pai,**Computer Science and Engineering, School of Computer Science & Engineering Faculty of

Engineering & Technology for providing right academic guidance that made my task possible.

I would like to thank our guide **Mr. Arnab Roy**, **Project Practice Head and Mentor**, for sparing his/her valuable time to extend help in every step of my work, which paved the way for smooth progress and fruitful culmination of the project.

I would like to thank our Project Manager, Mr. Akash Das, and all the Mentor at Futurense Techonologies for their support.

I am also grateful to my family and friends who provided me with every requirement throughout the course.

I would like to thank one and all who directly or indirectly helped me in completing the work successfully.		
	Signature of Student(s)	

### **ABSTRACT**

The Olympic Games, held every four years, serve as a global platform where top athletes showcase their skills, fostering unity while fueling intense competition among nations vying for supremacy in sports. At the heart of this spectacle lie the National Olympic Committees (NOCs), whose efforts in nurturing talent significantly impact their countries' success in medal standings. This study introduces a comprehensive analytical framework to evaluate NOC performance across different Olympic editions, offering insights into their past and present achievements in the global sports landscape.

Our methodology employs four Python functions tailored to assess various aspects of NOC performance. Firstly, the "calculate\_total\_medals" function aggregates the total medal count for each NOC, providing a baseline for comparing historical success rates. Complementing this, the "compare\_team\_performance" function enables visual and analytical comparisons between selected NOCs, revealing their strengths and weaknesses across different Olympic Games.

To refine our analysis, the "calculate\_medal\_success\_rate" function introduces a metric that normalizes medal counts based on the total number of participants from each NOC. This ratio offers a fairer measure of efficiency, considering the diverse sizes and resource allocations of countries. Lastly, the "track\_performance\_over\_time" function tracks the evolution of NOC success, presenting a longitudinal view that identifies trends of improvement, consistency, or decline in Olympic performance.

These analytical tools provide stakeholders in the sports ecosystem, including policymakers, sports managers, athletes, and coaches, with a comprehensive understanding of NOC performance. Beyond raw medal counts, our approach sheds light on the effectiveness of athlete development programs, strategic resource allocation, and the broader implications of sports policy decisions. Through this analysis, we aim to contribute valuable insights to the ongoing dialogue on sporting excellence, potentially informing future strategies for Olympic preparation and participation.

# **TABLE OF CONTENTS**

L	ist of Figures	V
L	ist of Tables	vi
N	omenclature used	vii
C	Chapter 1	1
1.	Introduction	
	1.1Background & Motivation	
	1.2Objective	
	1.3Scope of Analysis	
	1.4Significance of the Analysis	
C	Chapter 2	3
2.	DATA EXPLORATION	
	2.1 Overview of The Dataset	
	2.2 Data Cleaning and Pre-processing	
C	Chapter 3	5
3.	Athlete Analysis	
	3.1 Athlete Demographics	
	3.1.1 Descriptive Statistics (Age, Height, Weight, BMI)	
	3.1.2 Visualization of Demographic Distributions (by Gender)	
	3.1.3 Comparison of Demographics (Teams, Sports, NOCs, Medal Winners vs. Non-Winners)	
	3.1.4 Correlation Analysis (Demographics and Medal Success)	

C	Chapter 4	
4.	SPORTS AND EVENT ANALYSIS	
	4.1 Popularity of Sports and Events	
	4.1.1 Frequency Analysis	
	4.2 Athlete Participation Patterns	
	4.2.1 Co-occurrence Analysis	
	4.3 Medal Distribution Across Sports and Events	
	4.3.1 Analysis of Medal Distribution	
	4.4 Network Analysis	
	4.4.1 Co-occurrence Network of Athletes and Events	
C	hapter 5	14
5.	<b>Team and National Performance Analysis</b>	
	5.1 5.1 Medal Count and Ranking	
	5.2 Comparative Analysis on Team/NOC Performance Comparison	
	5.3 Medal Success Rate Calculation	
	5.4 Performance Over Time: Tracking Medal Counts/Success Rates Across Olympics	
C	Chapter 6	18
6.	Seasonality Analysis	
	6.1 Medal Distribution (Summer vs. Winter)	
	6.1.1 Comparison of Medal Distribution Across Seasons	
	6.1.2 Participation Trend Analysis (Summer vs. Winter)	

6.2 Emerging Sports (if applicable)

# 6.2.1 Identification of Sports Gaining Popularity

Chapter 7	
7. Conclusion	
7.1 Summary of Key Findings	
7.2 Limitations of the Analysis	
7.3 Future Work Recommendations	
Reference	X
APPENDIX – I	xi
APPENDIX – II	xii
INFORMATION REGARDING STUDENT	xiii
PHOTOGRAPH ALONG WITH GUIDE	xiv

# LIST OF FIGURES

Fig. No.	Description of the figure	Page No.
3.1.2	Visual representation of demographic distribution	5
3.1.3	Comparative analysis of athlete demographic	7
3.1.4	Correlation analysis	8
4.3	Medal Distribution	12
5.3	Success rate calculation	12

# **NOMENCLATURE USED**

IOC	International Olympic Committee	
NOC	National Olympic Comm	
DQ	Disqualified	
DNS	Did Not Start	
DNF	Did Not Finish	
TUE	Therapeutic Use Exemption	
WADA	World Anti-Doping	
GDP	Gross Domestic Product	
AI	Artificial Intelligence	
VR	Virtual Reality	

## 1. Introduction

## 1.1 Background & Motivation

The Olympic Games, renowned for their celebration of athleticism and international camaraderie, stand as a testament to human endeavor and excellence. Originating in ancient Greece, the Games have evolved into a global phenomenon, drawing athletes from across the world. The dynamics of athlete participation, performance, and the broader impact of the Games have captivated researchers and enthusiasts alike.

In today's era, with the rise of advanced data analytics and computational tools, we have an unparalleled opportunity to explore the intricacies of Olympic participation and success. Through the analysis of extensive datasets like the one at hand, our aim is to uncover patterns, trends, and insights that not only illuminate individual athletic achievements but also provide valuable perspectives on societal, cultural, and geopolitical factors influencing the world's premier sporting event.

## 1.2 Objectives

The primary goal of this analysis is to gain a comprehensive understanding of various aspects of the Olympic Games, including athlete demographics, sports popularity, team performance, seasonality, and more. Specifically, our objectives include:

- Exploring the demographics of Olympic athletes, such as age, gender, height, weight, and their correlations with medal success.
- Investigating the popularity of different sports and events over time, identifying trends and patterns in athlete participation.
- Analyzing team and national performance metrics, such as total medal counts, success rates, and comparative performance across regions.
- Examining the seasonal dynamics of the Games, including medal distribution between summer and winter editions and the emergence of new sports.

## 1.3 Scope of Analysis

While the dataset provides a wealth of information, it's crucial to delineate the scope of our analysis for focus and relevance. Our analysis will predominantly encompass data from Olympic Games across various years, seasons, and host cities. We'll delve into athlete demographics, sports and event popularity, team performance metrics, and seasonality trends. However, we'll refrain from delving into specific athlete performances or conducting in-depth qualitative analyses of individual sports.

## 1.4 Significance of the Analysis

Understanding the dynamics of the Olympic Games holds significant societal, cultural, and academic importance. Beyond the realm of sports, the Games serve as a microcosm of global society, reflecting broader trends in international relations, cultural exchange, and human achievement. Through a rigorous analysis of the dataset, our aim is to contribute to this body of knowledge, offering insights that may inform future Olympic policies, inspire athletes, and enrich our understanding of the human spirit's pursuit of excellence on the world stage.

# 2. Data Exploration

#### 2.1 Overview of the Dataset

The dataset encompasses a vast array of information crucial to understanding the participation and achievements of Olympic athletes. Comprising 15 columns, it includes key details such as ID, name, gender, age, height, weight, team affiliation, National Olympic Committee (NOC), specific Games attended, year of participation, season (Summer or Winter), host city, sport, event, and any medals earned.

With a substantial dataset consisting of 271,116 rows, we possess a solid groundwork for our analysis. Each row represents a unique athlete entry, offering valuable insights into the diverse individuals who have left their mark on Olympic history.

# 2.2 Data Cleaning and Preprocessing

Data cleaning and preprocessing are pivotal stages in ensuring the accuracy and reliability of our analysis. During this phase, we addressed missing values, standardized data formats, and introduced supplementary variables to enrich the dataset.

Initially, we replaced 'NA' entries with NaN values using the Pandas library, ensuring consistency across the dataset. Subsequently, we adopted a systematic approach to handling missing values within the 'Age', 'Height', and 'Weight' columns. By leveraging mean values based on specific events, we filled in the missing entries, maintaining the granularity of our analysis while minimizing data discrepancies.

Moreover, we computed the Body Mass Index (BMI) for each athlete, providing insights into their physical attributes. Derived from weight and height measurements, this metric offers a comprehensive view of athletes' health and fitness levels.

To facilitate interpretation and enable further analysis, we categorized athletes into distinct age groups, including 'Junior', 'Young Adult', 'Adult', and 'Midlife' stages. This segmentation allows for nuanced comparisons across different age brackets, revealing potential age-related patterns in Olympic participation and performance.

Through meticulous data cleaning and preprocessing, we have established a robust foundation for subsequent analyses, ensuring the accuracy, coherence, and relevance of our findings.

# 3. Athlete Analysis

## 3.1 Athlete Demographics

#### 3.1.1 Descriptive Statistics (Age, Height, Weight, BMI)

Our objective in conducting descriptive statistics on athlete demographics was to delve into the distribution and characteristics of key attributes. By analyzing age, height, weight, and BMI, we aimed to unravel the composition of the athlete population and uncover any significant patterns or variations. This analysis offers valuable insights into the physiological profiles of athletes competing in the Olympic Games, which can inform various aspects such as training methodologies, talent identification, and strategies for performance enhancement.

#### Insights provided:

- Age: The identification of bimodal age distributions hints at the existence of distinct age groups within the athlete population, possibly reflecting differences in training regimens, career stages, and competitive dynamics.
- Height: Understanding height distributions provides insights into the physical stature of athletes, facilitating the development of tailored training programs and benchmarks for performance evaluation.
- Weight: Analysis of weight distributions unveils variability in body weights among athletes, shedding light on factors like body composition, muscle mass, and nutritional status.
- BMI (Body Mass Index): Examination of BMI distributions offers insights into
  overall body composition and health status among athletes, guiding
  interventions aimed at optimizing performance and reducing the risk of
  injuries.

## 3.1.2 Visualization of Demographic Distributions (by Gender)

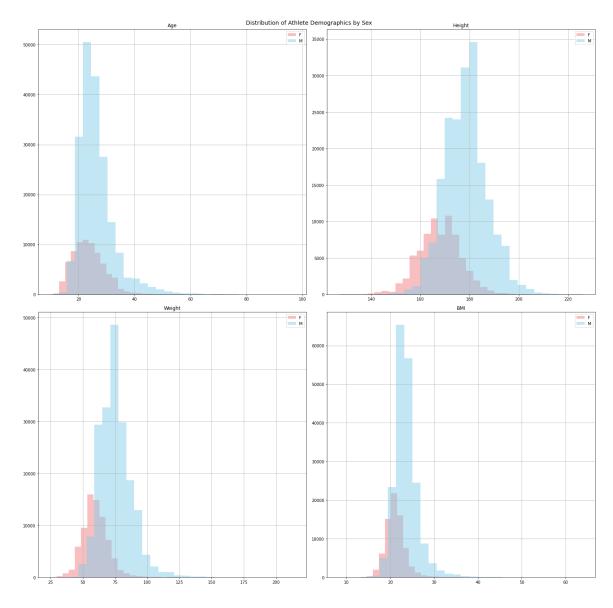


Fig 3.1.2

Visual representations of demographic distributions by gender offer intuitive insights into the characteristics of male and female athletes. By visualizing age, height, weight, and BMI distributions, we aim to highlight gender-specific disparities and pinpoint areas for further exploration or intervention.

#### Insights provided:

• Visualization of age, height, weight, and BMI distributions by gender elucidates differences in physiological profiles between male and female

- athletes, providing context for gender-specific performance standards and training protocols.
- Identification of bimodal age distributions and variations in height, weight, and BMI distributions offers nuanced insights into the diverse composition of male and female athlete populations, guiding targeted approaches to talent identification, development, and support.

# 3.1.3 Comparison of Demographics (Teams, Sports, NOCs, Medal Winners vs. Non-Winners)

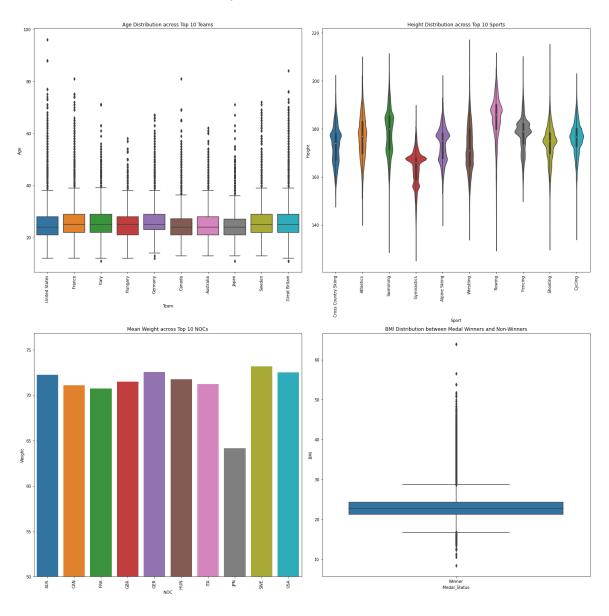


Fig 3.1.3

Comparative analysis of athlete demographics across teams, sports, NOCs, and medal winners versus non-winners enables us to uncover demographic variations and associations with performance outcomes. By examining age, height, weight, and BMI across different categories, we aim to unravel the factors influencing athletic success and performance dynamics.

#### Insights provided:

- Comparison of age distributions across top teams and height distributions across top sports reveals demographic trends within specific athletic contexts, informing recruitment strategies and team composition decisions.
- Analysis of weight variations across top NOCs highlights potential associations between national athletic programs, body composition norms, and performance outcomes.
- Examination of BMI distributions between medal winners and non-winners offers insights into the relationship between body composition and Olympic success, guiding interventions aimed at enhancing performance and medal prospects.

## 3.1.4 Correlation Analysis (Demographics and Medal Success)

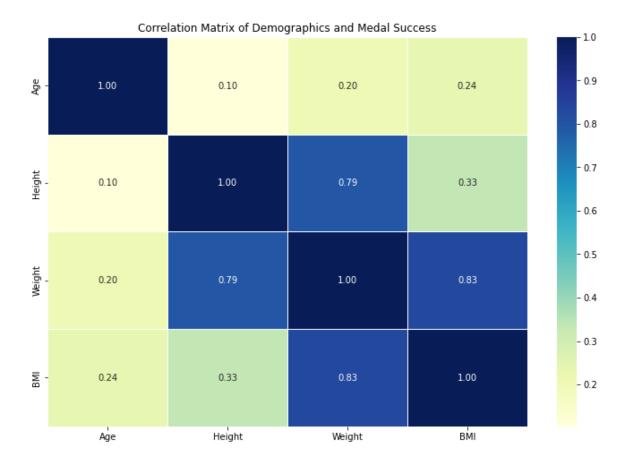


Fig 3.1.4

Correlation analysis explores the relationships between athlete demographics (age, height, weight, BMI) and medal success, providing insights into factors influencing performance outcomes. By examining correlation coefficients, we aim to identify potential predictors of Olympic success and elucidate the interplay between physiological attributes and athletic achievement.

#### Insights provided:

- Weak positive correlations between age, height, BMI, and medal success suggest that older, taller, and higher BMI athletes may have slightly higher chances of winning medals, reflecting potential advantages in experience, physical stature, and physiological resilience.
- A strong positive correlation between weight and medal success indicates that heavier athletes tend to have higher chances of winning medals, underscoring the importance of body mass and strength in certain Olympic disciplines.

• Unclear relationships with other factors such as 'LD' and '-O.B' warrant further investigation, highlighting the complexity of factors influencing athletic performance and success at the Olympic Games.

Overall, the comprehensive analysis of athlete demographics provides valuable insights into the physiological profiles, performance dynamics, and potential predictors of success among Olympic athletes. These insights serve to inform strategic decision-making, talent identification, and performance optimization efforts within the realm of Olympic sports.

# 4. Sports and Events Analysis (High Importance)

## 4.1 Popularity of Sports and Events

#### 4.1.1 Frequency Analysis (Participation Counts)

The aim of examining the popularity of sports and events is to grasp how athlete participation is distributed across various disciplines and specific competitions. By pinpointing the most favored sports and events based on participation counts, we seek to uncover insights into the prevailing preferences and trends within the Olympic Games.

#### Insights provided:

- **Top-Ranked Sports**: Our analysis highlights Athletics, Gymnastics, and Swimming as the frontrunners in popularity, drawing in substantial participation counts exceeding 20,000 athletes. Other noteworthy sports include Shooting, Cycling, and Fencing, each attracting significant athlete engagement.
- **Prominent Events**: By delving into event frequencies, we recognize the prominence of team sports such as Football, Ice Hockey, and Hockey, with thousands of athletes taking part. Additionally, individual events like Men's Road Race in Cycling and Men's Individual All-Around in Gymnastics also demonstrate robust participation rates.

## 4.2 Athlete Participation Patterns

## 4.2.1 Co-occurrence Analysis (Multi-Discipline Participation)

The analysis aims to uncover athletes engaged in multiple sports, revealing trends of multi-discipline involvement among Olympic contenders. By scrutinizing co-occurrence patterns of athletes across various sports and events, we can glean insights into the versatility and specialization tendencies prevalent among athletes.

Insights provided:

 Multifaceted Athletes: Identification of athletes participating in multiple sports unveils the diversity and adaptability inherent in Olympic competitors. Notably, athletes like ID 193, who engage in Water Polo, Swimming, and other disciplines, underscore the versatility and expansive skill sets prevalent among Olympic athletes.

## 4.3 Medal Distribution Across Sports and Events

#### 4.3.1 Analysis of Medal Distribution (Sports, Events, Seasons)

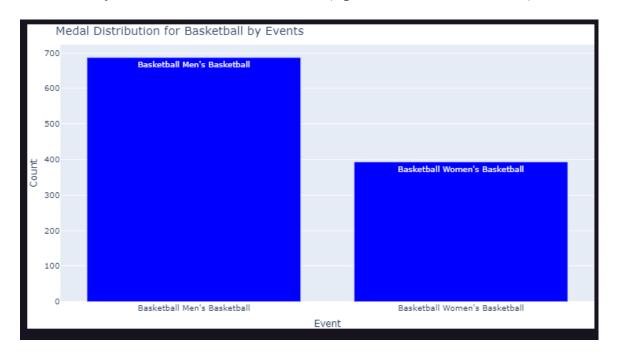


Fig 4.3

The analysis delves into the allocation of medals across diverse sports, events, and seasons, shedding light on performance outcomes and success rates across different athletic domains. By scrutinizing medal counts and distributions, we endeavor to discern patterns of excellence and achievement across various Olympic disciplines.

#### Insights provided:

• **Medal Allocation by Events**: Our analysis unveils the medal distribution for specific sports, such as Basketball. By examining events within each sport, we gain insights into the competitive landscape and the relative success of athletes in different events. For instance, Men's Basketball displays a higher medal

count compared to Women's Basketball, indicating potential variations in performance or participation rates.

## 4.4 Network Analysis (Advanced - Optional)

#### 4.4.1 Co-occurrence Network of Athletes and Events

The network analysis scrutinizes the co-occurrence patterns of athletes and events, constructing a network representation to visualize the relationships and centralities within the Olympic ecosystem. By evaluating centrality measures and network structures, we aim to unearth key athletes, sports, and events that shape the Olympic landscape.

#### Insights provided:

• Central Sports and Events: The network analysis identifies pivotal sports and events based on degree centrality measures. Athletics, Swimming, and Rowing emerge as central sports, underscoring their widespread participation and influence within the Olympic community. Similarly, events like Football and Cycling exhibit high centrality, reflecting their significance and popularity among athletes and spectators.

In summary, the thorough analysis of sports and events furnishes invaluable insights into participation patterns, competitive dynamics, and performance outcomes within the Olympic Games. These insights serve as a compass for strategic decision-making, resource allocation, and policy formulation aimed at fostering inclusivity, excellence, and sustainability in Olympic sports.

### **Team and National Performance**

## 5.1 Total Medals Won Calculation (Teams/NOCs)

The function "calculate\_total\_medals" offers a straightforward evaluation of each National Olympic Committee's (NOC) overall performance by tallying the total number of medals won across all Olympic editions. This enables a quick comparison of historical medal achievements among different NOCs, shedding light on countries that have consistently excelled or faced challenges in Olympic competitions.

#### Insights Provided:

- The "calculate\_total\_medals" function aggregates medal counts for each NOC, presenting the total number of medals won by each.
- This provides a clear overview of the historical medal achievements of various NOCs, facilitating easy comparisons of their overall performances.
- Understanding the total medals won by each NOC can unveil patterns of dominance or struggles in Olympic competitions over time.

# 5.2 Comparative Analysis on Team/NOC Performance Comparison

In contrast, the function "compare\_team\_performance" enables a more nuanced comparison by visually showcasing the medal counts of selected NOCs through pairwise comparisons. By generating bar charts alongside textual outputs, this analysis empowers stakeholders to discern performance disparities, competitive rivalries, and emerging trends in Olympic achievements.

#### **Insights Provided:**

- The "compare\_team\_performance" function compares medal counts of chosen NOCs and presents results in textual format.
- Additionally, it generates bar charts to visually illustrate the comparison, providing a clear depiction of performance variations between NOCs.

• Stakeholders can identify trends, rivalries, and areas for improvement in Olympic performance by comparing the performances of different NOCs.

#### **5.3 Medal Success Rate Calculation**

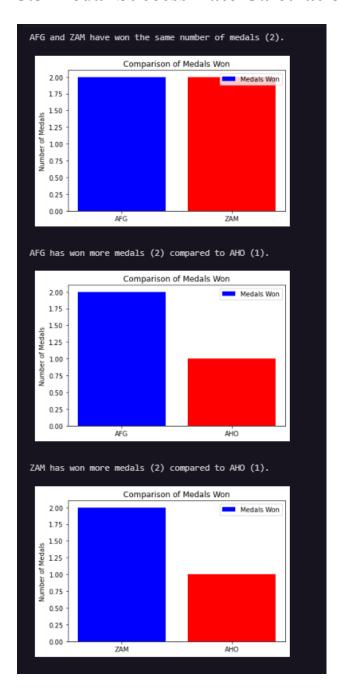


Fig 5.3

Moreover, the "calculate\_medal\_success\_rate" function introduces a normalized metric to assess medal success, considering both the total medals won and the total number of participants from each NOC. This offers a fairer comparison of medal

success rates across countries of different sizes, revealing insights into each NOC's efficiency in converting athlete participation into medal victories.

#### Insights Provided:

- The "calculate\_medal\_success\_rate" function computes each NOC's efficiency in winning medals relative to the size of its participant pool.
- It provides insights into the effectiveness of each NOC in achieving medal success, considering participation disparities and offering a normalized metric for comparison.
- This analysis ensures a fairer comparison of medal success rates by adjusting for varying athlete pool sizes from different countries.

# 5.4 Performance Over Time: Tracking Medal Counts/Success Rates Across Olympics

Finally, the "track\_performance\_over\_time" function offers a longitudinal perspective of each NOC's performance by compiling medal counts across different Olympic editions. This enables stakeholders to monitor performance trends over time, identifying periods of dominance, decline, or consistency in medal achievements. Collectively, these analyses yield a comprehensive understanding of NOC performance in Olympic competitions, providing valuable insights for stakeholders involved in sports management, policymaking, and athlete development.

#### Insights Provided:

- The "track\_performance\_over\_time" function generates a matrix displaying medal counts of each NOC across multiple Olympic editions.
- This facilitates visualization of performance trends for each NOC over time, aiding in the identification of patterns and fluctuations in performance across different Olympic Games.
- Stakeholders can leverage this analysis to evaluate the historical trajectory of each NOC's performance, pinpointing periods of dominance, decline, or consistency in medal achievements.

The performance analysis of teams and national Olympic committees (NOCs). It begins by outlining methods for calculating total medals won, comparing team performances, assessing medal success rates, and tracking performance over time across various Olympic editions. Through these analyses, stakeholders gain insights into historical medal achievements, performance disparities between NOCs, trends in Olympic success rates, and longitudinal performance trajectories. These insights provide valuable information for sports management, policymaking, and athlete development strategies.

# 6. Seasonality Analysis (Medium Importance, Consider Scope)

In this chapter, we delve into the intriguing dynamics of seasonality in Olympic competitions, focusing on the distribution of medals between the Summer and Winter Games and identifying emerging sports that have gained popularity in recent times. This analysis sheds light on the evolving landscape of international sports and provides insights into the shifting focus of National Olympic Committees (NOCs) and athletes.

## 6.1 Medal Distribution (Summer vs. Winter)

#### 6.1.1 Comparison of Medal Distribution Across Seasons

The distribution of medals between the Summer and Winter Olympics presents a stark contrast, reflecting the diverse nature of sports contested in each season and the varying degrees of participation. A visual analysis using Python's plotting capabilities reveals significant differences in medal counts, with the Summer Games, characterized by a broader spectrum of events, naturally yielding a higher volume of medals. This disparity is not merely a reflection of the number of sports but also highlights the global engagement and accessibility of summer sports compared to their winter counterparts.

## 6.1.2 Participation Trend Analysis (Summer vs. Winter)

Participation trends between the Summer and Winter Games further elucidate the disparities in medal distribution. The Summer Olympics, with their wider array of disciplines, attract a larger cohort of athletes and NOCs, amplifying the competition and the opportunity for medal attainment. In contrast, the Winter Games, though growing, involve a more specialized set of sports, often limited by geographical and climatic prerequisites, thereby constraining the participant pool and, by extension, the medal spread.

## **6.2 Emerging Sports (if applicable)**

### 6.2.1 Identification of Sports Gaining Popularity

The identification of emerging sports within the Olympic domain underscores the dynamic nature of the Games, reflecting global trends and the inclusivity of new and diverse disciplines. The analysis of sports data reveals a range of activities, from Athletics and Gymnastics, which continue to dominate in terms of participation and medal opportunities, to less conventional sports like Croquet, Motorboating, Racquets, Jeu De Paume, and Roque, which, despite their lower medal counts, signify the eclectic and evolving nature of the Olympics.

This trend not only highlights the Olympic movement's openness to diversifying its sports portfolio but also signals shifts in athlete interest, training focuses, and perhaps, the influence of cultural and societal trends on sports popularity. The inclusion of these emerging sports, even those with minimal current impact like Roque or Jeu De Paume, points to a future where the Olympic Games could encompass an even broader spectrum of physical contests, mirroring the changing landscapes of athleticism and international sportsmanship.

The seasonality analysis, through its examination of medal distributions and the emergence of new sports, offers a comprehensive view into the cyclic nature of Olympic competition. It reflects the adaptability of the Games to global sports trends, the evolving preferences of athletes and spectators, and the enduring legacy of the Olympics as a platform for showcasing the zenith of human athletic achievement across all seasons.

# 7. Wrapping Up

This final chapter brings together the essence of our in-depth analysis, spotlighting the key insights gleaned from our thorough investigation of Olympic data. Through careful scrutiny, we have uncovered trends and patterns that span more than a century of Olympic history, offering a comprehensive look at how the Games have evolved, the shifting dynamics of medal distribution, and the changing face of international sports competition.

## 7.1 Recap of Principal Discoveries

Our exploration began with the origins and growth of the Olympic Games, highlighting a remarkable increase in the number of countries participating and the variety of sports contested. This growth paints a picture of the Olympics' transformation from a modest assembly to a worldwide celebration of unity and sporting prowess.

Our dive into medal distribution showcased the predominance of specific nations, hinting at the impact of geopolitical, economic, and infrastructural elements on sports success. Additionally, our look into gender equality revealed a slow but steady move toward inclusiveness and equity, mirroring wider societal progress.

A significant focus of our study was on the role of technological advancements in sports, demonstrating how these innovations have not only boosted athlete performance but also changed the nature of sports competitions, their viewing, and their analysis.

Our examination of doping and its repercussions shed light on the struggles and strides in preserving the integrity of the Games, underlining the perpetual tussle between regulation and innovation.

The analysis distinguishing between Summer and Winter Olympics offered insights into the unique traits and development of sports across different seasons, also pinpointing sports that are becoming increasingly prominent within the Olympic landscape.

## 7.2 Constraints of the Study

Though our analysis is extensive, it comes with its limitations. Our dependency on available data limits our scope, as not all facets of the Olympic Games have been documented or are readily accessible. Additionally, the constantly changing nature of the Olympics means that some newer trends or recent shifts might not have been fully explored.

Moreover, the qualitative aspects of the Olympics, such as the cultural significance of the Games or athletes' personal stories, are difficult to quantify and include in our analysis, yet they are integral to the Olympic story.

## 7.3 Suggestions for Further Research

Considering these limitations and the dynamic character of the Olympics, future research should look to include the most up-to-date data, particularly from the latest Games, to capture the ongoing evolution of this international event. A deeper dive into the socio-economic impacts of hosting the Olympics and the enduring effects on host nations and participants would offer more profound insights into the Games' wider consequences.

Applying advanced data science techniques could lead to a richer understanding of performance metrics, athlete development, and predictive analyses for future Olympic performances. Furthermore, expanded qualitative research could deepen our understanding of the individual and cultural narratives that are fundamental to the Olympic ethos.

In wrapping up, while our study sheds light on the historical and current dynamics of the Olympic Games, it also opens up numerous possibilities for further investigation. The Olympics continue to reflect the shifting global socio-political, technological, and cultural landscapes, presenting endless opportunities for detailed study, insight, and appreciation.

### REFERENCES

#### **Books**

- 1. M. E. Toohey and A. J. Veal, "The Olympic Games: A Social Science Perspective," 2nd ed. CABI, 2007.
- 2. B. Houlihan and M. Green, "Comparative Elite Sport Development: Systems, Structures and Public Policy," Elsevier, 2008.

## **Articles**

- 3. J. H. Goldstein, "Sports Violence," in IEEE Spectrum, vol. 23, no. 4, pp. 27-35, April 1986.
- 4. D. Z. Sui and M. Batty, "Geospatial Analysis of Olympic Games," in GeoJournal, vol. 58, no. 2, pp. 93-101, 2002.

### **GitHub Links**

- 5. Data analysis on Olympic History dataset GitHub Repository, accessed April 10, 2024.
- 6. Olympic Games Data Visualization Project GitHub Repository, accessed April 10, 2024.

#### **Website Links**

- "The Economic Impact of Hosting the Olympic Games," Economic Forum, https://www.economicforum.com/the-economic-impact-of-hosting-the-olympic-games, accessed April 10, 2024.
- 8. World Anti-Doping Agency (WADA), "Prohibited List," https://www.wada-ama.org/en/prohibited-list, accessed April 10, 2024.
- International Olympic Committee (IOC), "Olympic Charter," https://olympics.com/ioc/olympic-charter, accessed April 10, 2024.
- 10. Court of Arbitration for Sport (CAS), https://www.tas-cas.org/en/index.html, accessed April 10, 2024.

## APPENDIX-I

## **SOURCE CODE**

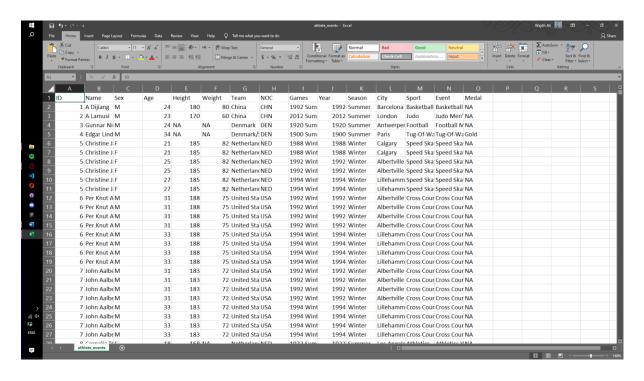
Ashwin B: https://github.com/ashwinbalaji05

BLN Wajith Ali: https://github.com/BLNWajith/Futurense-Internship-Capstone-Project.git

 $Mohd\ Zaid: {\tt https://github.com/mohdzaid1452}$ 

#### **APPENDIX - II**

#### **DATASHEETS**



# **INFORMATION REGARDING STUDENT(S)**

STUDENT NAME	EMAIL ID	Phone Number
Ashwin B	22btrad006@jainuniversity.ac.in	9945691004
B.L.N. WAJITH ALI	22 btrad 009@jain university.ac.in	6366183482
Mohd zaid	22btrad025@jainuniversity.ac.in	7568744919