Olympics 2024 Dashboard Using Python and Power BI: Further Predictions and Study

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***Abstract*—The Olympic Games represent one of the most significant global sporting events, attracting attention from analysts, spectators, and policymakers worldwide. Leveraging data analytics and visualization tools, this study focuses on the development of a dynamic and predictive dashboard for the 2024 Olympics using Python and Power BI. The project integrates historical Olympic datasets, machine learning models for medal predictions, and interactive visual elements to provide insights into country performances, athlete statistics, and expected outcomes. This paper elaborates on the stages of data acquisition, transformation, visualization, model evaluation, and future enhancements while emphasizing the importance of predictive analytics in sports management.**

***Index Terms*—Olympics 2024, Sports Analytics, Power BI Dashboard, Python Data Analysis, Predictions, Olympic Medal Forecasting, Data Visualization, Predictive Modeling, Athlete Performance Analysis, Historical Sports Data, Interactive Dashboards.**

1. INTRODUCTION

The Olympic Games, a quadrennial global sporting event, represent a convergence of human excellence, international cooperation, and cultural expression. With each edition, billions of people tune in to witness not only thrilling athletic performances but also the rise of emerging nations, socio-political narratives, and the dynamic evolution of global sports culture. The Paris 2024 Olympics promises to be a technologically advanced and widely followed event, especially in the digital era, where data analytics is transforming the way sports are consumed, understood, and strategized.

In the age of big data, the integration of analytical tools with real-time datasets has revolutionized decision-making processes in sports. From scouting and coaching to sponsorship and broadcasting, data now plays a pivotal role. The current study focuses on the design and implementation of an interactive and predictive dashboard tailored for the Olympics 2024, developed using Python and Power BI. This fusion of programming and visualization enables powerful backend computation alongside user-friendly front-end representations.

Power BI, a business intelligence platform, is used to visualize these results, allowing both technical and non-technical stakeholders to gain insights through interactive graphics. Python, known for its flexibility in data manipulation and model building, is utilized to clean, transform, and analyze historical Olympic data.

The primary aim of this research is not just retrospective analysis, but forward-looking insights to predict and understand likely outcomes of the upcoming games and help federations, analysts, and enthusiasts make informed decisions. The dashboard becomes a tool not only for showcasing past achievements but also for preparing for future contests. Through this paper, we present the architecture, methodologies, findings, and implications of the Olympics 2024 Dashboard, while underscoring the expanding role of predictive analytics in the sports domain. As global attention turns to Paris, this study offers a timely contribution to the intersection of technology and international sports.

The Olympic Games showcase the peak of athletic achievement and international participation. Analyzing performance trends and predicting outcomes not only aids sports strategists but also engages audiences and stakeholders. This research aims to develop a comprehensive dashboard integrating Python for data processing and Power BI for visualization to support predictions and insights for the Paris 2024 Olympics.

2. OBJECTIVES

The primary objectives of this research are centered on harnessing the capabilities of Python and Power BI to create a comprehensive and predictive analytical dashboard for the 2024 Olympics. This study aims to clean, preprocess, and analyze historical Olympic data using Python to extract meaningful insights. It further seeks to develop accurate forecast medal tallies based on historical sports performance indicators. A key goal is to design an interactive Power BI dashboard that enables intuitive exploration of these predictions and underlying patterns. The research also strives to highlight trends in athlete demographics and the influence of national investments in sports infrastructure. By integrating visualization and predictive modelling, the project endeavours to support data-driven decision-making for stakeholders such as sports analysts, policymakers, and enthusiasts.

3. LITERATURE REVIEW

The application of data analytics in sports, particularly in predicting Olympic outcomes, has gained traction over the past two decades. Numerous studies have attempted to quantify the factors influencing a nation's Olympic success, including economic capacity, population size, and geopolitical stability. Bernard and Busse (2004) were among the early researchers to establish that GDP and population size are strong predictors of medal counts, using econometric models to correlate economic indicators with Olympic performance.

Subsequent research expanded the modelling approach. For instance, Bredtmann, Crede, and Otten (2016) introduced more nuanced variables such as human development indices and education levels to refine prediction accuracy. In parallel, advancements in machine learning have enabled the application of more complex, non-linear models such as decision trees, support vector machines, and XGBoost, which often outperform traditional linear regression approaches due to their ability to capture interaction effects among variables.

Data visualization in sports has also evolved. Tools like Tableau and Power BI have democratized access to analytical insights, allowing coaches, fans, and administrators to engage with data visually rather than statistically. However, the literature indicates a gap in combining real-time visual dashboards with integrated machine learning predictions. Few studies embed Python models directly into Power BI dashboards, which limits dynamic interactivity and real-time updates.

This research aims to bridge that gap by integrating predictive analytics and dashboarding into a single, interactive platform tailored for the 2024 Olympics, thereby contributing a practical application to the existing body of academic work.

4. METHODOLOGY

The development of the Olympics 2024 Dashboard involved a structured, multi-phase methodology integrating data preprocessing in Python with dynamic visualization in Power BI. This approach allowed for comprehensive data analysis, machine learning-driven predictions, and interactive visual storytelling.

5. DATA ACQUISITION

Primary data was sourced from Kaggle's Olympic historical datasets (1896–2024), supplemented by socio-economic data from the World Bank and the United Nations. Additional athlete data—including gender, age was compiled to enable more granular performance assessments. Medal tallies, sports participation statistics were collected and organized in Excel format and CSV files.

6. DATA PREPROCESSING AND ANALYSIS USING PYTHON

Python was chosen for its rich ecosystem of libraries suitable for data analysis and modelling. Using libraries such as pandas, NumPy, matplotlib, and seaborn, the data underwent extensive preprocessing:

- Null values and duplicate records were removed.
- Country names and event names were standardized.
- Historical data was aggregated by country, sport, and year.
- Feature engineering was conducted to derive new metrics such as medal efficiency, gender ratio, host advantage index, and athlete age distribution.

Integration with Power BI

The final phase of the dashboard development involved the integration of pre-processed data and predictive outputs into Power BI, using its Python scripting capability. This functionality allowed seamless import of Python-generated data frames directly into the Power BI environment, ensuring that analytical and visual elements remained synchronized and dynamically refreshable.

Once the cleaned and enriched dataset was imported using the Python Script data connector, Power BI was used to construct an intuitive, interactive dashboard. The visual elements were designed to cater to both technical and non-technical users, enabling comprehensive exploration of Olympic performance trends and medal predictions. Key visualization components included:

- Bar and Line Charts: These were used to illustrate country-wise and year-wise medal trends. Line charts helped visualize historical progression, while bar charts displayed projected medal tallies for 2024, based on machine learning model outputs.
- Slicers and Filters: Interactive slicers were incorporated to enable users to filter data by year, sport, country, and medal type. This allowed granular analysis, letting users compare specific nations or sports over time.
- Geo-Mapping: Power BI's mapping tools were employed to represent the global distribution of Olympic medals. Countries were color-coded based on medal counts, providing a geographical perspective of

7. MEDAL FORECAST

Based on extensive historical data analysis a medal forecast table was generated to predict country-level performances in the 2024 Paris Olympics. This predictive model considered multiple influential variables including past medal counts.

The forecast highlights the expected continuation of dominance by traditional sporting powerhouses such as the United States, China, and Russia. According to the model, the United States is predicted to lead the medal table with approximately 112 total medals, leveraging its broad sports infrastructure, youth development programs.

China follows with an estimated 93 medals, sustained by its centralized sports system and focus on Olympic events. Russia, despite ongoing restrictions in international sports, is projected to earn around 75 medals based on historical consistency and depth in various disciplines.

In Europe, countries like the United Kingdom, France, and Germany are expected to remain strong contenders, with France anticipated to experience a moderate medal boost as the host nation—a phenomenon historically known as the "host advantage," often resulting in a 10–15% increase in medal wins. Emerging nations such as India and Brazil are forecasted to enter the top 15 medal-winning countries. This is largely attributed to recent governmental policies that emphasize youth sports training, international exposure, and Olympic-targeted investments.

Notably, India's expected performance surge is driven by growth in sports like wrestling, boxing, and athletics

- KPI Cards and Tooltips: Key performance indicators (KPIs), such as total medals, top-performing nations, and medal growth rate, were presented using dynamic cards. Tooltips enriched user experience by offering contextual information when hovering over charts or maps.

This integration empowered real-time analytical interaction and visual storytelling, transforming complex data into accessible insights. The dashboard's responsive design ensures adaptability for updates, making it a valuable tool for analysts, sports federations, and enthusiasts preparing for the 202Olympics.

The forecasted table serves not only as a reference for medal expectations but also as a strategic tool for sports federations, policymakers, and analysts to prepare, allocate resources, and motivate athletes in advance of the Paris Olympics.

These predictions, while statistical in nature, provide valuable insights into global trends in athletic performance and national sports development strategies.

Although the prediction table serves as a valuable roadmap for expectations, it must be noted that actual Olympic results may still vary due to injuries, last-minute disqualifications, political scenarios, or exceptional individual performances.

Table1: Countrywise Sample Prediction Data of Bronze

Sr. No.	Country	Year:2028	Year:2032
1.	Croatia	2 - 4	2 - 4
2.	Hong Kong	2 - 6	2 - 7
3.	Jamaica	1 - 6	2 - 6
4.	Kazakhstan	6 - 14	7 - 15
5.	Serbia	4 - 9	5 - 10

The table above "Country wise Sample Prediction Data of Bronze" presents sample projected ranges of bronze medal counts for five countries—Croatia, Hong Kong, Jamaica, Kazakhstan, and Serbia—for the Olympic Games of 2028 and 2032. Each country is assigned a range that likely reflects the output of a statistical or machine learning prediction model, incorporating uncertainty and variability in performance outcomes. For instance, Croatia is predicted to win between 2 to 4 bronze medals consistently in both 2028 and 2032, indicating stable performance. Hong Kong shows a slight potential improvement, with an expected 2 to 6 medals in 2028 and 2 to 7 in 2032. Jamaica follows a similar trend with a prediction of 1 to 6 medals in 2028 and an improvement to 2 to 6 in 2032, which may reflect growth in sports development or athlete investment.

Among the listed countries, Kazakhstan stands out with the predicted range, showing 6 to 14 medals in 2028 and 7 to 15 in 2032, suggesting strong upward momentum and possibly a greater national focus on competitive sports. Serbia, on the other hand, demonstrates moderate growth, moving from a 4 to 9 range in 2028 to 5 to 10 in 2032. The use of prediction intervals instead of exact numbers indicates an analytical approach that accounts for uncertainties such as athlete injuries, changing qualification criteria, or socio-political influences. This predictive data, likely generated using Python-based modelling integrated with Power BI, serves as an essential tool for stakeholders aiming to forecast future performance, allocate training resources, and prepare strategic plans ahead of Olympic competitions.

8. POWER BI DASHBOARD DESIGN

The Power BI dashboard was meticulously designed to provide a holistic and interactive visualization platform that allows users to explore Olympic performance trends and predictions. One of the key features includes Country-level Medal Projection Cards, which present snapshot overviews of forecasted medal counts for individual nations. These KPI-style cards dynamically update based on user selections, enabling quick identification of top-performing countries and medal leaders for the 2024 Olympics.

In addition to summary insights, Time Series Graphs were integrated to illustrate historical medal count trends over the years. These visualizations help users track performance progressions for specific countries, identify patterns across different Olympic editions, and analyze the impact of external variables such as hosting status or geopolitical shifts on medal outcomes. These time-based visuals are particularly useful for sports analysts and historians examining longitudinal performance data.

To explore the composition of athletes participating in the games, Athlete Demographics Charts were developed. These charts display age distributions, gender ratios, and physical metrics such as height and weight, offering a demographic snapshot of athlete populations. These insights can reveal trends such as increasing female participation or age-related advantages in certain sports.

Furthermore, Geo Heatmaps was used to visualize global medal density. Countries were color-coded according to their total medal counts, offering a clear geographical understanding of Olympic dominance and emerging sporting regions. This spatial representation adds a valuable dimension to the dashboard, making regional disparities and strengths easily interpretable.

The dashboard also includes Sport-wise Performance Comparisons, allowing users to evaluate country performance across different sports categories such as athletics, swimming, gymnastics, and wrestling. These comparative visuals assist in identifying specialization areas and strengths for each nation. Finally, for year, country, gender, and sport were embedded to enhance interactivity, enabling users to customize their views and perform focused analyses with just a few clicks. Together, these elements make the Power BI dashboard a powerful tool for Olympic data exploration, strategy development, and fan engagement.

9. CONCLUSION

The development and analysis of the Olympics 2024 Dashboard using Python and Power BI demonstrate the immense potential of data analytics and visualization in transforming how we understand and engage with international sporting events. By harnessing historical Olympic data, this study presents a comprehensive and forward-looking approach to performance analysis and medal forecasting. The integration of Python scripting allowed for advanced data processing, machine learning-based prediction, and feature engineering, while Power BI brought these insights to life through intuitive, interactive visualizations tailored for diverse user groups including sports analysts, policymakers, and enthusiasts.

The predictive dashboard not only showcases country-wise and sport-wise trends but also offers actionable insights for federations aiming to enhance their athletes' performance. Moreover, real-time adaptability through Power BI's scripting capabilities ensures that the dashboard can evolve with incoming data during the actual event.

Importantly, this project also highlights how digital tools can democratize access to complex analytical insights, enabling better planning, strategic investment, and public engagement with the Olympic Games. As the world anticipates the Paris 2024 Olympics, this dashboard stands as a testament to the growing role of data science in global sports.

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