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Visualizing Olympic Migration and Medal Trends: A Geopolitical Perspective

Report submitted for the Data Visualization course (CSC_51052) as part of the Master Data AI at Institut Polytechnique de Paris.

Palaiseau

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ABSTRACT

This report presents a data visualization project focused on analyzing athlete migration, geopolitical influences, and Olympic medal performance during the Olympic Games from 1986 to 2018. Using a combination of datasets, including Olympic medal counts, population data, and geopolitical events, we explore key trends such as migration patterns of athletes, medals per capita, and temporal medal accumulation across countries. The visualizations are designed to reveal the relationship between global political events and athletic representation, as well as how countries perform in relation to their population size. Interactive visualizations, including flow maps, choropleth maps, and line charts, were implemented using D3.js to offer a comprehensive analysis of the data. The project underscores the value of visualizing complex, multi-dimensional datasets to derive meaningful insights into historical and geopolitical factors affecting Olympic performance.

Keywords: Olympic Games, athlete migration, geopolitical impact, medals per capita, data visualization, D3.js, temporal trends, choropleth maps, interactive visualizations.

RÉSUMÉ

Ce rapport présente un projet de visualisation de données axé sur l'analyse des migrations d'athlètes, des influences géopolitiques et de la performance des médailles aux Jeux Olympiques de 1986 à 2018. En utilisant une combinaison de jeux de données, incluant les comptes des médailles olympiques, les données de population et les événements géopolitiques, nous explorons les principales tendances telles que les migrations d'athlètes, le nombre de médailles par habitant et l'accumulation temporelle de médailles par pays. Les visualisations sont conçues pour mettre en lumière les relations entre les événements politiques mondiaux et la représentation athlétique, ainsi que les performances des pays en fonction de leur taille démographique. Des visualisations interactives, incluant des flux migratoires, des cartes choroplèthes et des graphiques linéaires, ont été implémentées à l'aide de D3.js afin d'offrir une analyse complète des données. Ce projet souligne l'importance de la visualisation de jeux de données complexes et multidimensionnels pour extraire des informations significatives sur les facteurs historiques et géopolitiques influençant la performance olympique.

Palavras-chave: Jeux Olympiques, migration des athlètes, impact géopolitique, médailles par habitant, visualisation de données, D3.js, tendances temporelles, cartes choroplèthes, visualisations interactives.

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS

$\Delta(h)$ Assinatura diádica

CONTENTS

1 INTRODUCTION

Here you should give the context, justifications...

Do yourself a favor and follow the structure guidelines in the file *Research_structure_guideli*
It should make your life easier.

In this template I will leave examples on how to cite, reference chapters, tables, figures, use math symbols along the text, write equations, label them for further referencing, use cases in equations, write tables, include figures, use special math formatting and symbols, use proof environments for theorems, matrix environments, etc. Remember to build the main file *thesis_main.tex* to visualize the updated pdf.

Example of how to reference a chapter: This dissertation is structured in... chapters. In Chapter 2 we present a ...

[Rami et al., 2001]

2 DATASET OVERVIEW

3 METHODOLOGY

Introduction here...

4 RESULTS

5 CONCLUSION

In this work we have considered ...

REFERENCES

[Rami et al., 2001] Rami, M. A., Chen, X., Moore, J. B., and Zhou, X. Y. (2001). Solvability and asymptotic behavior of generalized riccati equations arising in indefinite stochastic lq controls. *IEEE Transactions on Automatic Control*, 46:428–440.

APPENDIX A – NUMERICAL DATA OF SIMULATIONS

Example of long tables that cross pages.

Table 1: System's output for all scenarios.

Time	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1	1.3	1.2	1.1	1.0
2	2.4	1.9	1.6	1.0
3	3.7	2.8	2.1	1.1
4	5.2	3.7	2.7	1.2
5	6.7	4.7	3.4	1.2
6	8.2	5.7	4.0	1.3
7	9.7	6.7	4.6	1.3
8	11.1	7.6	5.2	1.4
9	12.4	8.4	5.7	1.4
10	13.6	9.2	6.2	1.4
11	14.7	9.9	6.7	1.5
12	15.7	10.6	7.1	1.5
13	16.7	11.2	7.5	1.5
14	17.5	11.7	7.8	1.5
15	18.3	12.2	8.1	1.6
16	18.9	12.7	8.4	1.6
17	19.5	13.1	8.6	1.6
18	20.0	13.4	8.9	1.6
19	20.5	13.7	9.0	1.6
20	20.9	13.9	9.2	1.6

Source: Author.

Table 2: System's output variance for all scenarios.

Time	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1	0.86	0.37	0.15	0.0007
2	3.54	1.50	0.60	0.003
3	6.19	2.62	1.05	0.005
4	8.25	3.49	1.40	0.007
5	9.58	4.05	1.62	0.008
6	10.21	4.32	1.73	0.009
7	10.30	4.36	1.74	0.009
8	9.97	4.22	1.69	0.008
9	9.37	3.96	1.58	0.008
10	8.58	3.63	1.45	0.007
11	7.70	3.25	1.30	0.007
12	6.78	2.87	1.15	0.006
13	5.87	2.48	0.99	0.005
14	5.01	2.12	0.85	0.004
15	4.20	1.78	0.71	0.004
16	3.48	1.47	0.59	0.003
17	2.84	1.20	0.48	0.002
18	2.28	0.97	0.39	0.002
19	1.81	0.77	0.31	0.002
20	1.42	0.60	0.24	0.001

Source: Author.

Table 3: Control policy for scenario A.

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
0	-137.9	-24.9	87.1	9.8	66.9
1	-138.7	-21.8	88.5	15.5	57.8
2	-136.0	-20.0	87.3	17.4	53.6
3	-126.9	-18.2	82.3	17.4	49.1
4	-116.2	-16.5	76.4	17.0	44.5

Continued on next page

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
5	-109.6	-15.5	72.9	16.3	42.6
6	-100.9	-14.3	68.3	15.6	39.6
7	-94.8	-13.3	65.1	14.8	37.8
8	-87.0	-12.0	60.9	14.2	35.0
9	-73.2	-11.0	53.5	12.5	30.6
10	-65.9	-10.0	49.4	11.5	28.5
11	-51.4	-9.2	41.5	9.6	24.2
12	-43.2	-8.4	37.0	8.3	22.0
13	-37.8	-7.2	34.1	7.9	19.7
14	-29.9	-6.4	29.7	6.9	17.2
15	-23.2	-5.4	25.9	6.1	14.8
16	-16.6	-4.6	22.2	5.2	12.8
17	-12.7	-3.9	20.0	4.7	11.4
18	-7.0	-3.3	16.8	3.9	9.7
19	-1.6	-2.7	13.7	3.3	7.7

Source: Author.

Table 4: Control policy for scenario B.

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
0	-89.3	-16.2	56.6	6.4	43.5
1	-89.3	-14.0	57.2	10.2	37.1
2	-85.8	-12.9	55.4	11.0	34.2
3	-80.5	-11.8	52.6	11.1	31.5
4	-76.7	-11.1	50.5	11.0	30.0
5	-74.3	-10.3	49.4	11.0	28.9
6	-63.1	-9.4	43.2	9.7	25.4
7	-57.4	-8.6	40.2	9.2	23.3
8	-50.3	-7.9	36.3	8.4	21.1
9	-45.8	-7.2	33.9	7.9	19.5
10	-38.0	-6.6	29.6	6.7	17.4
11	-35.3	-5.8	28.2	6.6	16.3

Continued on next page

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
12	-29.3	-5.3	25.0	5.8	14.4
13	-24.1	-4.6	22.0	5.2	12.7
14	-19.0	-4.2	19.2	4.3	11.4
15	-14.9	-3.6	17.0	3.9	9.9
16	-10.5	-3.1	14.4	3.3	8.5
17	-7.1	-2.6	12.6	3.0	7.2
18	-4.4	-2.1	11.0	2.6	6.2
19	-0.3	-1.7	8.7	2.1	4.9

Source: Author.

ANNEX A – NUMERICAL DATA OF SIMULATIONS

Example of long tables that cross pages.

Table 5: System's output for all scenarios.

Time	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1	1.3	1.2	1.1	1.0
2	2.4	1.9	1.6	1.0
3	3.7	2.8	2.1	1.1
4	5.2	3.7	2.7	1.2
5	6.7	4.7	3.4	1.2
6	8.2	5.7	4.0	1.3
7	9.7	6.7	4.6	1.3
8	11.1	7.6	5.2	1.4
9	12.4	8.4	5.7	1.4
10	13.6	9.2	6.2	1.4
11	14.7	9.9	6.7	1.5
12	15.7	10.6	7.1	1.5
13	16.7	11.2	7.5	1.5
14	17.5	11.7	7.8	1.5
15	18.3	12.2	8.1	1.6
16	18.9	12.7	8.4	1.6
17	19.5	13.1	8.6	1.6
18	20.0	13.4	8.9	1.6
19	20.5	13.7	9.0	1.6
20	20.9	13.9	9.2	1.6

Source: Author.

Table 6: System's output variance for all scenarios.

Time	Scenario 1	Scenario 2	Scenario 3	Scenario 4
1	0.86	0.37	0.15	0.0007
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3	6.19	2.62	1.05	0.005
4	8.25	3.49	1.40	0.007
5	9.58	4.05	1.62	0.008
6	10.21	4.32	1.73	0.009
7	10.30	4.36	1.74	0.009
8	9.97	4.22	1.69	0.008
9	9.37	3.96	1.58	0.008
10	8.58	3.63	1.45	0.007
11	7.70	3.25	1.30	0.007
12	6.78	2.87	1.15	0.006
13	5.87	2.48	0.99	0.005
14	5.01	2.12	0.85	0.004
15	4.20	1.78	0.71	0.004
16	3.48	1.47	0.59	0.003
17	2.84	1.20	0.48	0.002
18	2.28	0.97	0.39	0.002
19	1.81	0.77	0.31	0.002
20	1.42	0.60	0.24	0.001

Source: Author.

Table 7: Control policy for scenario A.

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
0	-137.9	-24.9	87.1	9.8	66.9
1	-138.7	-21.8	88.5	15.5	57.8
2	-136.0	-20.0	87.3	17.4	53.6
3	-126.9	-18.2	82.3	17.4	49.1
4	-116.2	-16.5	76.4	17.0	44.5

Continued on next page

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
5	-109.6	-15.5	72.9	16.3	42.6
6	-100.9	-14.3	68.3	15.6	39.6
7	-94.8	-13.3	65.1	14.8	37.8
8	-87.0	-12.0	60.9	14.2	35.0
9	-73.2	-11.0	53.5	12.5	30.6
10	-65.9	-10.0	49.4	11.5	28.5
11	-51.4	-9.2	41.5	9.6	24.2
12	-43.2	-8.4	37.0	8.3	22.0
13	-37.8	-7.2	34.1	7.9	19.7
14	-29.9	-6.4	29.7	6.9	17.2
15	-23.2	-5.4	25.9	6.1	14.8
16	-16.6	-4.6	22.2	5.2	12.8
17	-12.7	-3.9	20.0	4.7	11.4
18	-7.0	-3.3	16.8	3.9	9.7
19	-1.6	-2.7	13.7	3.3	7.7

Source: Author.

Table 8: Control policy for scenario B.

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
0	-89.3	-16.2	56.6	6.4	43.5
1	-89.3	-14.0	57.2	10.2	37.1
2	-85.8	-12.9	55.4	11.0	34.2
3	-80.5	-11.8	52.6	11.1	31.5
4	-76.7	-11.1	50.5	11.0	30.0
5	-74.3	-10.3	49.4	11.0	28.9
6	-63.1	-9.4	43.2	9.7	25.4
7	-57.4	-8.6	40.2	9.2	23.3
8	-50.3	-7.9	36.3	8.4	21.1
9	-45.8	-7.2	33.9	7.9	19.5
10	-38.0	-6.6	29.6	6.7	17.4
11	-35.3	-5.8	28.2	6.6	16.3

Continued on next page

Time	CDI	EMBR3	ITUB4	PETR4	VALE5
12	-29.3	-5.3	25.0	5.8	14.4
13	-24.1	-4.6	22.0	5.2	12.7
14	-19.0	-4.2	19.2	4.3	11.4
15	-14.9	-3.6	17.0	3.9	9.9
16	-10.5	-3.1	14.4	3.3	8.5
17	-7.1	-2.6	12.6	3.0	7.2
18	-4.4	-2.1	11.0	2.6	6.2
19	-0.3	-1.7	8.7	2.1	4.9

Source: Author.