Problem Chosen	2025 MCM/ICM Summary Sheet	Team Control Number
C		2506135

Together, Individuals Make a Difference

Summary

Here is the abstract of your paper.

Firstly, that is ...

Secondly, that is ...

Finally, that is ...

$F(\omega) = \int_{-\infty}^{\infty} f(t) e^{-i\omega t}\, dt$

$f(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(\omega) e^{i\omega t}\, d\omega$

PCA

%

Keywords: **A, B, C,**

Contents

1 Introduction

1.1 Problem Background

1.2 Restatement of Problem

A literatrue[1] say something about this problem ... There is a conception named "momentum" in tennis, which has a great impact on players' performance. It is a generalization of the influence in manifold aspects like mental stress and residual energy. So the fluctuation of momentum is the most probable factor that reveals the trend of match. However,the momentum is not easy to be quantified for it includes many subjective indicators, and there are few models that can be directly used, so we decide to cut in the following questions from statistical analysis and data procession:

- Develop a model that captures the flow of play as points occur and apply it to one or more of the matches. Your model should identify which player is performing better at a given time in the match, as well as how much better they are performing. Provide a visualization based on your model to depict the match flow. *Note: in tennis, the player serving has a much higher probability of winning the point/game. You may wish to factor this into your model in some way.*
- A tennis coach is skeptical that "momentum" plays any role in the match. Instead, he postulates that swings in play and runs of success by one player are random. Use your model/metric to assess this claim.
- Coaches would love to know if there are indicators that can help determine when the flow of play is about to change from favoring one player to the other.

  1) Using the data provided for at least one match, develop a model that predicts these swings in the match. What factors seem most related (if any)?

  2) Given the differential in past match "momentum" swings how do you advise a player going into a new match against a different player?

- Test the model you developed on one or more of the other matches. How well do you predict the swings in the match? If the model performs poorly at times, can you identify any factors that might need to be included in future models? How generalizable is your model to other matches (such as Women's matches), tournaments, court surfaces, and other sports such as table tennis.
- Produce a report of no more than 25 pages with your findings and include a one- to two-page memo summarizing your results with advice for coaches on the role of"momentum", and how to prepare players to respond to events that impact the flow of play during a tennis match.

1.3 Our work

We do such things ...

1. We do ...

2. We do ...

3. We do ...

2 Assumptions

3 Notations

The primary notations used in this paper are listed in Table 1.

Table 1: Notations

Symbol	Definition
C_i	the first one
S_i	the second one
G	the second one
V	the second one
B	the second one
M	the second one
A	the second one
D	the second one
E	the second one
γ	Sport Advantagen Coefficient
m_{c_i}	the second one
$m_{c_i s_j}$	the second one
g_i	the second one
ξ	The Probability of First Medal

4 Data Preprocessing

4.1 Basic Data Preprocessing

$$G_i \cap G_j = \emptyset, \bigcup_{i=1}^{5} G_i = X$$

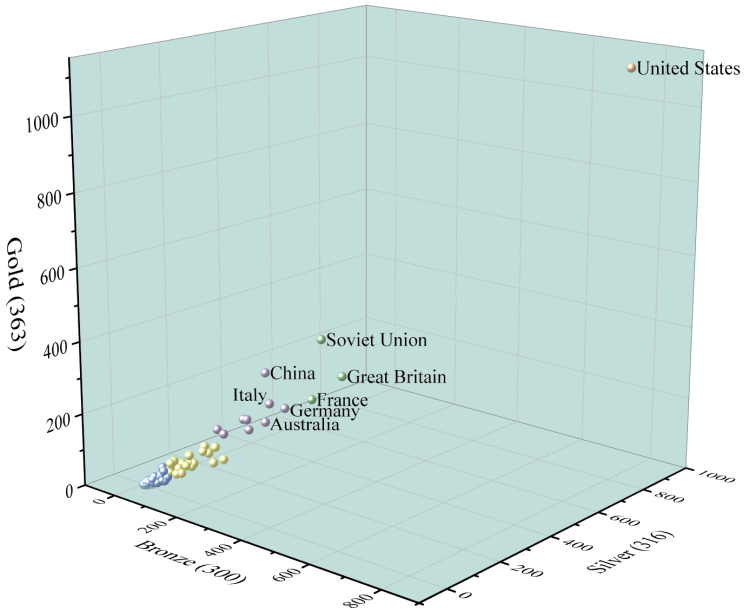


Figure 1: Scatter plot of national level classification (based on Kmeans++clustering algorithm)

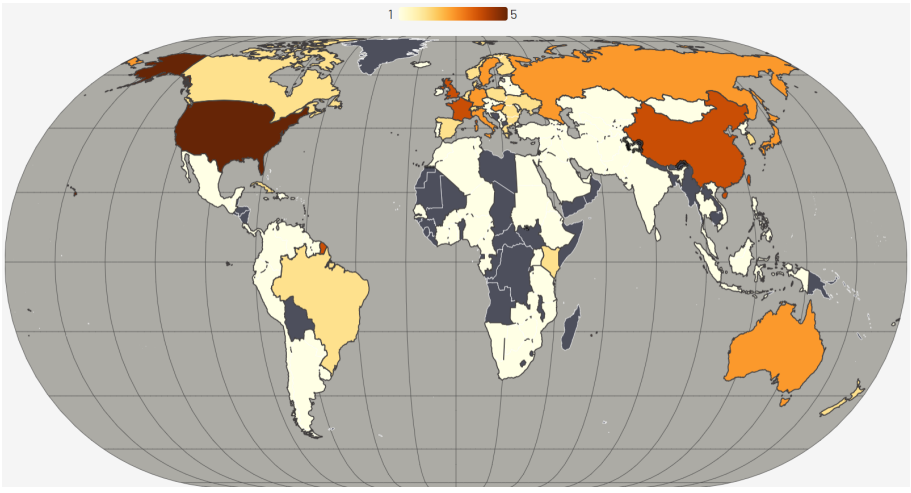


Figure 2: aa

4.2 Data Mining

5 Task1:

5.1 Details about Model 1

The detail can be described by equation (1):Equation 1:

$$\alpha+\beta=\gamma \tag{1}$$

$$\alpha+\beta=\gamma$$

$$\alpha$$

$$\gamma=\frac{m_{c_i s_j}}{\sum m_{c_i s_j}}$$

$$\begin{aligned} &A+B+C+D+E+F \\ &=G+Q+W+E+R+T+Y \\ &=A+S+D+F+G+H+J \end{aligned} \tag{2}$$

$$F(x)=\begin{cases} 0 & ,\text{if } x<0 \\ x+1 & ,\text{if } x>0 \\ 1 & ,\text{otherwise} \end{cases} \tag{3}$$

Table 2: Variable Name

Variable Name	*Code*	Definition
Whether Host Country	*is host*	Whether the country is the host(1 for host,0 for non-host)
Medal Expectation Increment *Personnel Expectation lncrement	*medal_increment * personnel_increment*	Product of medal expectation increment and personnel expectation increment
Sport Advantage Coefficient	*sport_adv*	Advantage coefficient of a specific sport
Country Level	*country_lvl*	The level of the country in the competition (ordered by rank)
Project Medal Expectation /Project Personnel Expection	*sport_medal _per_ person*	Ratio of sport medals to projected personnel for a specific sport

Continued on next page

Table 2: Variable Name (Continued)

Gold Medal Probability	*gold_prob*	Probability of an athlete winning a gold medal
Silver Medal Probability	*silver_prob*	Probability of an athlete winning a silver medal
Bronze Medal Probability	*silver_prob*	Probability of an athletewinning a bronze medal
No Medal Probability	*no_medal_probe*	Probability of an athlete winning no medal

6 Task2:

6.1 Conclusion of Model 2

The results are shown in Figure 3, where t denotes the time in seconds, and c refers to the concentration of water in the boiler.

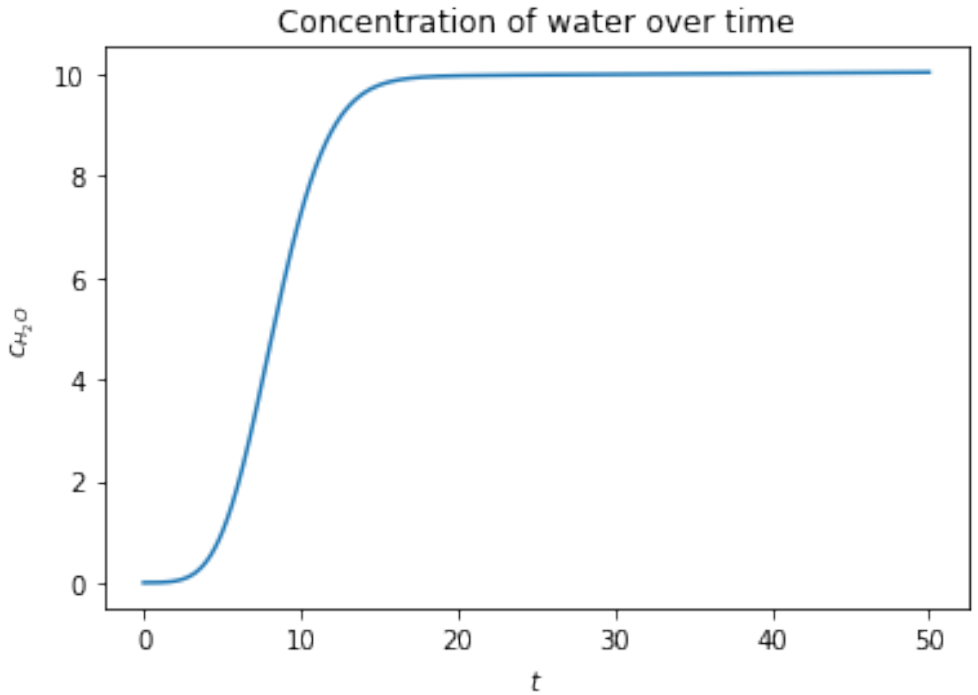
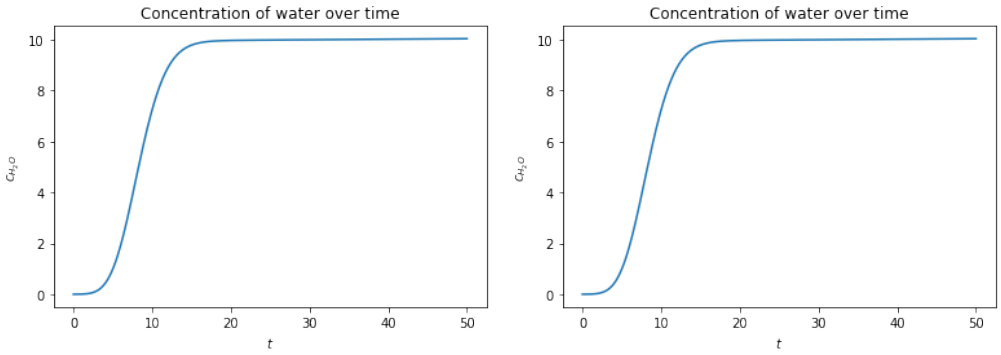


Figure 3: The result of Model 2

6.2 Commetary on Model 2

The instance of long and wide tables are shown in Table **??**.

Figure 4 gives an example of subfigures. Figure 4a is on the left, and Figure 4b is on the right.



(a) Image on the left (b) Image on the right

Figure 4: Two images

7 Task3

8 Task4

9 Sensitivity Analysis

10 Model Evaluation

10.1 Strengths

- First one...
- Second one ...

10.2 Weaknesses

- Only one ...

11 Conclusion

Memorandum

To: Heishan Yan
From: Team 1234567
Date: October 1st, 2019
Subject: A better choice than MS Word: LaTeX

In the memo, we want to introduce you an alternate typesetting program to the prevailing MS Word: **LaTeX**. In fact, the history of LaTeX is even longer than that of MS Word. In 1970s, the famous computer scientist Donald Knuth first came out with a typesetting program, which named TeX . . .

Firstly, . . .

Secondly, . . .

Lastly, . . .

According to all those mentioned above, it is really worth to have a try on LaTeX!

References

[1] Einstein, A., Podolsky, B., & Rosen, N. (1935). Can quantum-mechanical description of physical reality be considered complete?. *Physical review*, 47(10), 777.

[2] *A simple, easy LaTeX template for MCM/ICM: EasyMCM*. (2018). Retrieved December 1, 2019, from `https://www.cnblogs.com/xjtu-blacksmith/p/easymcm.html`

Appendix A: Further on LaTeX

To clarify the importance of using LaTeX in MCM or ICM, several points need to be covered, which are ...

To be more specific, ...

All in all, ...

Anyway, nobody **really** needs such appendix ...

Appendix B: Program Codes

Here are the program codes we used in our research.

test.py

```python
# Python code example
for i in range(10):
    print('Hello, world!')
```

test.m

```
% MATLAB code example
for i = 1:10
    disp("hello, world!");
end
```

test.cpp

```
// C++ code example
#include <iostream>
using namespace std;

int main() {
    for (int i = 0; i < 10; i++)
        cout << "hello, world" << endl;
    return 0;
}
```