

Chi-Square Test

The Fab Four of Tennis

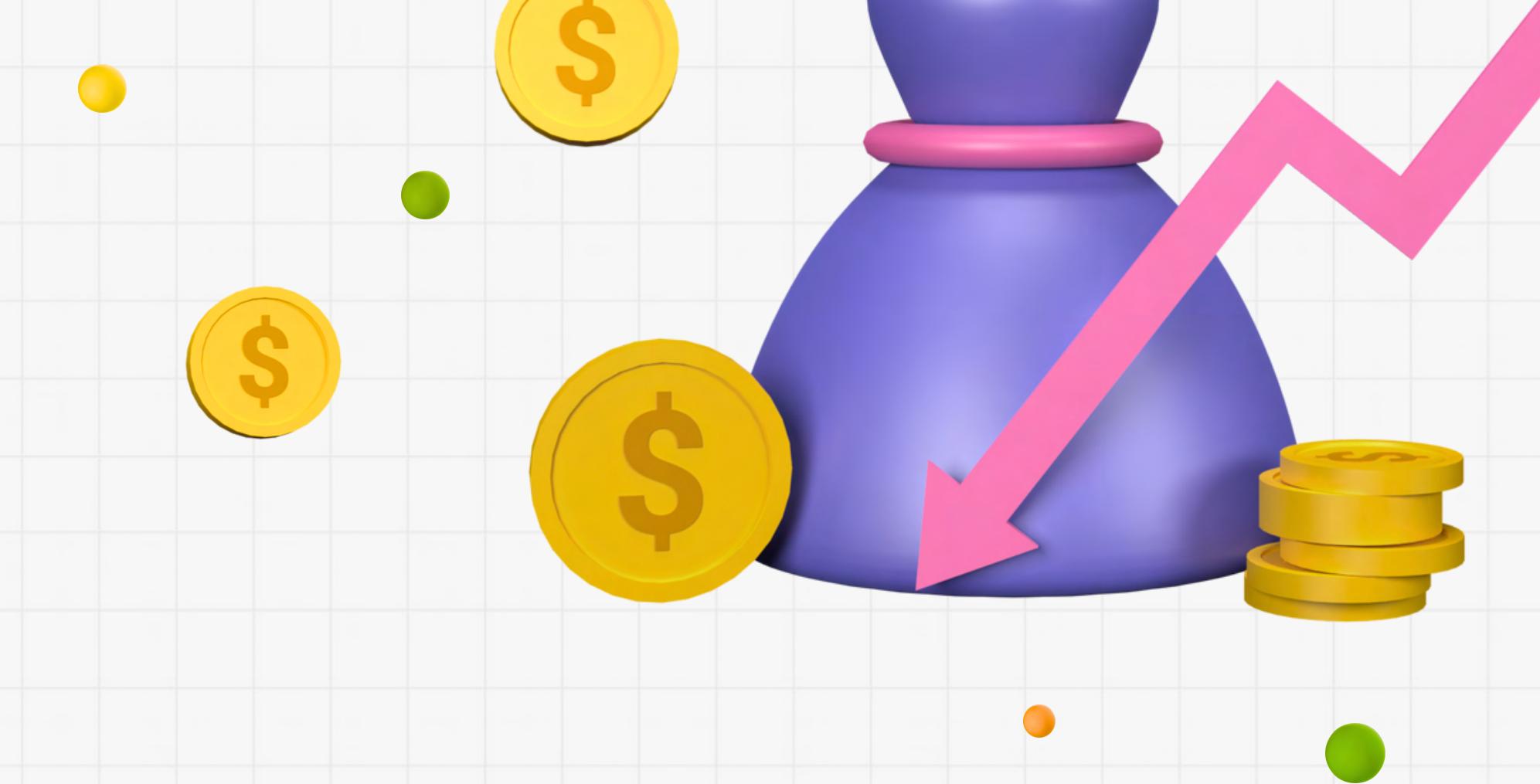
Harvard Case
Study



Agenda

- 1 Introduction
- 2 Versatile
- 3 Contingency Table
- 4 Court Surfaces

- 5 Fab Four Players
- 6 Statistical Tools
- 7 Hypotheses
- 8 Results



Introduction



Introduction

In March 2013, Tennis nerds: Frank Ryerson & Joe Wicks - watching a replay of the 2013 Australian Open Final.

Who do you think is the most versatile player of the Fab Four in the game today - Federer, Nadal, Djokovic or Murray?



Versatile



In recent years, men's tennis has been dominated by Roger Federer, Rafeal Nadal, Novak Djokovic and Andy Murray. The question is whether their performance depends on the type of court surface.

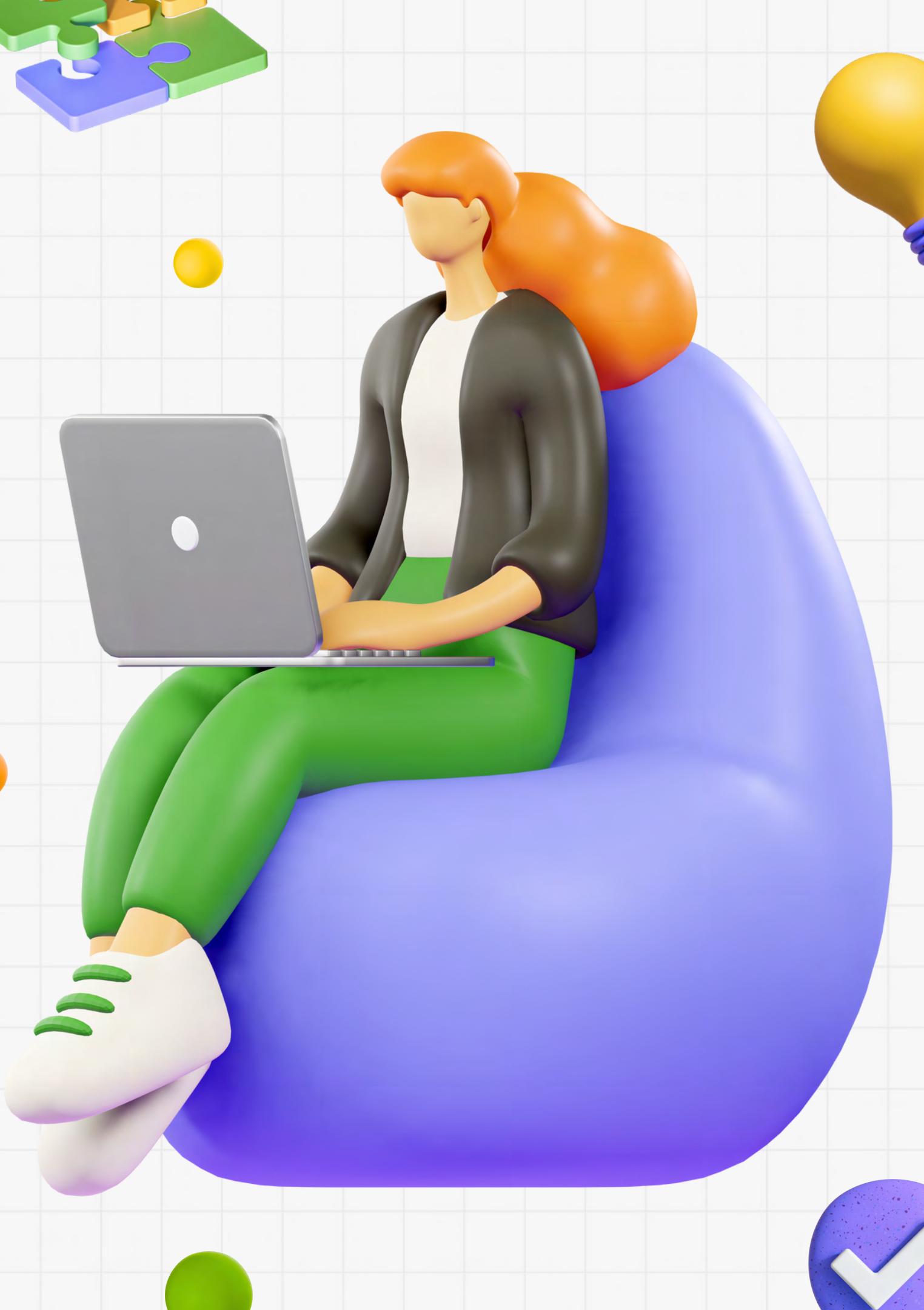


Who do you think handles different court surfaces the best?



Nadal is more comfortable on clay as compared to grass or hard court.

Finding their records online



Wins & Losses on Different Court Surfaces

Metrics	Grass		Hard		Clay	
	Win	Loss	Win	Loss	Win	Loss
Federer	94	5	427	61	185	37
Nadal	50	12	254	81	283	26
Djokovic	43	12	288	61	141	42
Murray	45	11	243	63	76	33

Court Surfaces



A close-up photograph of three bright yellow tennis balls resting on a vibrant green grass surface. In the background, a dark purple tennis net is visible, stretching across the frame. The grass has a slightly uneven texture with some small brown spots.

**Grass
Court**



**Clay
Court**



**Hard
Court**

Fab Four



Swiss
Roger Federer



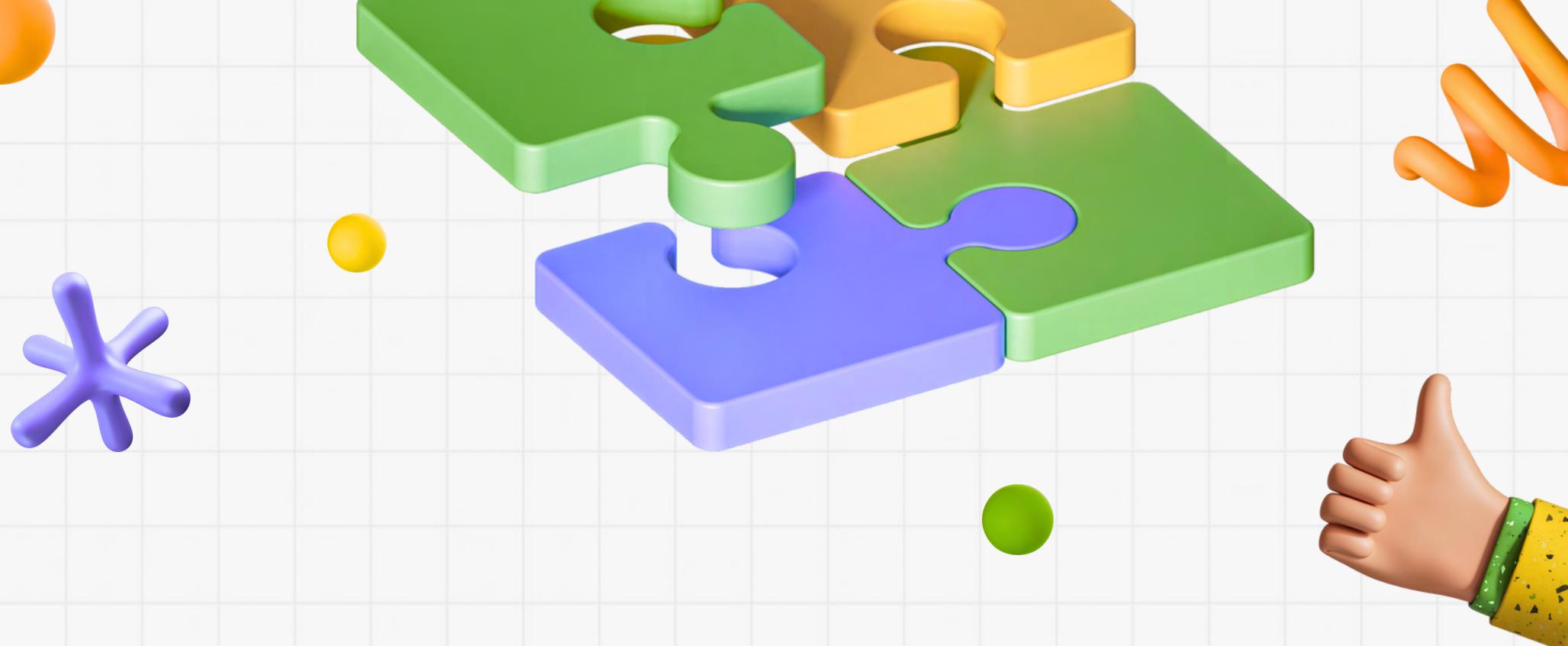
Spain
Rafael Nadal



Australia
Novak Djokovic



Scotland
Andy Murray





Chi-Square Test

1

Hypothesis Testing

2

Contingency Table

3

Chi-Square test for
each Player

4

Performance Vs. Types of
Court Surfaces.

Questions

Based on the data downloaded by Frank, describe a hypothesis test to determine whether each player's performance depends on the type of surface.



Null and Alternate Hypotheses

For each player, is there evidence to believe that the type of surface affects their performance?



Based on the results of the analysis, who is the most versatile player?

Win % - each player - Different surfaces

Metrics	Grass	Hard	Clay
Federer	94.9%	87.5%	83.3%
Nadal	80.6%	75.8%	91.6%
Djokovic	78.2%	82.5%	77%
Murray	80.4%	79.4%	69.7%

Hypotheses

Null Hyp:

The type of court surface does not make a difference in Roger Federer's performance.

VS

Alternate Hyp:

The type of court surface does make a difference in Roger Federer's performance

Federer

Observed

	Grass	Hard	Clay	Total	Percentage
Wins	94	427	185	706	87%
Losses	5	61	37	103	13%
Total	99	488	222	809	100%

Expected

	Grass	Hard	Clay	Total	Percentage
Wins	86	426	194	706	87%
Losses	13	62	28	103	13%
Total	99	488	222	809	100%

Test Result

There is a difference in performance

0.0151881

<

0.05

Nadal

Observed

	Grass	Hard	Clay	Total	Percentage
Wins	50	254	283	587	83%
Losses	12	81	26	119	17%
Total	62	335	309	706	100%

Expected

	Grass	Hard	Clay	Total	Percentage
Wins	52	279	257	587	83%
Losses	10	56	52	119	17%
Total	62	335	309	706	100%

Test Result

There is a difference in performance
0.0000006 < 0.05

Djokovic

Observed

	Grass	Hard	Clay	Total	Percentage
Wins	43	288	141	472	80%
Losses	12	61	42	115	20%
Total	55	349	183	587	100%

Expected

	Grass	Hard	Clay	Total	Percentage
Wins	44	281	147	472	80%
Losses	11	68	36	115	20%
Total	55	349	183	587	100%

Test Result No difference in performance

0.2903688 > 0.05

Murray

Observed

	Grass	Hard	Clay	Total	Percentage
Wins	45	243	76	364	77%
Losses	11	63	33	107	23%
Total	56	306	109	471	100%

Expected

	Grass	Hard	Clay	Total	Percentage
Wins	43	236	84	364	77%
Losses	13	70	25	107	23%
Total	56	306	109	471	100%

Test Result No difference in performance

0.0983742 > 0.05

Chi-Square Test Results

Player	P-Value	Conclusion
Federer	0.0152	Reject the null
Nadal	0.0000	Reject the null
Djokovic	0.2904	Cannot reject the null
Murray	0.0984	Cannot reject the null

Marketing

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Brainstorming

Finance

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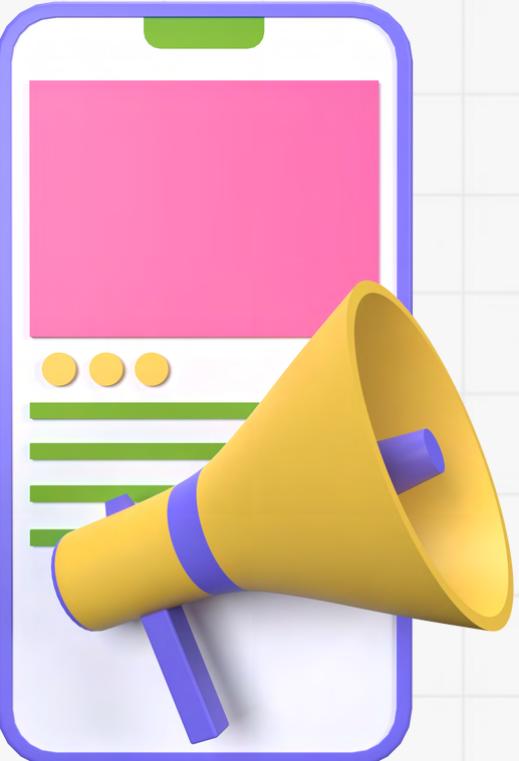
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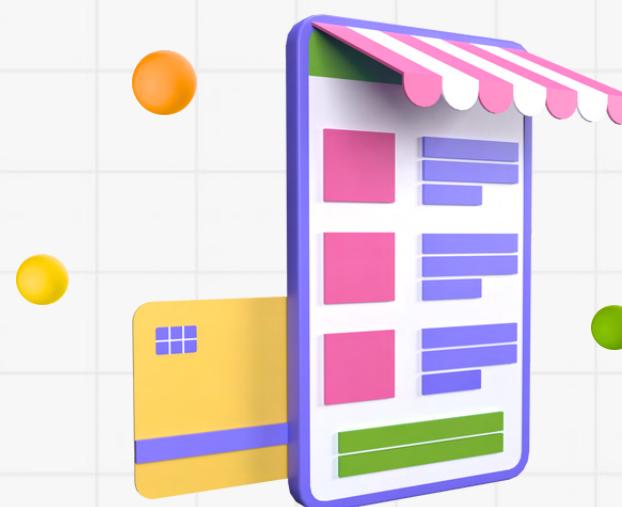
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Conclusion

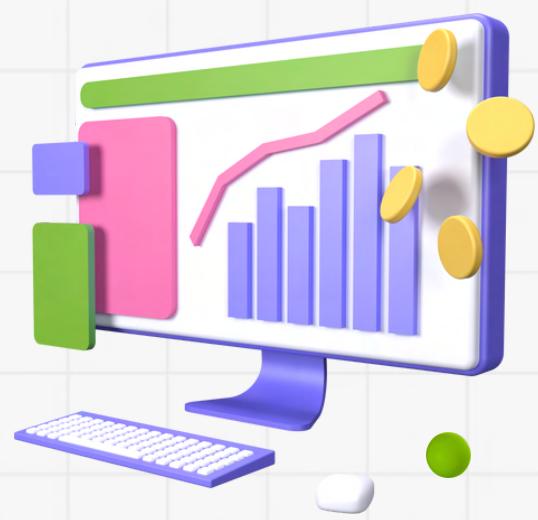


Marketing channels



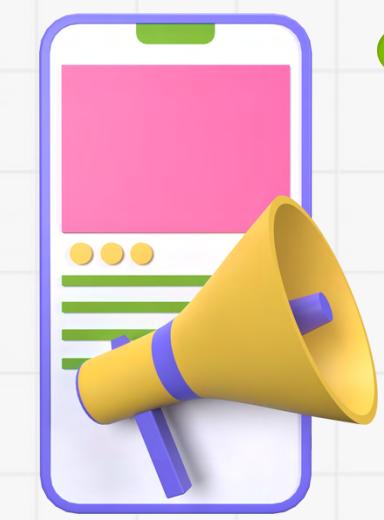
Display ads

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Email campaigns

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Social networks

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Moment of

Questions and answers

