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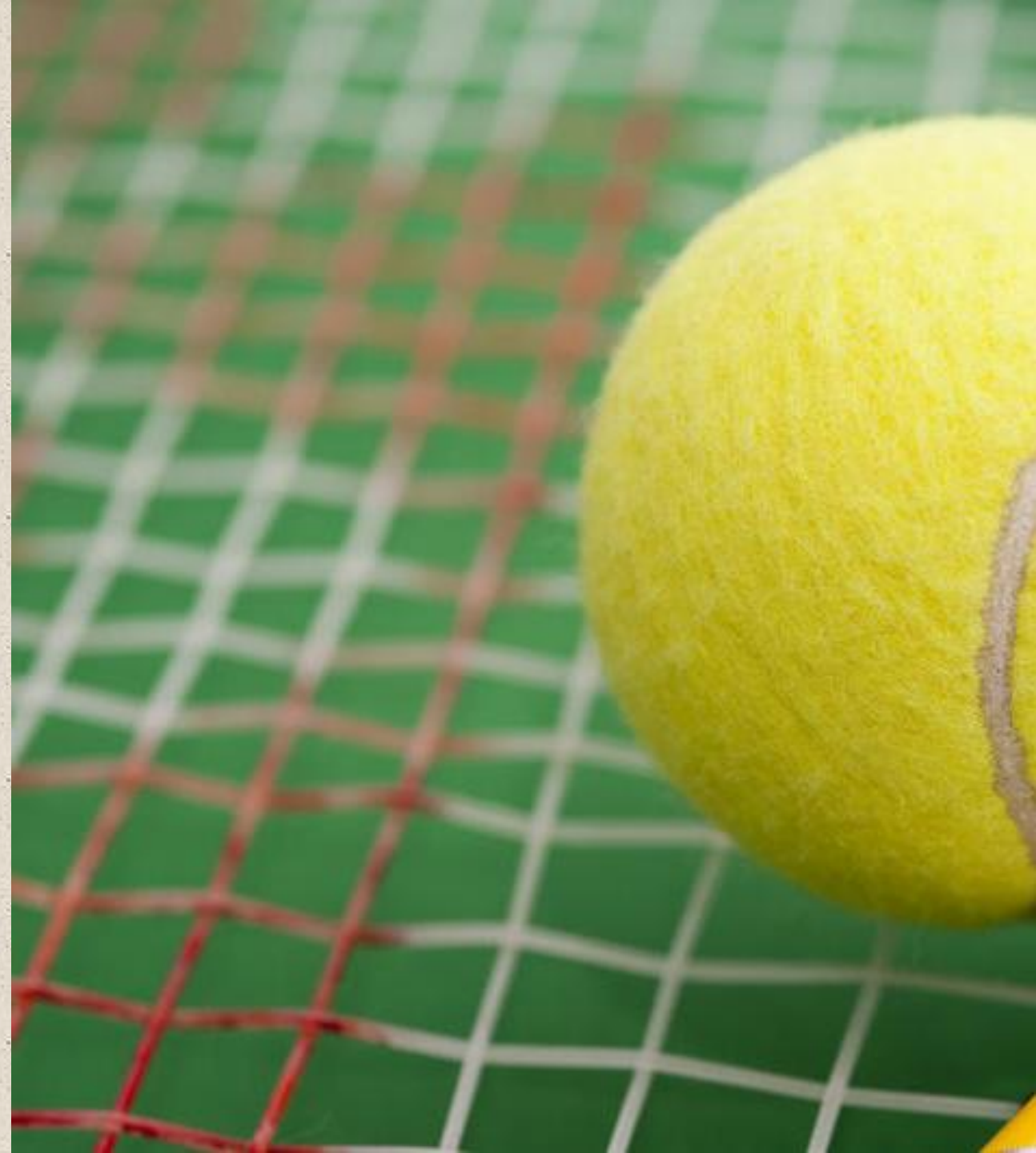
WHO IS THE G.O.A.T?

Question: Who is the greatest male professional tennis player in the Open Era?

- Analyze 46 years of ATP (Association of Tennis Professionals) data
- Create an index to compare players
- This question is hotly debated in the media and among tennis fans



THE SITUATION

It's too close to call…

- Roger Federer: most Grand Slam titles and weeks ranked at #1
- Jimmy Connors: most overall titles
- Rafael Nadal: currently ranked #1 and highest career winning percentage overall
- Novak Djokovic: only player in history to hold all four Grand Slams on three different surfaces at the same time
- Someone else?

A BRIEF HISTORY

Men's Professional Tennis

- The "Open Era" began in 1968 when Grand Slam tournaments agreed to allow professional players to compete with amateurs [1]
- Since 1972 the professional tournaments have been part of various tour circuits [2]
  - Grand Prix, World Championships, ATP Tour
- Australian Open was played on grass until 1988 [3]
- US Open has been played on 3 surfaces [4]
  - grass until 1974
  - clay from 1975 until 1977
  - hard courts from 1978 until today
- Player rankings: determined over the past 52 weeks by adding up ranking points from tour events [5] :
  - 4 Grand Slams
  - 8 Master's 1000s
  - 4 best ATP 500s
  - 2 best ATP 250s
  - ATP Finals if player qualifies

Sources:

1 https://en.wikipedia.org › wiki › History_of_tennis

2 https://en.wikipedia.org › wiki › Association_of_Tennis_Professionals

3 https://en.wikipedia.org › wiki › Australian_Open

4 https://en.wikipedia.org › wiki › Tennis_court

5 https://en.wikipedia.org › wiki › ATP_Rankings

- **Contains Jeff Sackmann's master ATP player file, historical rankings, results, and match stats**

- **Includes tour-level main draw matches:**
  - **159,812 observations of 50 variables**

- **The different tournament levels are represented by single letters: 'G' = Grand Slams, 'M' = Masters 1000s, 'A' = other tour-level events**

- **We used Wikipedia for # of weeks ranked #1 data due to gaps in years for Jeff Sackmann's rankings data**

THE DATA

1. **ATP Tennis Results and Stats on GitHub**
2. **Wikipedia: One table: List of ATP #1 Ranked Singles Players**

PREPARING THE DATA

Programming in R

- Read in data
  - Read in Jeff Sackmann csv files: 1973:2019
  - Wikipedia Rankings: extracted table
- Column Changes
  - deleted 35, renamed 2, added 6 and defined classes
- Used ifelse ( ) to define index variables by Round and Level or by Surface
- Removed NA's by using filter( )

ANALYSIS

Programming in R

- Created new dataframes for key variables
- Added a new weight column for each dataframe
- Assigned a value for each weight column
- Created df_index and df_our_ranks for our final calculation

ANALYSIS

Create Player Indices

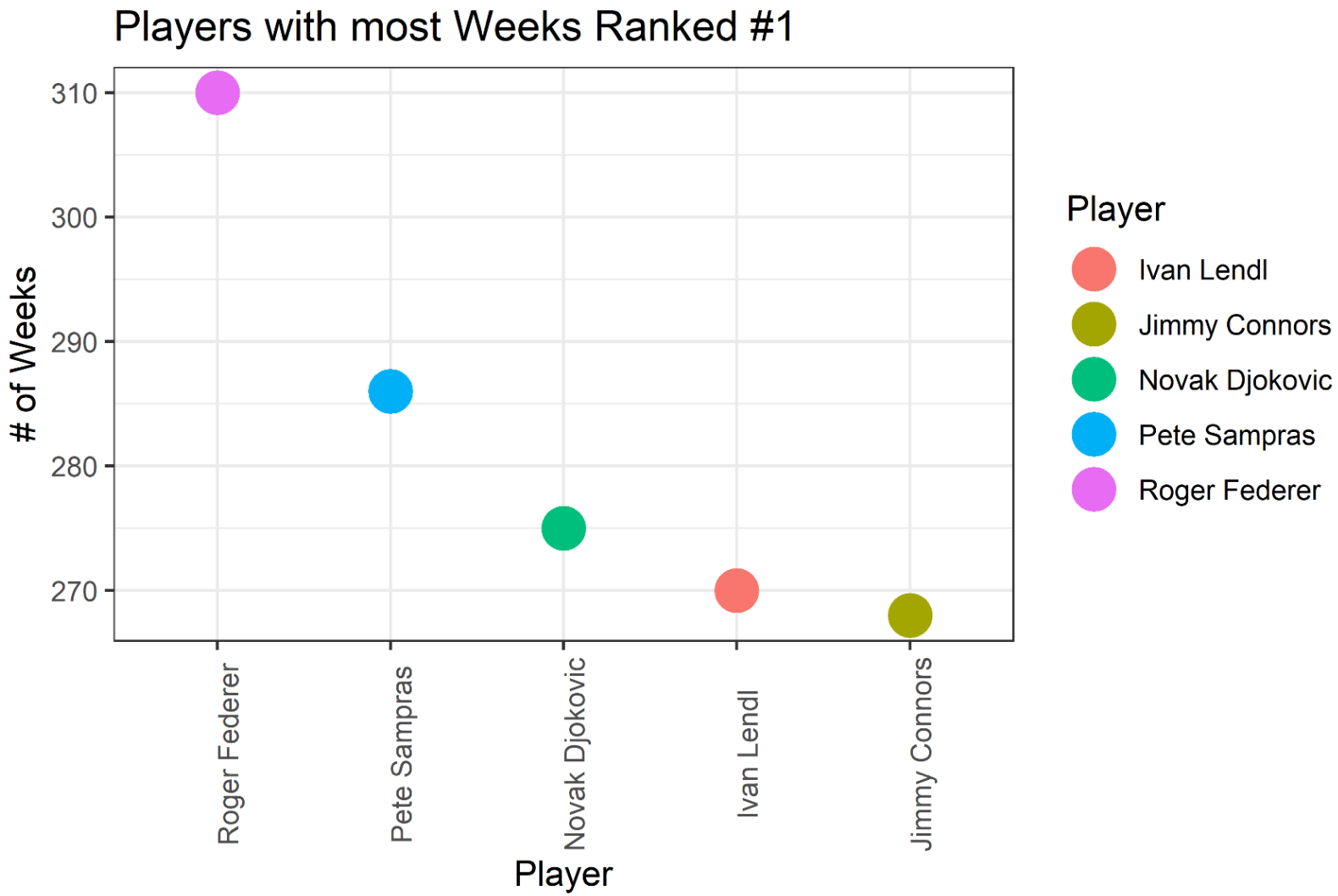
Developed a method to compare players across the Open Era

- Assigned a weight to each of the following
- Variables:
  - Number of
    - Grand Slam Titles
    - Grand Slam Finals
    - Grand Slam Semifinals
    - All Tournament Titles
    - All Tournament Finals
    - All Tournament Semifinals
    - Weeks Ranked at #1 for ATP Tour
    - Career Match Wins on Clay Courts
    - Career Match Wins on Grass Courts
    - Career Match Wins on Hard Courts

	A	B	C	D	E	F
1	**Variable**	**# of Obs**	**Our Weight**	**Multiplier**	**New our weight**	**Final Weight**
2	GrandSlamTitles	184	0.3	1000	300	1.6304
3	GrandSlamFinals	184	0.18	1000	180	0.9783
4	GrandSlamSemis	368	0.108	1000	108	0.2935
5	All Tourney Titles	3478	0.1125	1000	112.5	0.0323
6	All Tourney Finals	3478	0.0675	1000	67.5	0.0194
7	All Tourney Semis	6769	0.0405	1000	40.5	0.0060
8	Weeks Ranked #1	2410	0.047875	1000	47.875	0.0199
9	Match wins Clay	64860	0.047875	1000	47.875	0.0007
10	Match wins Hard	57538	0.047875	1000	47.875	0.0008
11	Match Wins Grass	16762	0.047875	1000	47.875	0.0029
12						
13			**Final weight = New our Weight / # of OBS**			

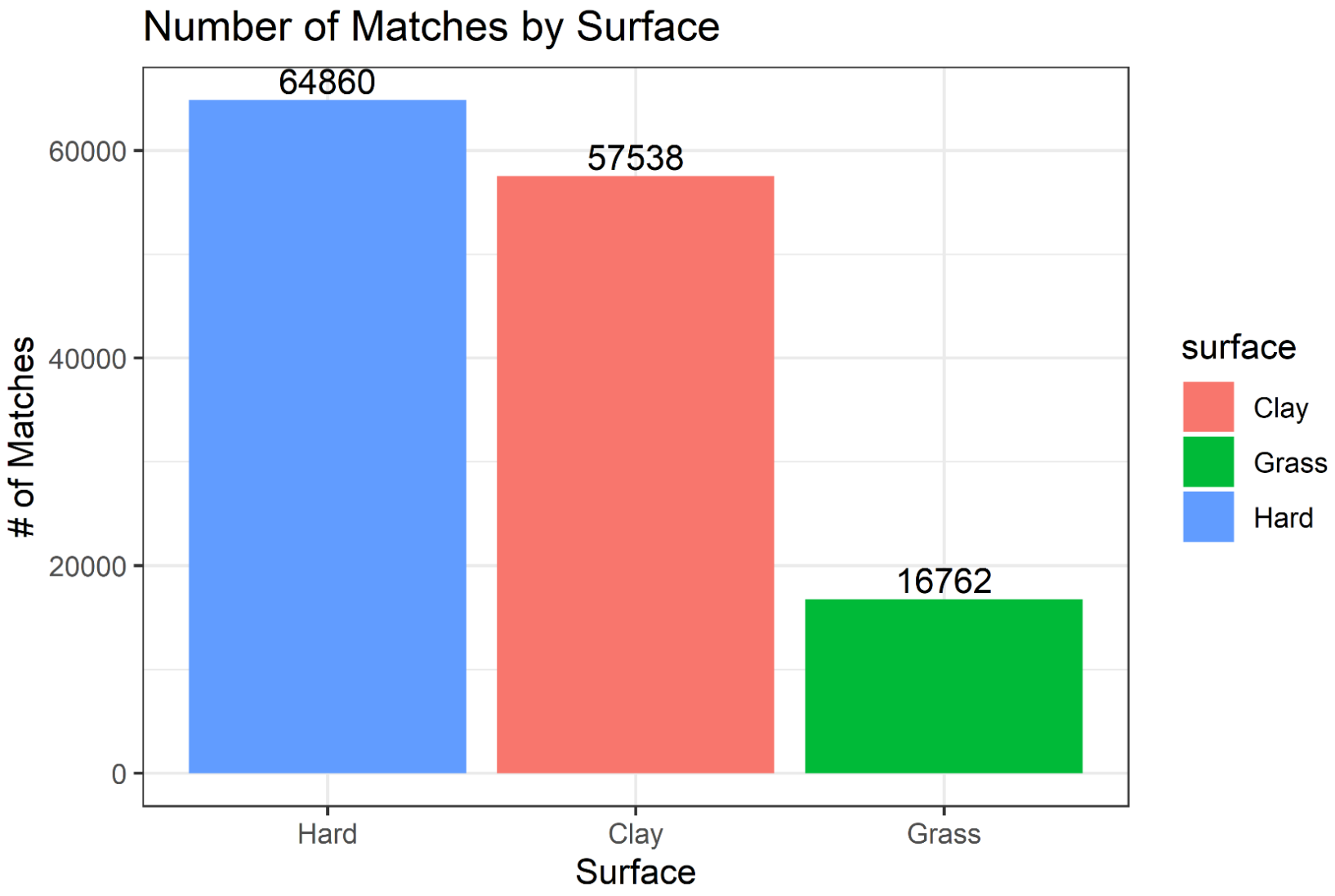
ANALYSIS

Variable Weights



ANALYSIS

Exploring the Data



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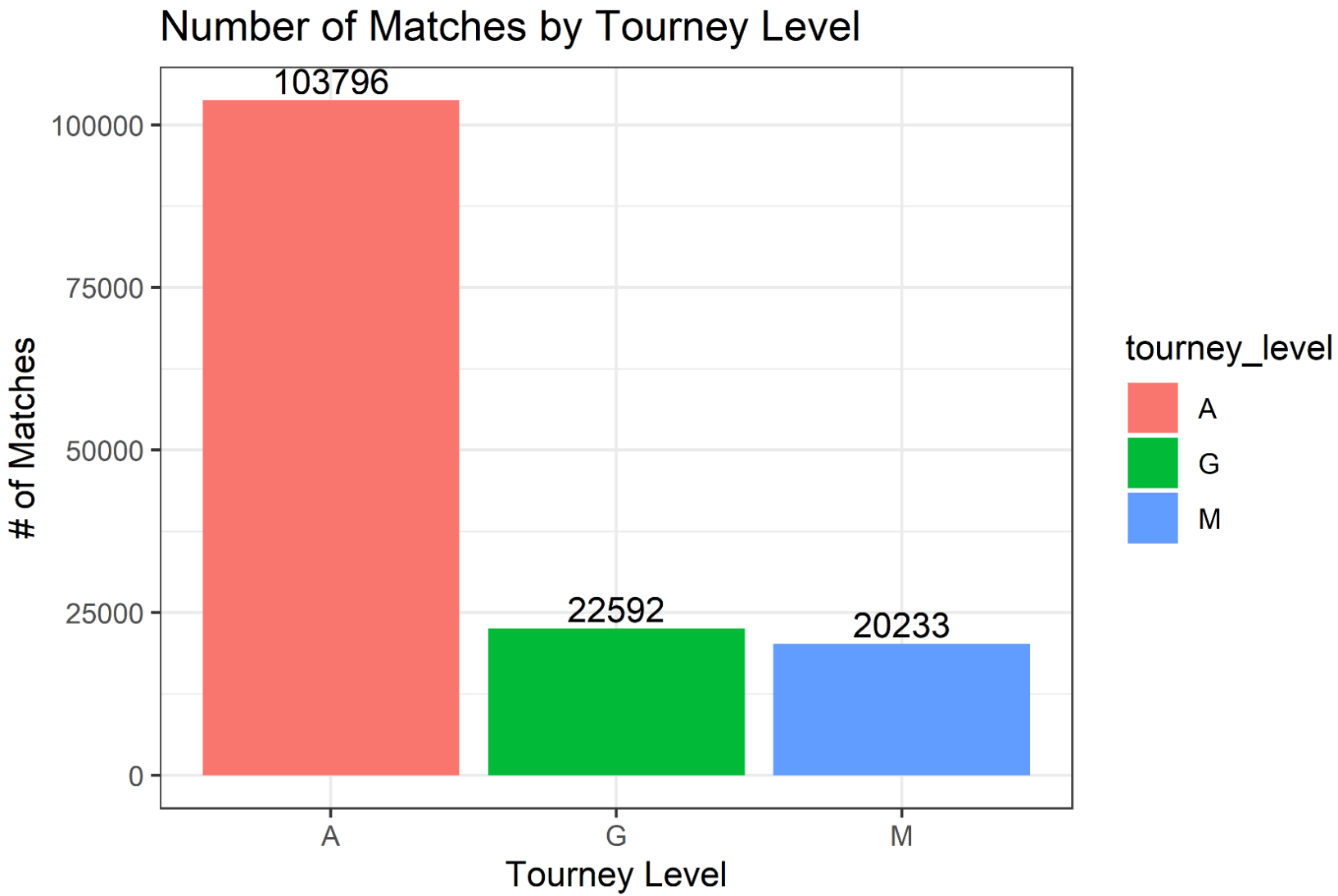

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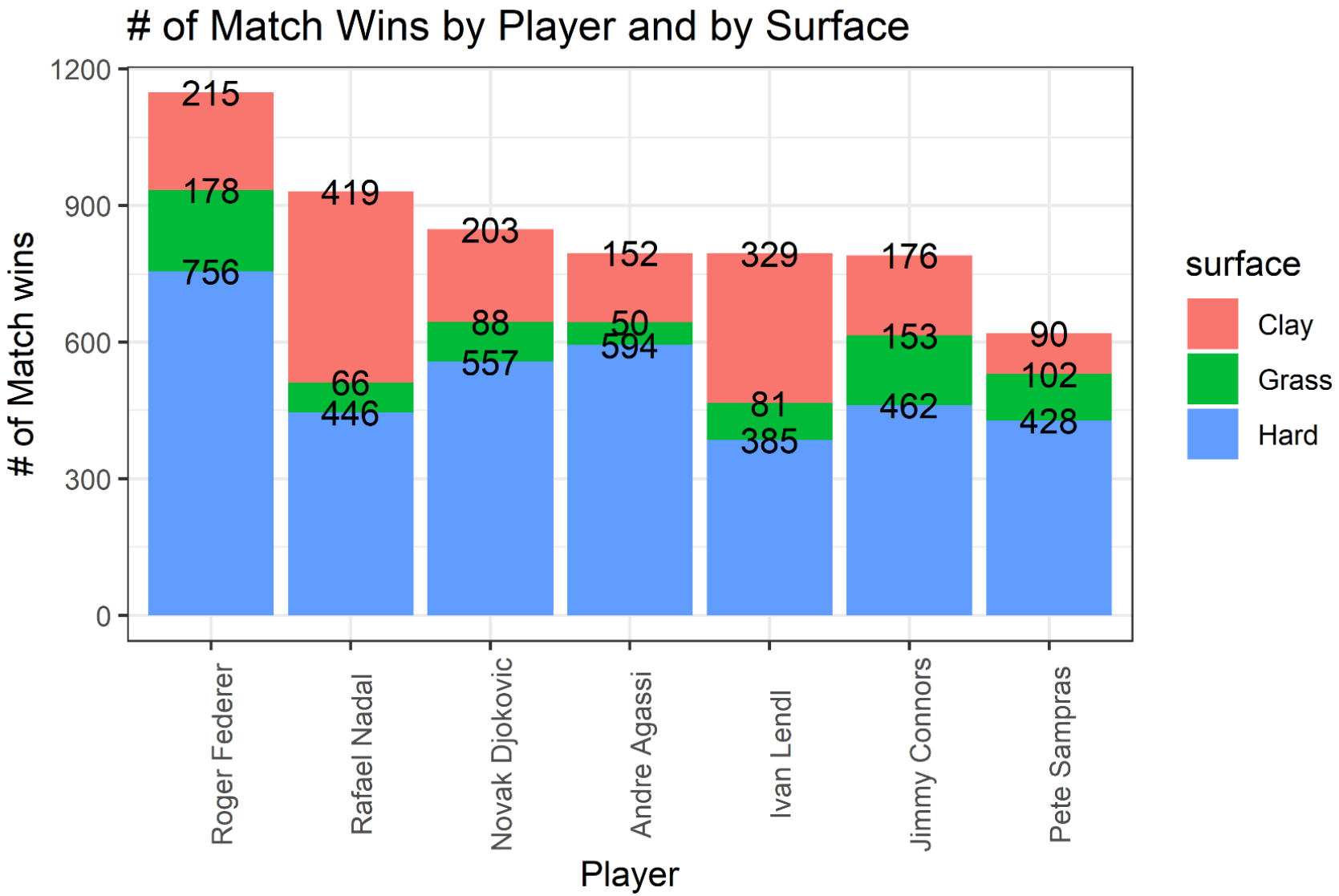

ANALYSIS

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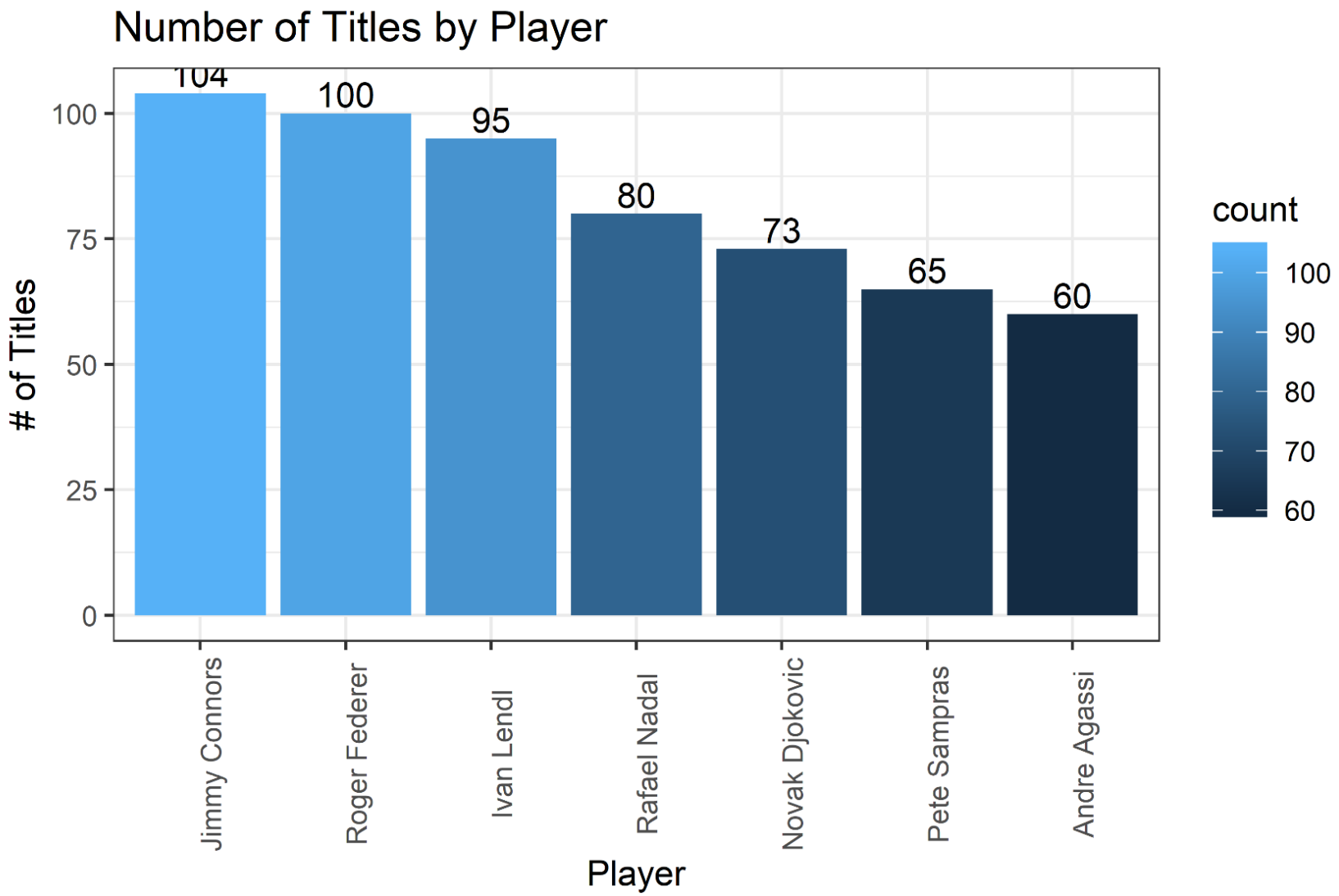

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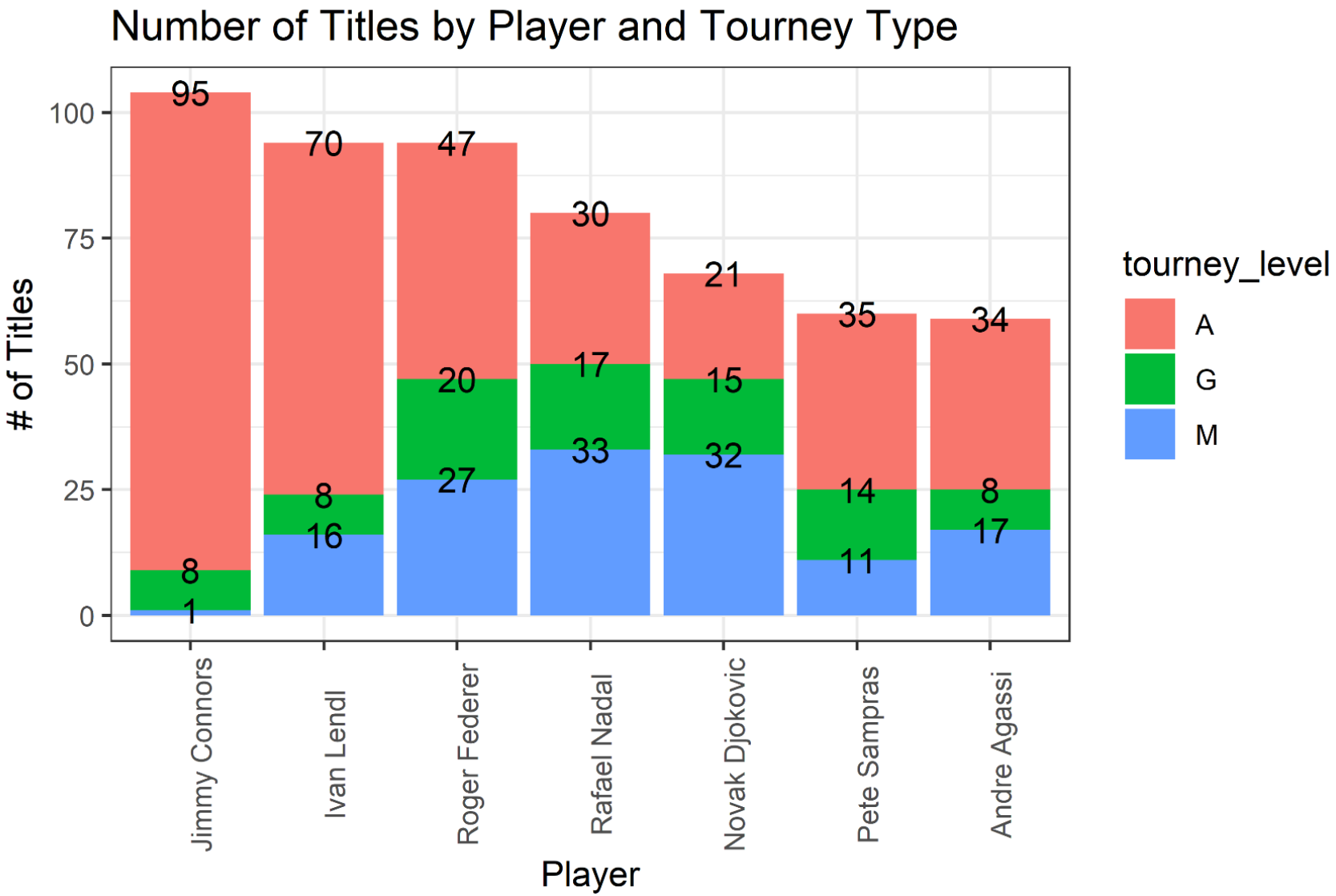

ANALYSIS

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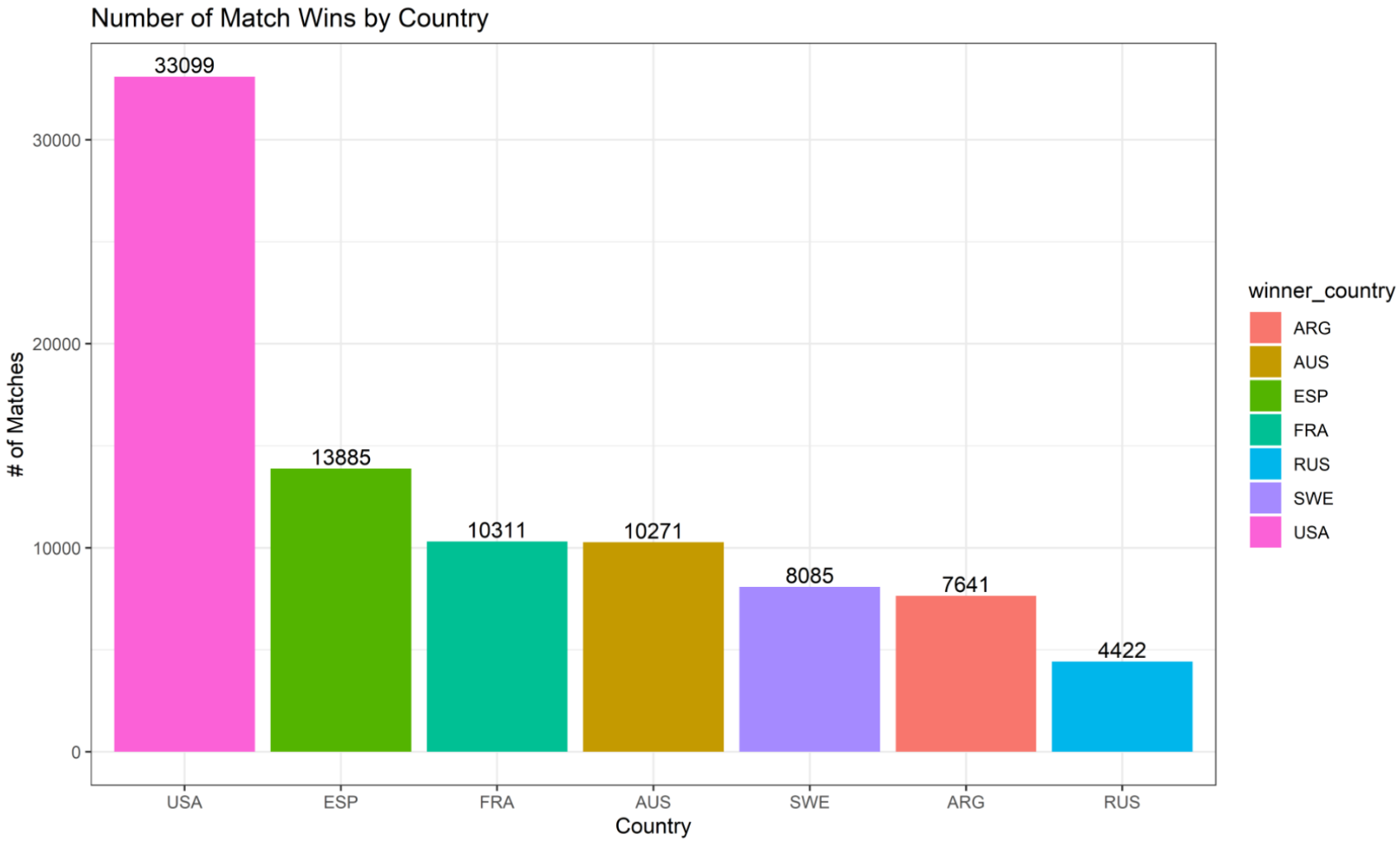


ANALYSIS

Exploring the Data

Challenges for our project

- **Sourcing complete tennis data**
  - Professional men's tennis experienced significant changes and leadership between 1973-2019
  - There are some tour-level matches with missing stats because ATP doesn't have them
  - We spent a lot of time figuring out the best data source
  - We weren't able to include 2019 March – October data
- **Downloading/merging multiple csv files**
  - variables with differing factor levels caused warnings when loading our data and during our analysis
- **Determining weights for player indices**
- **Reordering the plot x-axis results**

OVERCOMING OBSTACLES

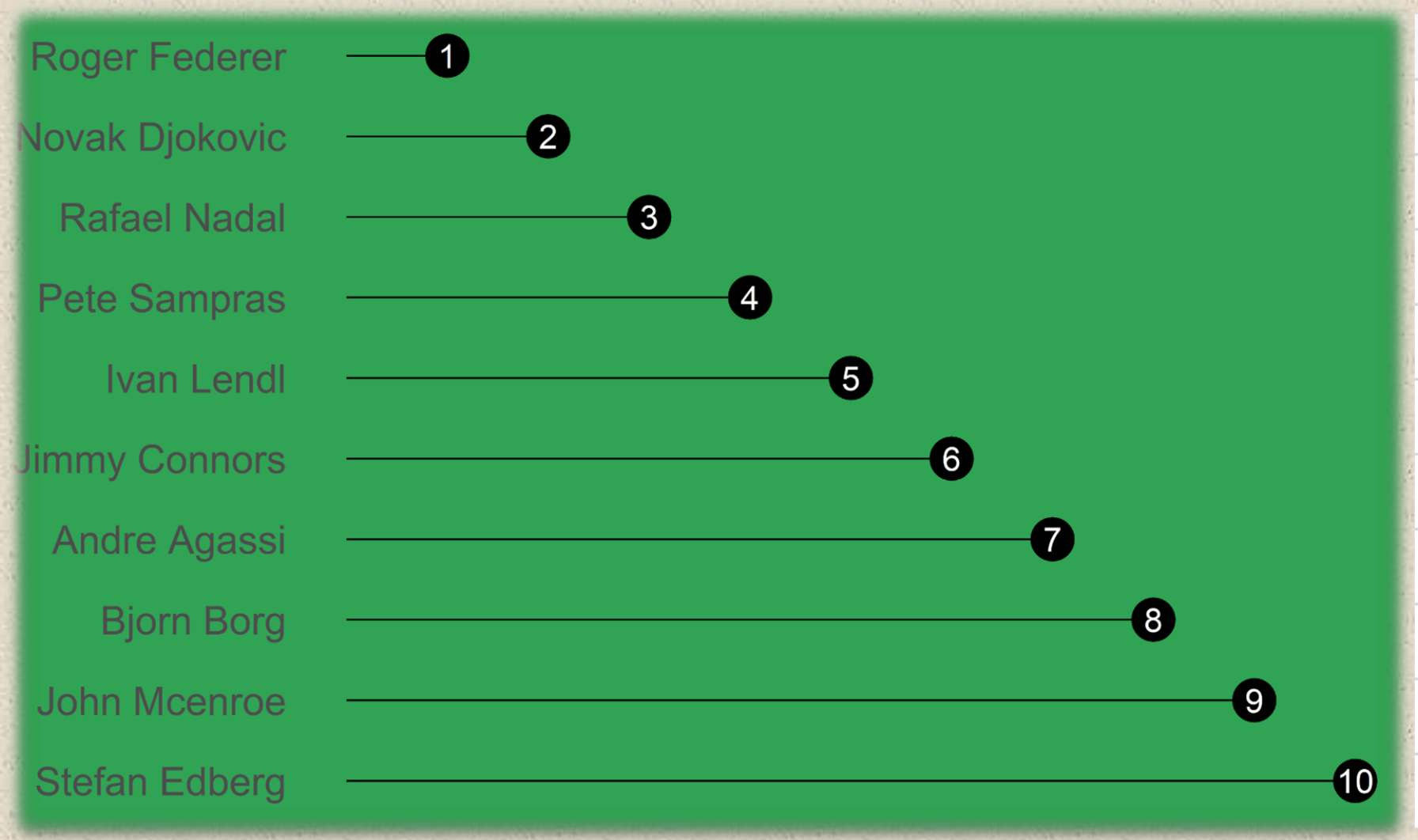
Our Solutions

- **Spent time searching for the best data source**
  - **We found the best data source available for free**
  - **We used a separate data set for # Weeks Ranked #1**
  - **We added data from 2019 for our final predictions**
- **We brought the factor variables into R as characters and converted them to factors**
- **We based our initial weights on the same percentages as Tour level events**
- **We created a spreadsheet to determine weights based on total observations for each variable**
- **Spent time exploring ggplot capabilities**

AND THE G.O.A.T IS.....

Roger Federer

TOP TEN PLAYERS FROM OUR INDEX



PlayerName	total	Rank
Roger Federer	56.9784	1
Novak Djokovic	44.8372	2
Rafael Nadal	44.4853	3
Pete Sampras	36.6153	4
Ivan Lendl	36.3440	5
Jimmy Connors	35.0324	6
Andre Agassi	28.0836	7
Bjorn Borg	25.7403	8
John Mcenroe	21.4285	9
Stefan Edberg	21.2756	10

ONE LAST THOUGHT

Predictions

Additional Analysis in R

How many Grand Slams will the top 3 players win over next 5 years?

- **Jeff Sackmann has a formula with points for:**
  - **Last two years of Grand Slam Titles, Finals and Semis**
  - **Player age over/under 27 years**
- **Federer, Nadal, and Djokovic stand out**
  - **Won all 8 Grand Slams in 2018 and 2019**
  - **Won 54 of last 64 Grand Slams (beginning in 2004)**
- **We created a data file for top 3 current players:**
  - **2018 and 2019 Grand Slam results and birthdays**

R FUNCTION

Predictions

- Initialized player data vectors and entered data
- Created points vector and calculated points for each player
- Wrote a function to sum the contents of each players' points vector:

```
Myfunc <- function(vector) {
    total <- 0
    for(i in vector) {
        total <-  i + total
    }
     total
}
```

- Calculated predicted number of Grand Slams:

DjokovicPredSlams <- (myfunc(DjokovicPoints))/100

Analysis Results:

- **Nadal will win 3 more for a total of 22 Grand Slams**
- **Federer will win 0 more for a total of 20 Grand Slams**
- **Djokovic will win 3 more for a total of 19 Grand Slams**

PREDICTIONS