NMIMS MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING

Data Extraction and Processing Project: Olympics Data

INTRODUCTION

We have taken a dataset of football players from the game FIFA 23 . As we surf through the report we can take a look at how we used R programming for data importing , data structure , data analysis , cleaning data etc .

PROBLEM STATEMENT

Perform a comprehensive analysis of FIFA player data to gain deep insights into player performance, attribute rankings, and the factors influencing player success. This analysis will hope to provide a holistic understanding of the football players ecosystem and answer critical questions for fans, clubs, and enthusiasts.

Packages used

Code:

```
library(tidyverse)
library(magrittr)
library(DataExplorer)
library(maps)
library(plotly)
library(DT)
library(tidytext)
library(gridExtra)
library(factoextra)
```

Data Description

Data Importing

Link : https://www.kaggle.com/datasets/javagarm/fifa-19-complete-player-dataset

Code:

```
df=read.csv("fifa.csv")
```

head(df) Output:

```
> df=read.csv("fifa.csv")
> head(df)
  X     ID             Name Age                                              Photo
1 0 158023         L. Messi  31 https://cdn.sofifa.org/players/4/19/158023.png
2 1  20801 Cristiano Ronaldo  33  https://cdn.sofifa.org/players/4/19/20801.png
3 2 190871         Neymar Jr  26 https://cdn.sofifa.org/players/4/19/190871.png
4 3 193080            De Gea  27 https://cdn.sofifa.org/players/4/19/193080.png
5 4 192985      K. De Bruyne  27 https://cdn.sofifa.org/players/4/19/192985.png
6 5 183277         E. Hazard  27 https://cdn.sofifa.org/players/4/19/183277.png
  Nationality                                Flag Overall Potential
1   Argentina https://cdn.sofifa.org/flags/52.png      94        94
2    Portugal https://cdn.sofifa.org/flags/38.png      94        94
3      Brazil https://cdn.sofifa.org/flags/54.png      92        93
4       Spain https://cdn.sofifa.org/flags/45.png      91        93
5     Belgium  https://cdn.sofifa.org/flags/7.png      91        92
6     Belgium  https://cdn.sofifa.org/flags/7.png      91        91
                Club                                  Club.Logo   Value  Wage
1        FC Barcelona https://cdn.sofifa.org/teams/2/light/241.png €110.5M €565K
2            Juventus  https://cdn.sofifa.org/teams/2/light/45.png    €77M €405K
3 Paris Saint-Germain  https://cdn.sofifa.org/teams/2/light/73.png €118.5M €290K
4   Manchester United  https://cdn.sofifa.org/teams/2/light/11.png    €72M €260K
5     Manchester City  https://cdn.sofifa.org/teams/2/light/10.png   €102M €355K
6             Chelsea   https://cdn.sofifa.org/teams/2/light/5.png    €93M €340K
  Special Preferred.Foot International.Reputation Weak.Foot Skill.Moves
1    2202           Left                         5         4           4
2    2228          Right                         5         4           5
3    2143          Right                         5         5           5
4    1471          Right                         4         3           1
5    2281          Right                         4         5           4
6    2142          Right                         4         4           4
       Work.Rate  Body.Type Real.Face Position Jersey.Number       Joined
1 Medium/ Medium      Messi       Yes       RF            10  Jul 1, 2004
2      High/ Low C. Ronaldo       Yes       ST             7 Jul 10, 2018
3   High/ Medium     Neymar       Yes       LW            10  Aug 3, 2017
```

Data Structure

Code:

dim(df)

Output:

```
> dim(df)
[1] 18207    89
```

There are 89 columns and 18207 rows

Code:

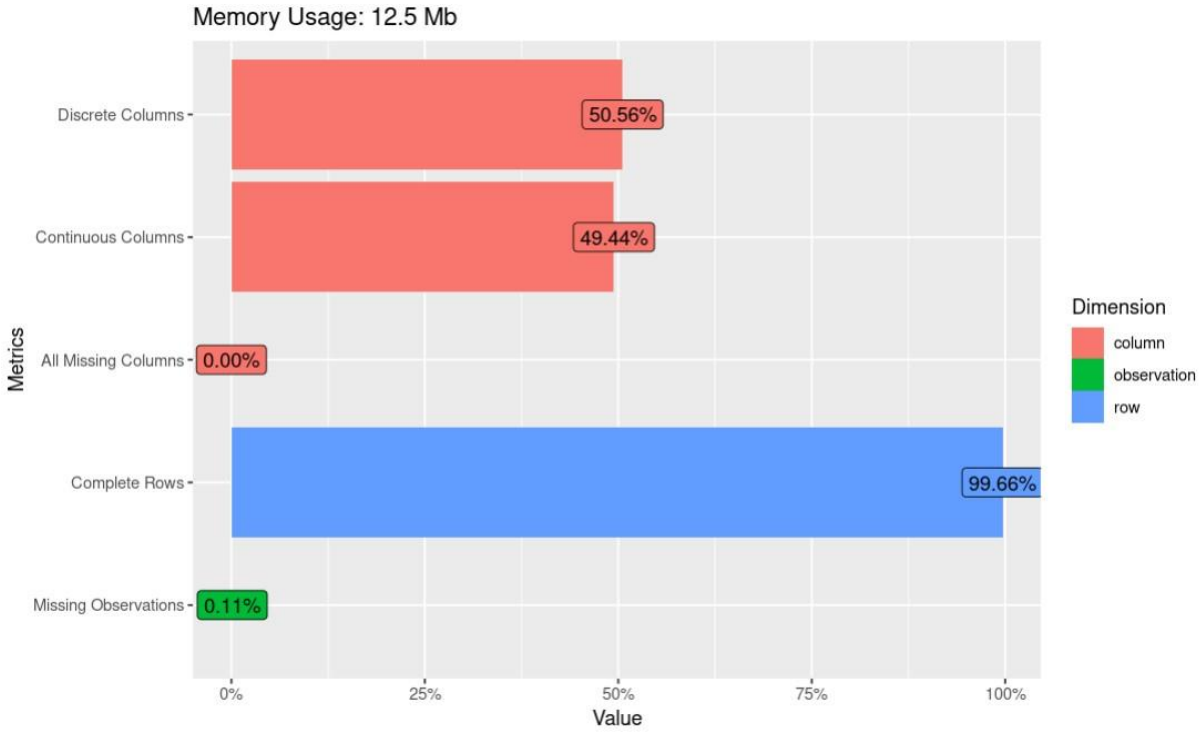
introduce(df)

plot_intro(df)

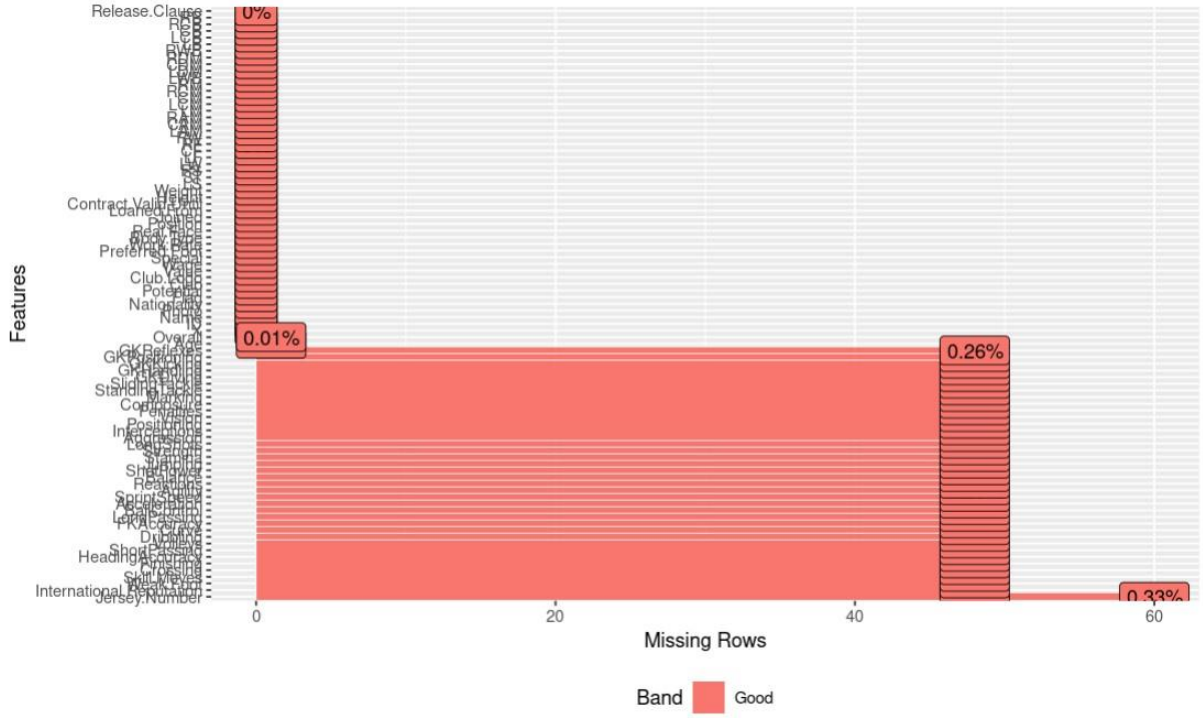
plot_missing(df)

Output:

```
> introduce(df)
   rows columns discrete_columns continuous_columns all_missing_columns total_missing_values complete_rows total_observations memory_usage
1 18207      89               45                44                   0                1838         18145            1620423     13138600
```



,



Data Manipulation

Creating League Variable and Sampling:

The data does not include league variable but we can extract leagues from Club variable.

Code:

```
bundesliga = c(
  "1. FC Nürnberg", "1. FSV Mainz 05", "Bayer 04 Leverkusen", "FC Bayern München",
  "Borussia Dortmund", "Borussia Mönchengladbach", "Eintracht Frankfurt",
  "FC Augsburg", "FC Schalke 04", "Fortuna Düsseldorf", "Hannover 96",
  "Hertha BSC", "RB Leipzig", "SC Freiburg", "TSG 1899 Hoffenheim",
  "VfB Stuttgart", "VfL Wolfsburg", "SV Werder Bremen"
)
```

```
premierLeague = c(
  "Arsenal", "Bournemouth", "Brighton & Hove Albion", "Burnley",
  "Cardiff City", "Chelsea", "Crystal Palace", "Everton", "Fulham",
  "Huddersfield Town", "Leicester City", "Liverpool", "Manchester City",
  "Manchester United", "Newcastle United", "Southampton",
  "Tottenham Hotspur", "Watford", "West Ham United", "Wolverhampton Wanderers"
)
laliga = c(
  "Athletic Club de Bilbao", "Atlético Madrid", "CD Leganés",
  "Deportivo Alavés", "FC Barcelona", "Getafe CF", "Girona FC",
  "Levante UD", "Rayo Vallecano", "RC Celta", "RCD Espanyol",
  "Real Betis", "Real Madrid", "Real Sociedad", "Real Valladolid CF",
  "SD Eibar", "SD Huesca", "Sevilla FC", "Valencia CF", "Villarreal CF"
)
seriea = c(
  "Atalanta","Bologna","Cagliari","Chievo Verona","Empoli",
  "Fiorentina","Frosinone","Genoa",

"Inter","Juventus","Lazio","Milan","Napoli","Parma","Roma","Sampdoria","Sassuolo","SPAL",
  "Torino","Udinese"
)
superlig = c(
  "Akhisar Belediyespor","Alanyaspor", "Antalyaspor","Medipol Basaksehir FK","BB
Erzurumspor","Besiktas JK",
  "Bursaspor","Çaykur Rizespor","Fenerbahçe SK", "Galatasaray SK","Göztepe
SK","Kasimpasa SK",
  "Kayserispor","Atiker Konyaspor","MKE Ankaragücü", "Sivasspor","Trabzonspor","Yeni
Malatyaspor"
)
ligue1 = c(
  "Amiens SC", "Angers SCO", "AS Monaco", "AS Saint-Étienne", "Dijon FCO", "En Avant de
Guingamp",
  "FC Nantes", "FC Girondins de Bordeaux", "LOSC Lille", "Montpellier HSC", "Nîmes
Olympique",
  "OGC Nice", "Olympique Lyonnais","Olympique de Marseille", "Paris Saint-Germain",
  "RC Strasbourg Alsace", "Stade Malherbe Caen", "Stade de Reims", "Stade Rennais FC",
"Toulouse Football Club"
)
eredivisie = c(
  "ADO Den Haag","Ajax", "AZ Alkmaar", "De Graafschap","Excelsior","FC Emmen","FC
Groningen",
  "FC Utrecht", "Feyenoord","Fortuna Sittard", "Heracles Almelo","NAC Breda",
  "PEC Zwolle", "PSV","SC Heerenveen","Vitesse","VVV-Venlo","Willem II"
)
liganos = c(
  "Os Belenenses", "Boavista FC", "CD Feirense", "CD Tondela", "CD Aves", "FC Porto",
  "CD Nacional", "GD Chaves", "Clube Sport Marítimo", "Moreirense FC", "Portimonense
SC", "Rio Ave FC",
```

"Santa Clara", "SC Braga", "SL Benfica", "Sporting CP", "Vitória Guimarães", "Vitória de Setúbal"

)

```
df$League = NA df$Country = NA
df$League[df$Club %in% bundesliga] = "Bundesliga"
df$League[df$Club %in% premierLeague] =
"Premier League" df$League[df$Club %in% laliga] =
"La Liga" df$League[df$Club %in% seriea] = "Serie
A" df$League[df$Club %in% superlig] = "Süper Lig"
df$League[df$Club %in% ligue1] = "Ligue 1"
df$League[df$Club %in% liganos] = "Liga Nos"
df$League[df$Club %in% eredivisie] = "Eredivisie"
df$Country[df$League == "Bundesliga"] =
"Germany" df$Country[df$League == "Premier
League"] = "UK" df$Country[df$League == "La Liga"]
= "Spain" df$Country[df$League == "Serie A"] =
"Italy" df$Country[df$League == "Süper Lig"] =
"Turkey" df$Country[df$League == "Ligue 1"] =
"France" df$Country[df$League == "Liga Nos"] =
"Portugal" df$Country[df$League == "Eredivisie"] =
"Netherlands" df$League = as.character(df$League)
df$Country = as.character(df$Country)
```

String manipulation:

Value and Wage variables has described as discrete variables. We should transform them into continuous variable.

Code:

```
head(df$Value)
```

Output:

```
> head(df$Value)
[1] "€110.5M" "€77M"    "€118.5M" "€72M"    "€102M"   "€93M"
```

Code:

```
df$Values = str_remove_all(df$Value,"€")
df$Values = str_replace_all(df$Values,"K", "000")
df$Values = str_remove_all(df$Values,"M")
df$Values = as.numeric(df$Values) df$Wages =
str_remove_all(df$Wage,"€") df$Wages =
str_replace_all(df$Wages,"K", "000") df$Wages =
as.numeric(df$Wages)
df$Values = ifelse(df$Values < 1000, df$Values * 1000000, df$Values)
```

Create Position Class:

Every players has a position on the football pitch. We can create Position Class variable by using Position information.

Code:

```
unique(df$Position)
```

Output:

```
> unique(df$Position)
 [1] "RF"  "ST"  "LW"  "GK"  "RCM" "LF"  "RS"  "RCB" "LCM" "CB"  "LDM" "CAM" "CDM" "LS"  "LCB" "RM"  "LAM" "LM"  "LB"  "RDM" "RW"  "CM"  "RB"  "RAM" "CF"  "RWB"
[27] "LWB" ""
>
```

Code: defence <- c("CB", "RB", "LB", "LWB", "RWB", "LCB", "RCB") midfielder <- c("CM", "CDM","CAM","LM","RM", "LAM", "RAM", "LCM", "RCM", "LDM", "RDM") df$Class = "" df$Class[df$Position %in% "GK"] = "Goal Keeper" df$Class[df$Position %in% defence] =

"Defender" df$Class[df$Position %in% midfielder] = "Midfielder" df$Class[!df$Position %in% c("GK", defence, midfielder)] = "Forward"
rm(defence, midfielder)

Height and Weight:
Height and Weight variables convert cm and kg units.
Code: df$Height = round((as.numeric(substr(df$Height, start = 1, stop = 1)) * 30.48) +
(as.numeric(substr(df$Height, start = 3, stop = 5)) * 2.54))
df$Weight = round(as.numeric(substr(df$Weight, start = 1, stop = 3)) / 2.204623)

Correction of Preferred foot variable:
Code:
foot_filter = df$Preferred.Foot %in% c("Left", "Right")
df = df[foot_filter,]
df$Preferred.Foot = as.factor(as.character(df$Preferred.Foot))

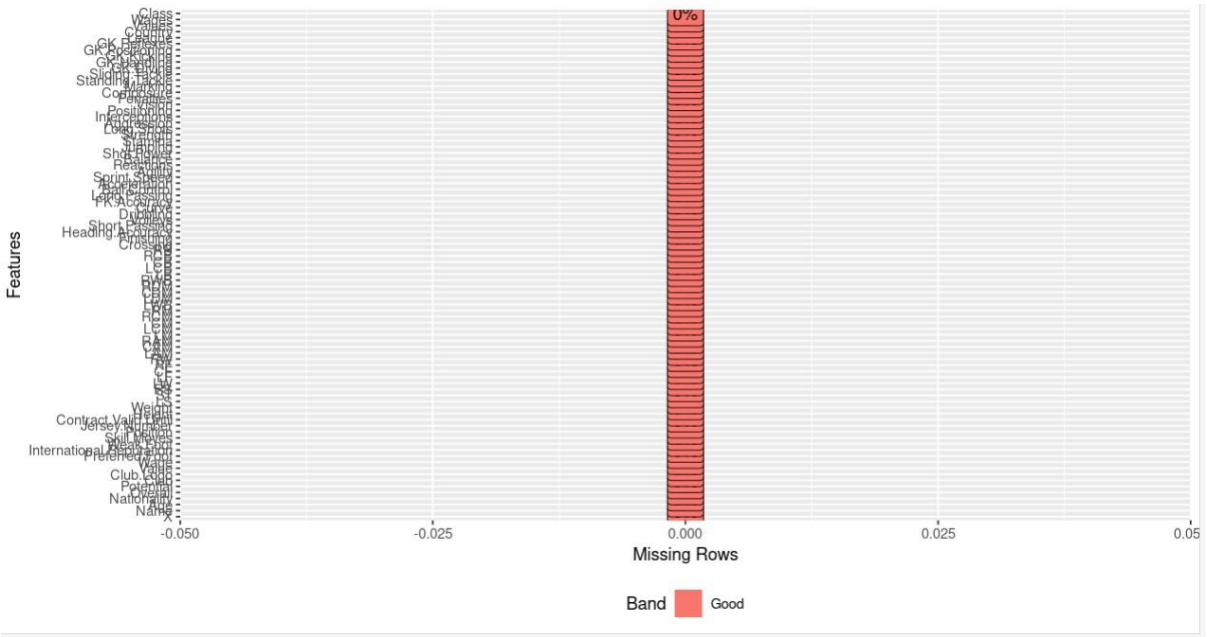
Rename some variables:
Code:
```
df %<>%
  rename(
    "Heading.Accuracy"= HeadingAccuracy,
    "Short.Passing"= ShortPassing,
    "FK.Accuracy" = FKAccuracy,
    "Long.Passing"= LongPassing,
    "Ball.Control"= BallControl,
    "Sprint.Speed"= SprintSpeed,
    "Shot.Power"= ShotPower,
    "Long.Shots"= LongShots,
    "Standing.Tackle"= StandingTackle,
    "Sliding.Tackle"= SlidingTackle,
    "GK.Diving"= GKDiving,
    "GK.Handling"= GKHandling,
    "GK.Kicking"= GKKicking,
    "GK.Positioning"= GKPositioning,
    "GK.Reflexes"= GKReflexes
  )
```

Remove Unncessary Variables:
Code: df = df[, !names(df) %in% c("ID", "Body.Type", "Real.Face", "Joined", "Loaned.From", "Release.Clause", "Photo", "Flag", "Special", "Work.Rate")]

Tidying Data

Code:
```
df=na.omit(df)
introduce(df)
plot_missing(df)
```
Output:

```
> df=na.omit(df)
> introduce(df)
  rows columns discrete_columns continuous_columns all_missing_columns total_missing_values complete_rows total_observations memory_usage
1 4333      84               38                 46                   0                    0          4333             363972      2645288
```



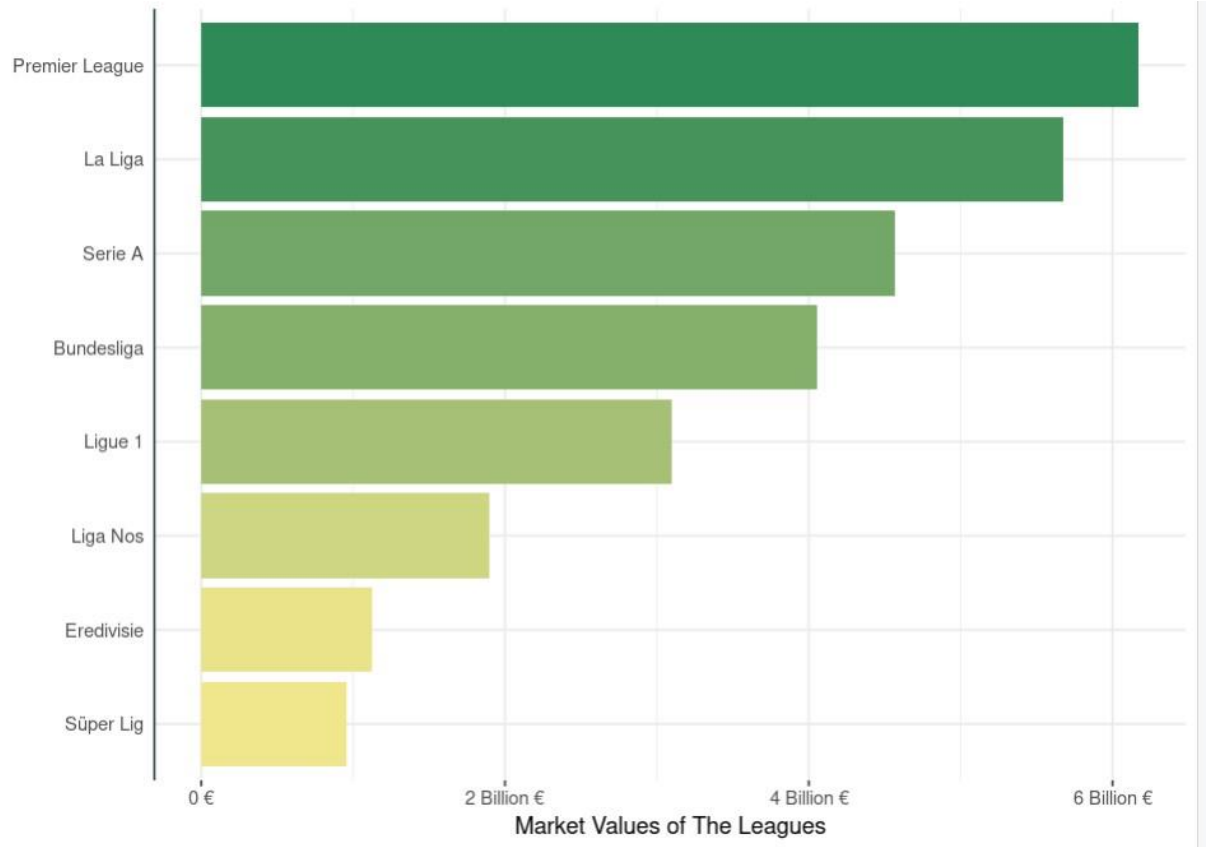
Data Analysis and Visulization

Total Market value in each league:

Code:

```
options(repr.plot.width = 12, repr.plot.height = 8)
df %>%
  group_by(League) %>% summarise(Total.Value =
  sum(as.integer(Values), na.rm = TRUE)) %>%
  ggplot(aes(reorder(League, Total.Value), Total.Value, fill = Total.Value))+
  geom_col(show.legend = FALSE)+
  coord_flip()+ theme_minimal()+ labs(x = NULL, y = "Market Values of rhe
  Leagues")+ scale_fill_gradient(low = "khaki", high = "seagreen")+
  theme(axis.line.y = element_line(colour = "darkslategray"), axis.ticks.x =
  element_line(colour = "darkslategray"))+ scale_y_continuous(labels = c("0
  €", "2 Billion €", "4 Billion €", "6 Billion €"))
```

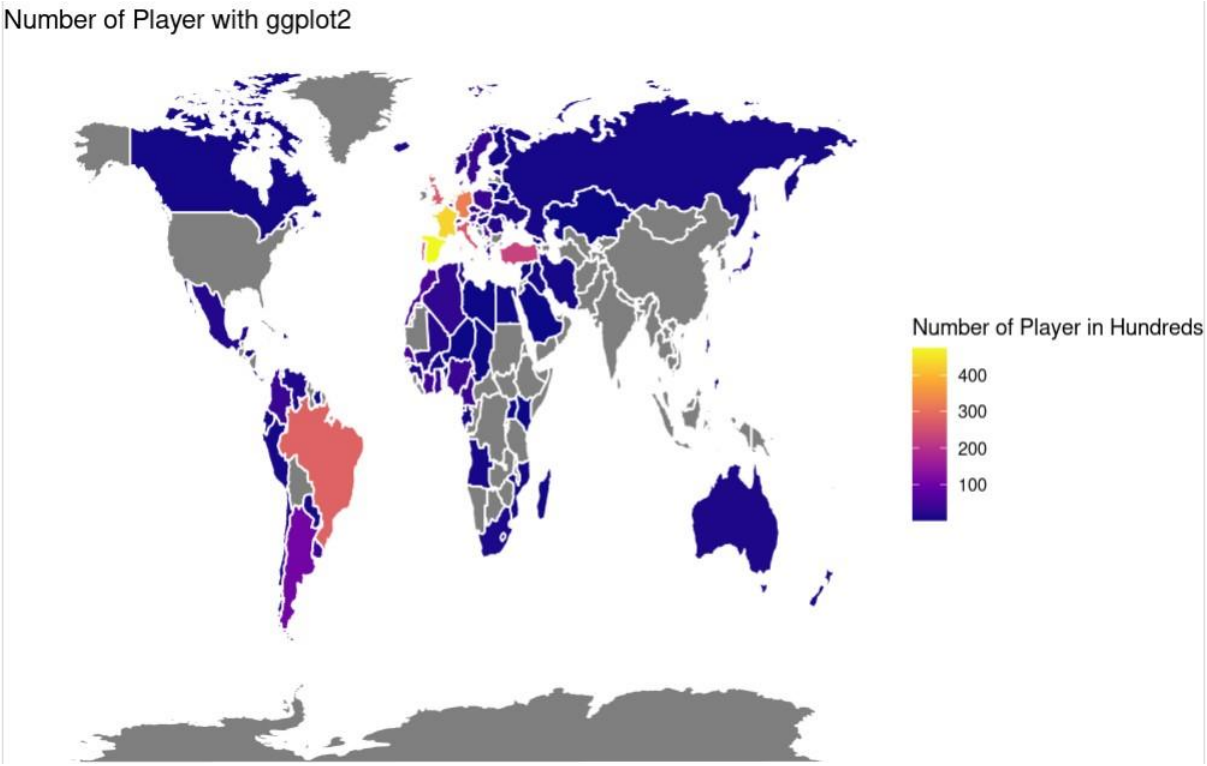
Output:



Interactive world map and number of players
Code:

```
options(repr.plot.width = 12, repr.plot.height = 8)
world_map = map_data("world") numofplayers
= world_map %>%
  mutate(region = as.character(region)) %>%
  left_join((df %>% mutate(Nationality = as.character(Nationality),
                           Nationality = if_else(Nationality %in% "England",
                                                 "UK", Nationality)) %>%
              #filter(League == "Bundesliga") %>%
              count(Nationality, name = "Number of Player") %>%
              rename(region = Nationality) %>%
              mutate(region = as.character(region))), by = "region")
ggplot(numofplayers, aes(long, lat, group = group))+
  geom_polygon(aes(fill = `Number of Player` ), color = "white", show.legend = TRUE)+
  scale_fill_viridis_c(option = "C")+ theme_void()+ labs(fill = "Number of Player in
  Hundreds", title = "Number of Player with ggplot2")
```

Output:

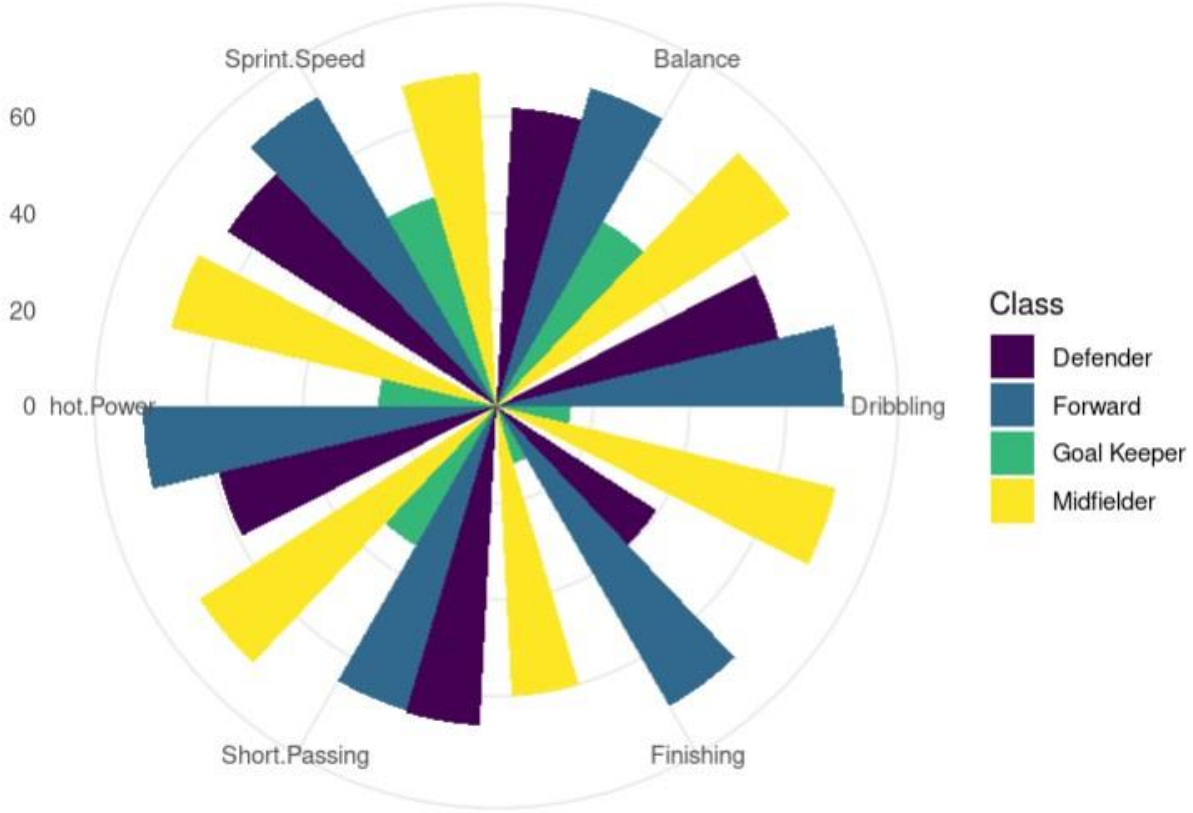


Average summary statistics of players by position class in the Premier League

Code:

```
options(repr.plot.width = 12, repr.plot.height = 8)
df %>%
  filter(League == "Premier League") %>% select(Class, Sprint.Speed, Dribbling,
  Shot.Power, Finishing, Balance, Short.Passing) %>% group_by(Class) %>%
  summarise_at(vars(Sprint.Speed:Short.Passing), funs(mean)) %>% gather(variables,
  values, -Class) %>% ggplot(aes(variables, values, fill = Class))+ geom_col(position =
  "dodge")+ coord_polar()+ scale_fill_ordinal()+ theme_minimal()+ labs(x = NULL, y = NULL)
```

Output:



Correlation:

Code: kor =

```
df %>%
  filter(League == "La Liga", Class == "Forward") %>%
  select(Name, Preferred.Foot, Finishing, Shot.Power)
cor.test(kor$Shot.Power, kor$Finishing, method = "pearson")
cor.test(kor$Shot.Power, kor$Finishing, method = "kendall") hypo =
cor.test(kor$Shot.Power, kor$Finishing, method = "spearman") hypo
```

Output:

```
        Pearson's product-moment correlation

data:  kor$Shot.Power and kor$Finishing
t = 12.023, df = 113, p-value < 0.00000000000000022
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.6560646 0.8198210
sample estimates:
     cor
0.749175


        Kendall's rank correlation tau

data:  kor$Shot.Power and kor$Finishing
z = 8.7156, p-value < 0.00000000000000022
alternative hypothesis: true tau is not equal to 0
sample estimates:
      tau
0.5674854


Warning message in cor.test.default(kor$Shot.Power, kor$Finishing, method = "spearman"):
“Cannot compute exact p-value with ties”

        Spearman's rank correlation rho

data:  kor$Shot.Power and kor$Finishing
S = 64431, p-value < 0.00000000000000022
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.7457925
```