# Who is really the most effective goalscorer

2022-11-14

This notebook is for analyzing goal scoring abilities of the best goalscorer in the last 8 year in the top 5 leagues in the world of football (season 2014/2015 to 2021/2022). We rank the players by the total amount of goals succeeding their total amount of expected Goals (xG), which means we take the difference between "total goals scored" minus "total goals expected". Therefore this notebook is divided into 3 parts.

In the first part all necessary data will be imported via the "understatr" library.

In the second part data will be analyzed and prepared. Our model focuses on goals and expected Goals (xG). In order to get the meaningful xG ranges, in which we will compare different players, we have to modify the data.

In the third part the results will be outputted and explained.

Thanks go out to BiscuitChaserFC for inspiring this idea of our model and ewen_ for the package for understatR! Link to the BiscuitChaserFC article: https://biscuitchaserfc.blogspot.com/2020/09/shot-data-for-top-5-european-leagues.html

Import libraries

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --
## v ggplot2 3.4.0      v purrr   0.3.5
## v tibble  3.1.8      v dplyr   1.0.10
## v tidyr   1.2.1      v stringr 1.4.1
## v readr   2.1.3      v forcats 0.5.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(understatr)
library("dplyr")
library(devtools)
```

```
## Loading required package: usethis
```

```
library(ggplot2)
library(ggsoccer)
library('bigassertr')
```

## Start of function declaration

These 2 functions are for the various fields- and shotmap plots used in this notebook

```
plot_areas_xG <- function(df, var, pltTitle) {

  ggplot() +
  annotate_pitch(colour = "black",
                 fill   = "white",
                 limits = FALSE) +
```

```
  geom_rect(data = df, inherit.aes=FALSE, aes(xmin = xmin, xmax = xmax, ymin = ymin, ymax = ymax,
       fill = var), colour=NA, alpha=.45) +

  scale_fill_manual('xG Areas',
                    values=c("cyan", "darkred", "deeppink", "darkseagreen", "cornflowerblue", "yellow
                    guide = guide_legend(override.aes = list(alpha = 0.45))) +

  theme_pitch() +
  theme(panel.background = element_rect(fill = "white")) +
  coord_flip(xlim = c(50, 101),
             ylim = c(-12, 112)) +
  ggtitle(pltTitle)

}
```

```
plot_shot_player <-function(boolean, df, strName, lowTshld, upTshld) {


    df <- df[(df$player==strName & df$xG >= lowTshld & df$xG <= upTshld & df$situation != "Penalty" ),]
    df <- df[,c("X","Y","xG","result", "situation", "xG_Ranges")]
    df$X <- df$X * 100
    df$Y <- df$Y * 100
    lowTshld <- lowTshld * 100
    upTshld <- upTshld * 100

    if (boolean ==TRUE) {
      a = geom_point(aes(x = X, y = 100 - Y, fill = result),
                shape = 21,
                size = 2.8)

      c = ggtitle(paste0(strName, ' shotmap where Expected Goals range between ' ,lowTshld, '% - ', upTs
    } else {
      df <- df[(df$result == "Goal" ),]
      a = geom_point(aes(x = X, y = 100 - Y, fill= xG_Ranges ), #colour=xG_Ranges
                shape = 21,
                size = df$xG *4.5)
      c = ggtitle(paste0(strName, ' goalmap where Expected Goals range between ' ,lowTshld, '% - ', upTs
      }

    ggplot(df) +
    annotate_pitch(colour = "white",
                   fill   = "springgreen4",
                   limits = FALSE) +

   a  +

    theme_pitch() +
    theme(panel.background = element_rect(fill = "springgreen4")) +
    coord_flip(xlim = c(50, 102),
               ylim = c(-12, 112)) +
    c

}
```

```
plot_areas <-function(df, strName, insideAreas, area) {

 df <- df[(df$player==strName & df$xGAreas == area & df$situation != "Penalty" ),]
 df$X <- df$X * 100
 df$Y <- df$Y * 100
 ggplot(df) +
 annotate_pitch(colour = "white",
                fill   = "springgreen4",
                limits = FALSE) +
 geom_point(aes(x = X, y = 100 - Y, fill = xG_Ranges),
            shape = 21,
           size = df$xG * 5 ) +

 geom_rect(data = insideAreas, inherit.aes=FALSE, aes(xmin = xmin, xmax = xmax, ymin = ymin, ymax = yma
      fill = area), colour=NA, alpha=.045) +


 scale_fill_manual('xG Areas',
                     values=c("cyan", "darkred", "deeppink", "darkseagreen", "cornflowerblue", "yellow"
                      guide = guide_legend(override.aes = list(alpha = 0.45))) +
  theme_pitch() +
  theme(panel.background = element_rect(fill = "springgreen4")) +
  coord_flip(xlim = c(50, 101),
             ylim = c(-12, 112)) +
  ggtitle(paste0(strName, ' goalmap ' , area))

}
```

This function formats numbers in a from us desired format

```
so_formatter <- function(x) {
  dplyr::case_when(
      x < 1e3 ~ as.character(x),
      x < 1e6 ~ paste0(as.character(x/1e3), "K"),
      x < 1e9 ~ paste0(as.character(x/1e6), "M"),
      TRUE ~ "To be implemented..."
  )
}
```

This is a function to get the player with the most goals. We are also free to set a minimum threshold of goals must be scored in order to be considered. The boolean variable let's us decide whether we want to include penalties or not.

```
get_goals <- function(boolean, df, t) {
  if (boolean == TRUE) {
    df <- df[(df$situation != "Penalty"),]
  }
  df <- df %>% group_by(player_id, player, result) %>% summarize(count=n())
  df <- df[(df$result == "Goal"  & df$count>=t),]
  df2<-df[order(-df$count),]
  return (df2)
}
```

This is just a helper function to create a dataframe dynamically

```r
dynamically_df <- function(df, df2) {

  intAllShots = nrow(df)
  intGoals =  sum(df$result == "Goal")
  dblConvRate= round(intGoals/intAllShots, digits =3);
  dblAvgXG = round(mean(df$xG, na.rm = TRUE), digits = 3)
  dblPerXG = round((dblConvRate - dblAvgXG), digits = 3)
  intGoalsxG = round((dblAvgXG * intAllShots), 2)
  dblPerXGTotal = intGoals - intGoalsxG

  df2[nrow(df2) + 1,] <- list(strName, dblConvRate, intGoalsxG, intGoals, intAllShots, dblAvgXG, dblPer
  df2 <-df2[order(-df2$Performance_Goals),]

  return (df2)
}
```

This function calculates all interesting key figures for penalties or free kicks (definded by the boolean)

```r
results_standards <- function(boolean, df, df2, strName) {

  if (boolean == TRUE) {
    df <- df[(df$player==strName & df$situation == "Penalty" ),]
  } else {
    df <- df[(df$player==strName & df$situation == "DirectFreekick" ),]
  }
  df2 <- dynamically_df(df, df2)
  return (df2)

}
```

This function calculates all interesting key figures important for a goalscorer and return the result ordered in a dataframe. The user has the freedom to choose which xG ranges he wants to consider, which are defined by "lowTshld" and "lowTshld".

```r
results_ranges <- function(boolean, df, df2, strName,lowTshld, upTshld) {

  if (boolean == TRUE) {
    df <- df[(df$player==strName & df$xG >= lowTshld & df$xG <= upTshld & df$situation != "Penalty" ),]
  } else {
    df <- df[(df$player==strName & df$xG > lowTshld & df$xG <= upTshld ),]
  }
  df2 <- dynamically_df(df, df2)
  return (df2)

}
```

This function calculates all interesting key figures important for a goalscorer according to the areas we defined and return the result ordered in a dataframe

```r
results_area <- function(boolean, df, df2, strName, strArea) {

  if (boolean == TRUE) {
    df <- df[(df$player==strName & df$xGAreas == strArea & df$situation != "Penalty" ),]
  } else {
    df <- df[(df$player==strName & df$xGAreas == strArea),]
  }
```

```
  df2 <- dynamically_df(df, df2)
  return (df2)

}
```

Variable Declaration

```
n = 3
```

## Part 1

All the code related to the process of pulling the "understatR" data is commented, because the performance of rendering the R markdown file to html or pdf was very slow as good as impossible. This pulling process can take up many hours. You can just comment out the code at this point if you want to test the code yourselves.

We get the data for the top 5 European leagues, we can drop the RFPL using the dplyr filter # {r} leagues<-get_leagues_meta()  leagues<-leagues%>%  filter(!league_name == "RFPL") #

These are the seasons we will take a closer look to # {r} unique(leagues$season) #

Pull team data with the purrr package to cycle through each unique league name and pull the team data for each match within the top 5 leagues # {r} team_data= data.frame() dfTemp = data.frame() #

Pull team data for the years desired with the purrr package to cycle through each unique league name and pull the team data for each match within the top 5 leagues # {r}  for (year in c (2014, 2015, 2016, 2017, 2018, 2019,  2020, 2021)) {  dfTemp<-map_dfr(unique(leagues$league_name), get_league_teams_stats, year = year)  team_data = rbind(team_data,dfTemp)}  dfTemp= data.frame() #

Count the number of occurrences of each team by team_id and team_name # {r} print(team_data %>% group_by(team_id,team_name, league_name) %>% summarize(count=n())) #

Now we pull the player data for the desired years, here again we make use of the understatR library # {r} player_data = data.frame()  for (year in c (2014, 2015, 2016, 2017, 2018, 2019,  2020, 2021)) {  dfTemp<-map_dfr(unique(team_data$team_name), get_team_players_stats, year = year)  player_data = rbind(player_data,dfTemp)} dfTemp= data.frame() #

First, create a vector of player_id (this is required in the UnderstatR get_player_shots() function # {r} players<-c(player_data$player_id) #

Now we pull the event data and get all the shots in these time period # {r} shot_data <- players %>% map_dfr(.,possibly(get_player_shots,otherwise=NULL)) #

Let's remove the data we don't need anymore # {r} rm(leagues, player_data, team_data, players, year) #

Let's export the shot_data as the process of pulling it from the internet was taking many hours #{r} write.csv(shot_data, "shot_data.csv") #

```
shot_data <- read.csv(file = 'shot_data.csv')
```

```
## Warning in scan(file = file, what = what, sep = sep, quote = quote, dec = dec, :
## embedded nul(s) found in input
```

## Part 2

Print the column names and the structure. If we go through the data set we see that there a lot of interesting columns like the x-y-coordinates of every given shot, the assist giver and the xG of every shot and so on.

```
names(shot_data)
```

```
##  [1] "id"              "minute"          "result"          "X"
##  [5] "Y"               "xG"              "player"          "h_a"
##  [9] "player_id"       "situation"       "year"            "shotType"
## [13] "match_id"        "h_team"          "a_team"          "h_goals"
## [17] "a_goals"         "date"            "player_assisted" "lastAction"
```

```
str(shot_data)
```

```
## 'data.frame':    370719 obs. of  20 variables:
##  $ id             : int  16299 16302 17594 17597 17601 17610 17614 16881 16884 16887 ...
##  $ minute         : int  34 50 19 22 38 79 88 2 10 13 ...
##  $ result         : chr  "BlockedShot" "BlockedShot" "MissedShots" "BlockedShot" ...
##  $ X              : num  0.96 0.906 0.858 0.878 0.85 ...
##  $ Y              : num  0.545 0.49 0.45 0.705 0.66 ...
##  $ xG             : num  0.0584 0.0884 0.0577 0.0434 0.042 ...
##  $ player         : chr  "Christian Benteke" "Christian Benteke" "Christian Benteke" "Christian Bente
##  $ h_a            : chr  "a" "a" "a" "a" ...
##  $ player_id      : int  606 606 606 606 606 606 606 606 606 606 ...
##  $ situation      : chr  "FromCorner" "OpenPlay" "OpenPlay" "OpenPlay" ...
##  $ year           : int  2014 2014 2014 2014 2014 2014 2014 2014 2014 2014 ...
##  $ shotType       : chr  "Head" "RightFoot" "Head" "RightFoot" ...
##  $ match_id       : int  4700 4700 4718 4718 4718 4718 4718 4657 4657 4657 ...
##  $ h_team         : chr  "Everton" "Everton" "Queens Park Rangers" "Queens Park Rangers" ...
##  $ a_team         : chr  "Aston Villa" "Aston Villa" "Aston Villa" "Aston Villa" ...
##  $ h_goals        : int  3 3 2 2 2 2 2 1 1 1 ...
##  $ a_goals        : int  0 0 0 0 0 0 0 2 2 2 ...
##  $ date           : chr  "2014-10-18T15:00:00Z" "2014-10-18T15:00:00Z" "2014-10-27T20:00:00Z" "2014-
##  $ player_assisted: chr  "Ashley Westwood" "Aly Cissokho" "Ashley Westwood" "Andreas Weimann" ...
##  $ lastAction     : chr  "Card" "Cross" "Throughball" "Pass" ...
```

```
nrow(shot_data)
```

```
## [1] 370719
```

```
unique(shot_data$result)
```

```
## [1] "BlockedShot" "MissedShots" "SavedShot"   "ShotOnPost"  "Goal"
## [6] "OwnGoal"
```

```
unique(shot_data$situation)
```

```
## [1] "FromCorner"     "OpenPlay"       "SetPiece"       "DirectFreekick"
## [5] "Penalty"
```

```
unique(shot_data$shotType)
```

```
## [1] "Head"          "RightFoot"     "LeftFoot"      "OtherBodyPart"
```

We see that there are 370719 total shots in the data set. The results and the situations of the shots give the expected outputs. Shot types are divided in to the both foots, header and other body parts.

Let's head the first 10 rows of the data set

```
head(shot_data, 10)
```

```
##       id minute      result     X     Y         xG            player h_a
## 1  16299     34 BlockedShot 0.960 0.545 0.05842246 Christian Benteke   a
```

```
## 2  16302     50 BlockedShot 0.906 0.490 0.08839515 Christian Benteke   a
## 3  17594     19 MissedShots 0.858 0.450 0.05768260 Christian Benteke   a
## 4  17597     22 BlockedShot 0.878 0.705 0.04344463 Christian Benteke   a
## 5  17601     38   SavedShot 0.850 0.660 0.04201407 Christian Benteke   a
## 6  17610     79 MissedShots 0.912 0.456 0.03211838 Christian Benteke   a
## 7  17614     88 MissedShots 0.705 0.583 0.00821782 Christian Benteke   a
## 8  16881      2 BlockedShot 0.897 0.658 0.06130439 Christian Benteke   h
## 9  16884     10 MissedShots 0.903 0.472 0.24199563 Christian Benteke   h
## 10 16887     13  ShotOnPost 0.853 0.540 0.08995013 Christian Benteke   h
##    player_id  situation year  shotType match_id              h_team      a_team
## 1        606 FromCorner 2014      Head     4700             Everton Aston Villa
## 2        606   OpenPlay 2014 RightFoot     4700             Everton Aston Villa
## 3        606   OpenPlay 2014      Head     4718 Queens Park Rangers Aston Villa
## 4        606   OpenPlay 2014 RightFoot     4718 Queens Park Rangers Aston Villa
## 5        606   OpenPlay 2014 RightFoot     4718 Queens Park Rangers Aston Villa
## 6        606 FromCorner 2014      Head     4718 Queens Park Rangers Aston Villa
## 7        606   OpenPlay 2014 RightFoot     4718 Queens Park Rangers Aston Villa
## 8        606   OpenPlay 2014  LeftFoot     4657         Aston Villa   Tottenham
## 9        606   OpenPlay 2014      Head     4657         Aston Villa   Tottenham
## 10       606   OpenPlay 2014  LeftFoot     4657         Aston Villa   Tottenham
##    h_goals a_goals                 date player_assisted   lastAction
## 1        3       0 2014-10-18T15:00:00Z Ashley Westwood         Card
## 2        3       0 2014-10-18T15:00:00Z    Aly Cissokho        Cross
## 3        2       0 2014-10-27T20:00:00Z Ashley Westwood  Throughball
## 4        2       0 2014-10-27T20:00:00Z Andreas Weimann         Pass
## 5        2       0 2014-10-27T20:00:00Z Andreas Weimann Dispossessed
## 6        2       0 2014-10-27T20:00:00Z            <NA>       Aerial
## 7        2       0 2014-10-27T20:00:00Z     Darren Bent     HeadPass
## 8        1       2 2014-11-02T16:00:00Z            <NA>         None
## 9        1       2 2014-11-02T16:00:00Z  Matthew Lowton        Cross
## 10       1       2 2014-11-02T16:00:00Z    Aly Cissokho         Pass
```

Let's check for missing or negative values in the data set

```
print(sapply(shot_data, function(x) sum(is.na(x))))
```

```
##             id         minute         result              X              Y
##              0              0              0              0              0
##             xG         player            h_a      player_id      situation
##              0              0              0              0              0
##           year       shotType       match_id         h_team         a_team
##              0              0              0              0              0
##        h_goals        a_goals           date player_assisted     lastAction
##              0              0              0          98605              0
```

There are only missing values for the "player_assisted" column which is quite normal, as not every shot is assisted by someone. There are cases when the shooter gets the ball by the opponents's defender for example. It's quite interesting though that around 26.6% of the shots don't have an assist. Let's take a closer look at free kicks and penalties.

```
nrow(shot_data[(shot_data$situation == "Penalty" | shot_data$situation == "DirectFreekick" ),])/nrow(sh
```

```
## [1] 0.05712683
```

Free kick and penalties make up for around 5.7% of the data

We can see that in the data set penalties and direct freekicks don't have an assist which then explaines the

high percentage of approx. 26.6%

Let's check for any negative values

```
print(shot_data %>% select_if(~any(. < 0)))
```

```
## data frame with 0 columns and 370719 rows
```

As expected there are none negative values. For this data set negative values wouldn't make any sense

Let's see what percentage of the total shots taken are penalty kicks

```
nrow(shot_data[(shot_data$situation != "Penalty"),])
```

```
## [1] 366015
```

```
1-(nrow(shot_data[(shot_data$situation != "Penalty"),])/nrow(shot_data))
```

```
## [1] 0.01268886
```

The total amount of given shots excluding penalties is 366015 and therefore penalties make up for 1.27% of total given shots

Here we make a new column and bin there different ranges for the xG data

```
shot_data<-shot_data%>%mutate(xG_Ranges = cut(xG, breaks = c(-Inf, 0.1, 0.2, 0.4, 0.65, 0.85, 1)))
shot_data$xG_Ranges <- as.character(shot_data$xG_Ranges)
```

But before that let's quickly get the xG-probability for penalties within these 8 seasons

```
mean(shot_data$xG[shot_data$situation=="Penalty"])
```

```
## [1] 0.7564446
```

The probability of a penalty resulting in a goal is 75.64% for the top 5 leagues. This is an expected value but some might be suirprised that it isn't higher.

We are only interested for shots who were given after midfield. There might be goals scored from the own yard but outliers don't interest us in this model. But we for sure will include all shots given, independent of their position when we will analyze the conversion rate of all given shots per player. We also exclude penalties here, as we already calculated the xG for penalties.

```
areasDf <- shot_data[(shot_data$X >= 0.5 & shot_data$situation != "Penalty"),]
```

In this step we will divide the playfield into different areas in order to analyze the xG of these sections and compare the players qualities within these areas. Therefore the field must be divided accordingly with the right x-y-values within the coordinate system of the field.

```
areasDf<- areasDf %>%
  mutate(xGAreas = case_when(X < 0.8294  & Y < 0.211 ~ 'Area 10',
                             X < 0.8294  & Y > 0.789 ~ 'Area 10',

                             X < 0.7163 & Y >= 0.211 & Y <= 0.789  ~ 'Area 9',
                             X >= 0.8294  & Y < 0.211 ~ 'Area 8',
                             X >= 0.8294  & Y > 0.789  ~ 'Area 8',

                             X >= 0.7163 & X < 0.8294  & Y >= 0.211 & Y <= 0.3678   ~ 'Area 7',
                             X >= 0.7163 & X < 0.8294  & Y >= 0.6322 & Y <= 0.789  ~ 'Area 7',
                             X >= 0.7163 & X < 0.8294  & Y > 0.3678 & Y < 0.6322  ~ 'Area 6',
                             X >= 0.8294  & Y >= 0.211 & Y < 0.3678  ~ 'Area 5',
                             X >= 0.8294  & Y >= 0.6322 & Y <= 0.789 ~ 'Area 5',
```

```
                            X >= 0.8294  & X <= 0.8846 & Y > 0.3678 & Y < 0.6322  ~ 'Area 4',
                            X > 0.8846 & X < 0.9423 & Y > 0.3678 & Y < 0.6322    ~ 'Area 3',
                            X >= 0.9423 & Y > 0.3678 & Y < 0.44222  ~ 'Area 2',
                            X >= 0.9423 & Y > 0.55778 & Y < 0.6322 ~ 'Area 2',
                            X >= 0.9423 & Y >= 0.44222 & Y <= 0.55778  ~ 'Area 1',
                            TRUE ~ 'e'))

unique(sort(areasDf$xGAreas))
```

```
##  [1] "Area 1"  "Area 10" "Area 2"  "Area 3"  "Area 4"  "Area 5"  "Area 6"
##  [8] "Area 7"  "Area 8"  "Area 9"
```

The output of the unique values of the xG areas shows us that there were no errors in the condition model. The error would be marked with the value “e”

We have to create a vector with our x-y-coordinates to plot in the field map. Therefore we assign the real values to variables to have a better readability of the vectors.

```
xA = 0.5
xB = 0.8294
xC = 0.9423
xD = 0.8846
xE = 0.7163
x1 = 1

yA = 0.211
yB = 0.789
yC = 0.3678
yD = 0.44222
yE = 0.55778
yF = 0.6322
y0 = 0
```

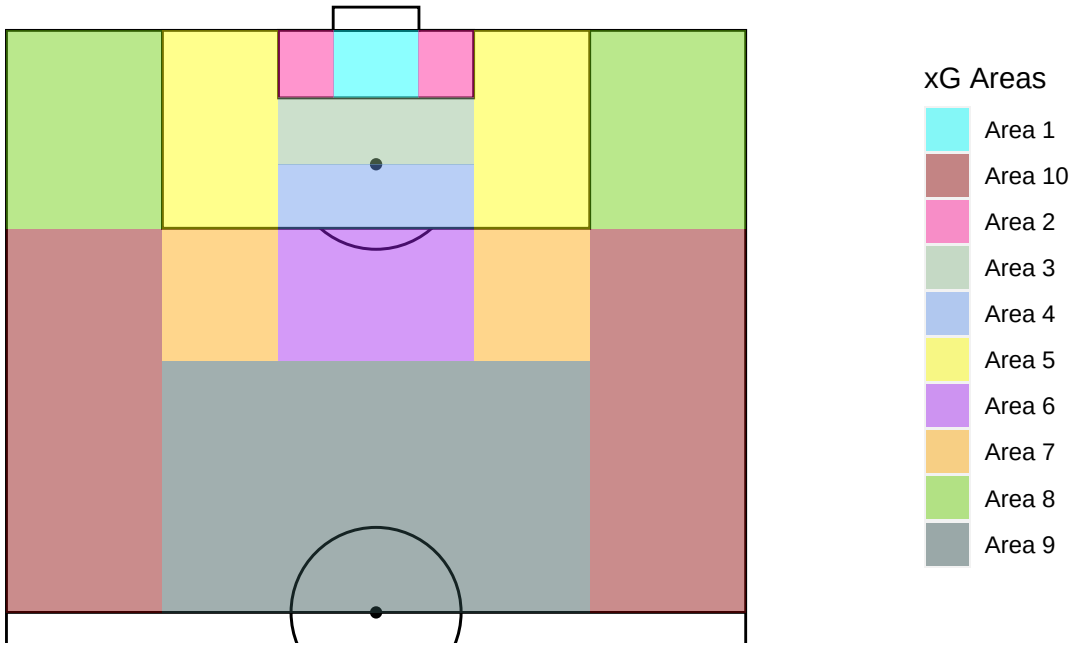
We have to create a vector with our x-y-coordinates to plot in the field map

```
xmin <- c(xC, xC, xC, xD, xB, xB, xB, xE, xE, xE, xB, xB, xA, xA, xA) *100
xmax <- c(x1, x1, x1, xC, xD, x1, x1, xB, xB, xB, x1, x1, xE, xB, xB) *100
ymin <- c(yD, yE, yC, yC, yC, yF, yA, yC, yF, yA, yB, y0, yA, yB, y0) *100
ymax <- c(yE, yF, yD, yF, yF, yB, yC, yF, yB, yC, x1, yA, yB, x1, yA) *100
xGAreas <- c("Area 1", "Area 2", "Area 2", "Area 3", "Area 4", "Area 5", "Area 5", "Area 6", "Area 7",

xG_plot_areas <- data.frame(xmin, xmax, ymin, ymax, xGAreas)
rm(xA,xB, xC, xD, xE, x1, yA, yB, yC, yD, yE, yF, y0, xmin, xmax, ymin, ymax)
```

```
pltTitle <- "Expected Goals (xG) divided into different areas"
plot_areas_xG(xG_plot_areas, xGAreas, pltTitle)
```

## Expected Goals (xG) divided into different areas




Let's have a look at the average xG of the different xG areas

```
xG_avrg <- areasDf %>%
  group_by(xGAreas) %>%
  summarise(across(xG, mean, na.rm = TRUE))

xG_avrg[order(-xG_avrg$xG),]
```

```
## # A tibble: 10 x 2
##    xGAreas     xG
##    <chr>    <dbl>
##  1 Area 1  0.499
##  2 Area 2  0.212
##  3 Area 3  0.169
##  4 Area 4  0.106
##  5 Area 5  0.0746
##  6 Area 8  0.0402
##  7 Area 6  0.0382
##  8 Area 7  0.0269
##  9 Area 10 0.0192
## 10 Area 9  0.0172
```

As expected the xG areas nearer to goal are significantly higher. Interesting to see is that the area 4 has a higher xG as the area 5, even though area 5 is nearer to the goal. The reason for this is that the degree of the shot position to the goal is really important for a xG model.

Now we will add the average xG to the "xG_plot_areas" dataframe, according to the xG areas

```
xG_plot_areas <- xG_plot_areas %>% full_join(xG_avrg)
```

```
## Joining, by = "xGAreas"
```

```
rm(xG_avrg)
```

We prepare the data for the fieldmap and also format our xG probabilities for a nicer display

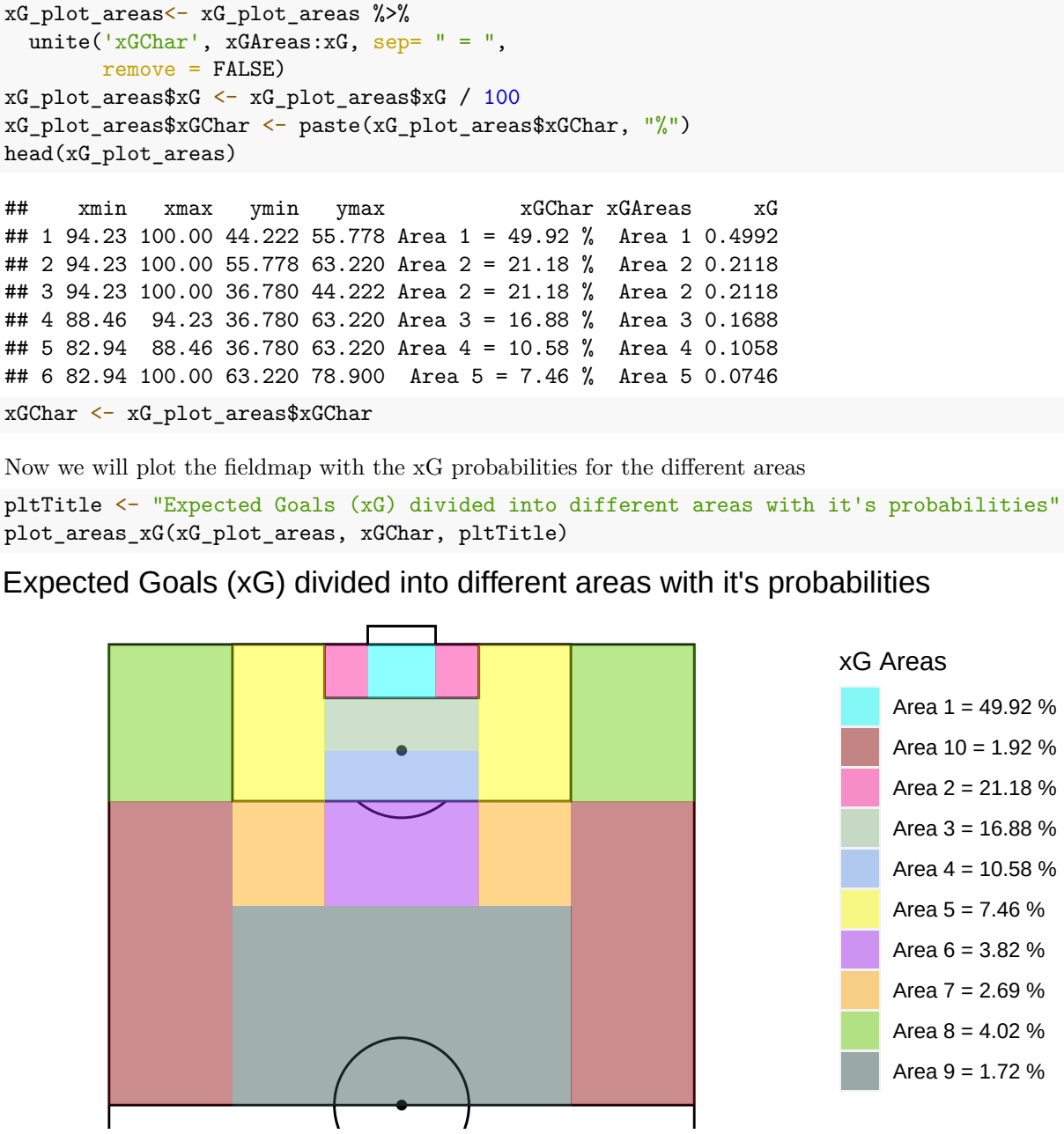
```
xG_plot_areas$xG <- xG_plot_areas$xG * 100
xG_plot_areas$xG <- round(xG_plot_areas$xG, digits = 2)
xG_plot_areas<- xG_plot_areas %>%
  unite('xGChar', xGAreas:xG, sep= " = ",
        remove = FALSE)
xG_plot_areas$xG <- xG_plot_areas$xG / 100
xG_plot_areas$xGChar <- paste(xG_plot_areas$xGChar, "%")
head(xG_plot_areas)
```

```
##    xmin   xmax   ymin   ymax           xGChar xGAreas     xG
## 1 94.23 100.00 44.222 55.778 Area 1 = 49.92 %  Area 1 0.4992
## 2 94.23 100.00 55.778 63.220 Area 2 = 21.18 %  Area 2 0.2118
## 3 94.23 100.00 36.780 44.222 Area 2 = 21.18 %  Area 2 0.2118
## 4 88.46  94.23 36.780 63.220 Area 3 = 16.88 %  Area 3 0.1688
## 5 82.94  88.46 36.780 63.220 Area 4 = 10.58 %  Area 4 0.1058
## 6 82.94 100.00 63.220 78.900  Area 5 = 7.46 %  Area 5 0.0746
```

```
xGChar <- xG_plot_areas$xGChar
```

Now we will plot the fieldmap with the xG probabilities for the different areas

```
pltTitle <- "Expected Goals (xG) divided into different areas with it's probabilities"
plot_areas_xG(xG_plot_areas, xGChar, pltTitle)
```




Some data manipulations

```
get_amount_group <-function(df, strColName, strNewCol) {
  df <- df %>%
    group_by(df[strColName]) %>%
    add_count(name = strNewCol)
  df$areaShots <- str_c(df[strColName], ' = ', df[strNewCol])
  return(df)
}
```

```
dfTemp <- areasDf
dfTemp <- get_amount_group(dfTemp, "result", "shots_distribution")
```

```
## Warning in stri_c(..., sep = sep, collapse = collapse, ignore_null = TRUE):
## argument is not an atomic vector; coercing
```

```
## Warning in stri_c(..., sep = sep, collapse = collapse, ignore_null = TRUE):
## argument is not an atomic vector; coercing
```

```
head(dfTemp, 10)
```

```
## # A tibble: 10 x 24
## # Groups:   result [4]
##       id minute result        X     Y      xG player h_a   playe~1 situa~2  year
##    <int>  <int> <chr>     <dbl> <dbl>   <dbl> <chr>  <chr>   <int> <chr>   <int>
##  1 16299     34 BlockedS~ 0.96  0.545 0.0584  Chris~ a         606 FromCo~  2014
##  2 16302     50 BlockedS~ 0.906 0.49  0.0884  Chris~ a         606 OpenPl~  2014
##  3 17594     19 MissedSh~ 0.858 0.45  0.0577  Chris~ a         606 OpenPl~  2014
##  4 17597     22 BlockedS~ 0.878 0.705 0.0434  Chris~ a         606 OpenPl~  2014
##  5 17601     38 SavedShot 0.85  0.66  0.0420  Chris~ a         606 OpenPl~  2014
##  6 17610     79 MissedSh~ 0.912 0.456 0.0321  Chris~ a         606 FromCo~  2014
##  7 17614     88 MissedSh~ 0.705 0.583 0.00822 Chris~ a         606 OpenPl~  2014
##  8 16881      2 BlockedS~ 0.897 0.658 0.0613  Chris~ h         606 OpenPl~  2014
##  9 16884     10 MissedSh~ 0.903 0.472 0.242   Chris~ h         606 OpenPl~  2014
## 10 16887     13 ShotOnPo~ 0.853 0.54  0.0900  Chris~ h         606 OpenPl~  2014
## # ... with 13 more variables: shotType <chr>, match_id <int>, h_team <chr>,
## #   a_team <chr>, h_goals <int>, a_goals <int>, date <chr>,
## #   player_assisted <chr>, lastAction <chr>, xG_Ranges <chr>, xGAreas <chr>,
## #   shots_distribution <int>, areaShots <chr>, and abbreviated variable names
## #   1: player_id, 2: situation
```

Format the data set

```
dfTemp["shots_distribution"] <- so_formatter(dfTemp["shots_distribution"])
```

We prepare the data for the fieldmap with total shots per area and also format the numbers for a nicer display

```
dfTemp <- areasDf
df_test <- dfTemp %>% group_by(xGAreas) %>% summarize(count=n())
assert_lengths(sum(df_test$count), nrow(areasDf))
df_test$count <- so_formatter(df_test$count)
dfTemp <- dfTemp %>% full_join(df_test)
```

```
## Joining, by = "xGAreas"
```

```
dfTemp$areaShots <- str_c(dfTemp$xGAreas, ' = ', dfTemp$count)
areaShots <- dfTemp[,c("xGAreas",  "areaShots")]
areaShots = areaShots[!duplicated(areaShots), ]
xG_plot_areas <- xG_plot_areas %>% full_join(areaShots)
```

```
## Joining, by = "xGAreas"
```

```
rm(areaShots, df_test)
areaShots <- xG_plot_areas$areaShots
xG_plot_areas
```

```
##     xmin   xmax   ymin    ymax           xGChar xGAreas     xG        areaShots
## 1  94.23 100.00 44.222  55.778 Area 1 = 49.92 %  Area 1 0.4992 Area 1 = 13.413K
```

```
## 2  94.23 100.00 55.778  63.220 Area 2 = 21.18 %  Area 2 0.2118 Area 2 = 12.036K
## 3  94.23 100.00 36.780  44.222 Area 2 = 21.18 %  Area 2 0.2118 Area 2 = 12.036K
## 4  88.46  94.23 36.780  63.220 Area 3 = 16.88 %  Area 3 0.1688 Area 3 = 77.307K
## 5  82.94  88.46 36.780  63.220 Area 4 = 10.58 %  Area 4 0.1058  Area 4 = 47.83K
## 6  82.94 100.00 63.220  78.900  Area 5 = 7.46 %  Area 5 0.0746 Area 5 = 68.371K
## 7  82.94 100.00 21.100  36.780  Area 5 = 7.46 %  Area 5 0.0746 Area 5 = 68.371K
## 8  71.63  82.94 36.780  63.220  Area 6 = 3.82 %  Area 6 0.0382 Area 6 = 72.631K
## 9  71.63  82.94 63.220  78.900  Area 7 = 2.69 %  Area 7 0.0269 Area 7 = 52.024K
## 10 71.63  82.94 21.100  36.780  Area 7 = 2.69 %  Area 7 0.0269 Area 7 = 52.024K
## 11 82.94 100.00 78.900 100.000  Area 8 = 4.02 %  Area 8 0.0402  Area 8 = 1.886K
## 12 82.94 100.00  0.000  21.100  Area 8 = 4.02 %  Area 8 0.0402  Area 8 = 1.886K
## 13 50.00  71.63 21.100  78.900  Area 9 = 1.72 %  Area 9 0.0172  Area 9 = 16.53K
## 14 50.00  82.94 78.900 100.000 Area 10 = 1.92 % Area 10 0.0192 Area 10 = 2.272K
## 15 50.00  82.94  0.000  21.100 Area 10 = 1.92 % Area 10 0.0192 Area 10 = 2.272K
```

Now we will look at all the shots forward the midfield and draw the the associated areas

```
dfTemp <- dfTemp[,c("X","Y","xG","result","xGAreas", "areaShots")]
dfTemp$X <- dfTemp$X * 100
dfTemp$Y <- dfTemp$Y * 100
print(sum(is.na(dfTemp$xGAreas)))
```

```
## [1] 0
```

We also double check if the column "xGAreas" has some missing value, which is not the case

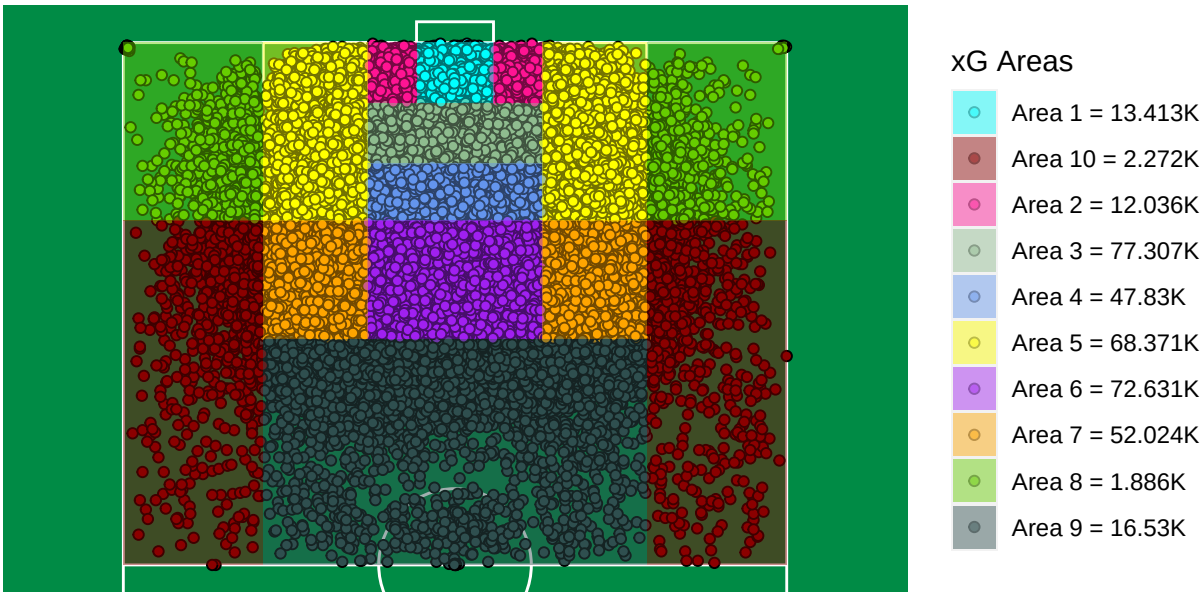
Let's plot all the shots given from the midfield and categorize them into our pre-defined areas

```
ggplot(dfTemp) +
  annotate_pitch(colour = "white",
                 fill   = "springgreen4",
                 limits = FALSE) +
  geom_point(aes(x = X, y = 100 - Y, fill = areaShots),
             shape = 21,
             size = 1.5) +

  geom_rect(data = xG_plot_areas, inherit.aes=FALSE, aes(xmin = xmin, xmax = xmax, ymin = ymin, ymax = y
       fill = areaShots), colour=NA, alpha=.45) +


  scale_fill_manual('xG Areas',
                    values=c("cyan", "darkred", "deeppink", "darkseagreen", "cornflowerblue", "yellow
                    guide = guide_legend(override.aes = list(alpha = 0.45))) +
  theme_pitch() +
  theme(panel.background = element_rect(fill = "springgreen4")) +
  coord_flip(xlim = c(50, 101),
             ylim = c(-12, 112)) +
  ggtitle("All shots divided into different xG areas")
```

All shots divided into different xG areas




Most shots were taken in Area 6 which is not that surprising. It might be interesting that so many shots were taken in Area 9.

```
dfTemp = data.frame()
```

# Part 3 Results

In the next steps we will group the players and filter out players who scored less than 120 goals from the season 2014/2015 to 2021/2022, the reason behind this filter is to rank and find the best scoring players. The players had to score at least 15 goals in average per seasons, as we have 8 seasons.

```
t=120
df_best <- get_goals(FALSE, shot_data, t)
```

```
## `summarise()` has grouped output by 'player_id', 'player'. You can override
## using the `.groups` argument.
```

```
listPlayersFinal <- df_best$player
df_best
```

```
## # A tibble: 19 x 4
## # Groups:   player_id, player [19]
##    player_id player                      result count
##        <int> <chr>                       <chr>  <int>
##  1       227 Robert Lewandowski          Goal     238
##  2      2097 Lionel Messi                Goal     237
##  3      2371 Cristiano Ronaldo           Goal     233
##  4       647 Harry Kane                  Goal     180
##  5      2098 Luis Suárez                 Goal     179
##  6       318 Pierre-Emerick Aubameyang   Goal     163
##  7      1209 Ciro Immobile               Goal     160
##  8      1250 Mohamed Salah               Goal     153
##  9      2370 Karim Benzema               Goal     147
## 10       594 Romelu Lukaku               Goal     136
## 11      3423 Kylian Mbappe-Lottin        Goal     136
```

```
## 12      3294 Edinson Cavani            Goal     134
## 13       619 Sergio Agüero             Goal     133
## 14       755 Jamie Vardy               Goal     133
## 15      3210 Wissam Ben Yedder         Goal     132
## 16      3277 Alexandre Lacazette       Goal     130
## 17      2099 Neymar                    Goal     127
## 18      1513 Mauro Icardi              Goal     125
## 19      2290 Iago Aspas                Goal     122
```

The output shows us that Robert Lewandowski was the player with the most goals counting 238, closely followed by Lionel Messi and Cristiano Ronaldo. Reminder: This output contains also penalties, we will look at the numbers without penalties in a moment.

As penalties distort the results we decided to filter them out. Thus we lowered the threshold of 120 goals to 103 goals which means that the players must have a scored at least approx. 13 goals on average per season without penalties.

```
t=100
df_best <- get_goals(TRUE, shot_data, t)
```

```
## `summarise()` has grouped output by 'player_id', 'player'. You can override
## using the `.groups` argument.
```

```
listPlayersFinal <- df_best$player
df_best
```

```
## # A tibble: 21 x 4
## # Groups:   player_id, player [21]
##    player_id player                     result count
##        <int> <chr>                      <chr>  <int>
##  1      2097 Lionel Messi               Goal     209
##  2       227 Robert Lewandowski         Goal     203
##  3      2371 Cristiano Ronaldo          Goal     182
##  4      2098 Luis Suárez                Goal     165
##  5       647 Harry Kane                 Goal     152
##  6       318 Pierre-Emerick Aubameyang  Goal     144
##  7      1250 Mohamed Salah              Goal     135
##  8      2370 Karim Benzema              Goal     129
##  9      3423 Kylian Mbappe-Lottin       Goal     125
## 10       594 Romelu Lukaku              Goal     119
## # ... with 11 more rows
```

The output shows us that, without considering penalties, Lionel Messi was the player with the most goals counting 203, closely followed by Robert Lewandoski. As expected Cristiano Ronaldo takes the third place.

We can also output the players with the most Penalty and Free kick goals.

```
penalties_df <- shot_data[(shot_data$situation == "Penalty"),]
freekicks_df <- shot_data[(shot_data$situation == "DirectFreekick"),]
```

```
t = 0
df_best<-get_goals(FALSE, penalties_df, t)
```

```
## `summarise()` has grouped output by 'player_id', 'player'. You can override
## using the `.groups` argument.
```

```
listPlayers <- df_best$player[1:10]
head(df_best, 10)
```

```
## # A tibble: 10 x 4
## # Groups:   player_id, player [10]
##    player_id player             result count
##        <int> <chr>              <chr>  <int>
##  1      2371 Cristiano Ronaldo  Goal      51
##  2      1209 Ciro Immobile      Goal      44
##  3       227 Robert Lewandowski Goal      35
##  4      1230 Fabio Quagliarella Goal      31
##  5      1612 Domenico Berardi   Goal      29
##  6       647 Harry Kane         Goal      28
##  7      2097 Lionel Messi       Goal      28
##  8      2099 Neymar             Goal      28
##  9      3210 Wissam Ben Yedder  Goal      28
## 10      1393 Lorenzo Insigne    Goal      27
```

After looking more into detail, we see that Ciro Immobile is also a player who benefits a lot from penalties.

Now we want to get all interesting key figures behind penalty data. Herefore we take the best 10 player who scored the most penalties. Via a pre-defined function we will now determine which player has the best Conversion Rate, Over/Underperformance of the xG and so on. The same procedure is followed when we analyzing free kicks.

```
col_header <- c("Player", "Conversion_Rate", "Goals_Expected", "Goals", "Shots", "Average_xG", "Performa
```

Let's have a deeper look into all penalties given by the top 10 player and get the results.

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayers) {

  df_best <-results_standards(TRUE, shot_data, df_best, strName)
}
df_best
```

```
##                Player Conversion_Rate Goals_Expected Goals Shots Average_xG
## 3  Robert Lewandowski           0.921          28.80    35    38      0.758
## 6           Harry Kane           0.903          23.59    28    31      0.761
## 1    Cristiano Ronaldo           0.810          47.38    51    63      0.752
## 4  Fabio Quagliarella           0.861          27.40    31    36      0.761
## 8               Neymar           0.848          24.91    28    33      0.755
## 2        Ciro Immobile           0.815          41.09    44    54      0.761
## 9    Wissam Ben Yedder           0.824          25.81    28    34      0.759
## 10     Lorenzo Insigne           0.794          25.87    27    34      0.761
## 5     Domenico Berardi           0.784          28.16    29    37      0.761
## 7         Lionel Messi           0.718          28.98    28    39      0.743
##    Performance_xG Performance_Goals
## 3           0.163              6.20
## 6           0.142              4.41
## 1           0.058              3.62
## 4           0.100              3.60
## 8           0.093              3.09
## 2           0.054              2.91
## 9           0.065              2.19
## 10          0.033              1.13
## 5           0.023              0.84
## 7          -0.025             -0.98
```

From a purely statistical point of view we can see that Robert Lewandowski actually is the best penalty taker

by the top 10 penalty goalscorers. He scored approx. 6 goals more by penalty regarding his xG value. The approx. number 6 is the difference between Expected Goals in total and the actual amount of scored Goals. He also has the best Conversion Rate. Lionel Messi under performed in this discipline. He scored approx. 1 penalty less as he should according to his xG value.

Interpreting the Conversion Rates means that if we take Lewandowski as example, we can conclude that statistically, he scores around 92 goals in 100 penalties. In contrast to that Messi only scores around 72 goals.

Let's do the same for freekicks

```
df_best<-get_goals(TRUE, freekicks_df, t)
```

```
## `summarise()` has grouped output by 'player_id', 'player'. You can override
## using the `.groups` argument.
```

```
listPlayers <- df_best$player[1:10]
head(df_best, 10)
```

```
## # A tibble: 10 x 4
## # Groups:   player_id, player [10]
##    player_id player             result count
##        <int> <chr>              <chr>  <int>
##  1      2097 Lionel Messi       Goal      28
##  2       843 James Ward-Prowse  Goal      14
##  3      1290 Miralem Pjanic     Goal      11
##  4      2378 Daniel Parejo      Goal      11
##  5       189 Hakan Calhanoglu   Goal      10
##  6       621 Aleksandar Kolarov Goal      10
##  7      1294 Paulo Dybala       Goal      10
##  8       646 Christian Eriksen  Goal       8
##  9      1445 Simone Verdi       Goal       8
## 10      3667 Nabil Fekir        Goal       8
```

The player with the most free kick goals is by far Lionel Messi followed by James Ward-Prowse. There are quite a few players with 10 or 11 free kick goals. We now will output the amount of free kicks taken by the top 10 of these players.

Let's have a depper look into all free kicks given by the top 10 player and get the results.

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayers) {

  df_best <-results_standards(FALSE, shot_data, df_best, strName)
}
df_best
```

```
##                Player Conversion_Rate Goals_Expected Goals Shots Average_xG
## 2   James Ward-Prowse           0.141          6.14    14    99      0.062
## 1        Lionel Messi           0.093         21.00    28   300      0.070
## 3      Miralem Pjanic           0.125          5.54    11    88      0.063
## 7        Paulo Dybala           0.130          4.93    10    77      0.064
## 6  Aleksandar Kolarov           0.115          5.22    10    87      0.060
## 4       Daniel Parejo           0.096          6.90    11   115      0.060
## 9        Simone Verdi           0.100          4.48     8    80      0.056
## 10        Nabil Fekir           0.092          4.70     8    87      0.054
## 5    Hakan Calhanoglu           0.071          7.33    10   141      0.052
## 8   Christian Eriksen           0.067          6.78     8   119      0.057
##    Performance_xG Performance_Goals
```

```
## 2          0.079             7.86
## 1          0.023             7.00
## 3          0.062             5.46
## 7          0.066             5.07
## 6          0.055             4.78
## 4          0.036             4.10
## 9          0.044             3.52
## 10         0.038             3.30
## 5          0.019             2.67
## 8          0.010             1.22
```

No player has underperformed considering their xG value. James Ward-Prowse has the best Total Goal Performance and Conversion Rate (around 14 free kick goals in 100 attempts, from a statistical pov.). He succeeded his total amount of goals expected by approx. 8 goals followed by Lionel Messi who succeeded his expected amount of goals by 7 goals. If we consider the "Performance_xG" column ("Conversion_rate" - "Average_xG") we see that Lionel Messi is not the second best player. This column is a pure statistical ratio which is also very important as it doesn't consider the amount of goals. But as we here talking still about football, the sheer amount of goals scored is one of the most important, if not the most skill for a goal scorer. Thus we decided to take this metric as our primary performance metric. This methodology will hold on also for the following analysis.

```
listPlayersFinal
```

```
##  [1] "Lionel Messi"              "Robert Lewandowski"
##  [3] "Cristiano Ronaldo"         "Luis Suárez"
##  [5] "Harry Kane"                "Pierre-Emerick Aubameyang"
##  [7] "Mohamed Salah"             "Karim Benzema"
##  [9] "Kylian Mbappe-Lottin"      "Romelu Lukaku"
## [11] "Ciro Immobile"             "Edinson Cavani"
## [13] "Antoine Griezmann"         "Sergio Agüero"
## [15] "Sadio Mané"                "Jamie Vardy"
## [17] "Gonzalo Higuaín"           "Mauro Icardi"
## [19] "Wissam Ben Yedder"         "Son Heung-Min"
## [21] "Alexandre Lacazette"
```

These are the 21 players who made it into our list. We decided to take also players like Erling Haaland and Zlatan Ibrahimovic into the list because as we all now these players are prolific goal scorers whose time window of their prime unfortunately not lies in these 8 seasons (2014/2015 to 2021/2022) we are looking at. Also both of them didn't fully play in the top 5 leagues. Ibrahimovic played in the MLS for almost 2 years and Haaland was transferred to Borussia Dortmund at the beginning of 2020.

We also took Neymar (127 goals) and Iago Aspas (125 goals) into our list as they would have made it into the list in the first place as we considered players with 120 goals or more including penalties. Although we think that penalties distort our model we have to admit that being good in penalties is a very important skill set for a goal scorer and thus decided to include these 2 players too.

Antoine Griezmann had 119 goals which is the reason we also included him in the list, as he had only had 1 goal less than the threshold of 120 goals

```
listPlayers2 <- c("Erling Haaland", "Zlatan Ibrahimovic", "Neymar", "Iago Aspas")
listPlayersFinal <- append(listPlayersFinal, listPlayers2)
rm(listPlayers2)
```

Via a pre-defined function we will now determine which player has the best Conversion Rate and xG Performance for the different xG areas and ranges in the following statistics.

Let's have a look into all shots given by the player and get the results for the last season 2021/2022.

Let's have a look into all shots given by the player and get the results.

```
lowTshld = 0.0000
upTshld = 1.000
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {

  df_best <-results_ranges(TRUE, shot_data, df_best, strName, lowTshld, upTshld)
}
listPlayers <- df_best$Player[1:n]
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 1              Lionel Messi           0.162         173.40   209  1294
## 20             Son Heung-Min          0.182          73.45   103   565
## 13         Antoine Griezmann          0.185          90.14   112   605
## 9       Kylian Mbappe-Lottin          0.213         108.19   125   588
## 25                Iago Aspas          0.179          78.44    95   530
## 5                 Harry Kane          0.154         135.63   152   990
## 11             Ciro Immobile          0.147         101.78   116   789
## 17           Gonzalo Higuaín          0.153          93.56   106   693
## 22            Erling Haaland          0.277          41.92    54   195
## 23        Zlatan Ibrahimovic          0.164          75.93    87   531
## 21       Alexandre Lacazette          0.193          92.02   103   535
## 4                 Luis Suárez          0.194         167.26   178   919
## 7              Mohamed Salah           0.161         124.32   135   840
## 19         Wissam Ben Yedder          0.197          96.62   104   528
## 16               Jamie Vardy          0.191          99.68   107   560
## 15                Sadio Mané          0.177         104.25   111   628
## 10             Romelu Lukaku          0.171         114.68   119   695
## 14             Sergio Agüero          0.160         106.72   111   693
## 18              Mauro Icardi          0.195         100.79   105   539
## 3          Cristiano Ronaldo          0.131         179.31   182  1390
## 8              Karim Benzema          0.171         128.52   129   756
## 6  Pierre-Emerick Aubameyang          0.202         146.37   144   714
## 2         Robert Lewandowski          0.191         209.80   203  1065
## 12            Edinson Cavani          0.209         123.21   116   555
## 24                    Neymar          0.157         107.90    99   631
##    Average_xG Performance_xG Performance_Goals
## 1       0.134          0.028             35.60
## 20      0.130          0.052             29.55
## 13      0.149          0.036             21.86
## 9       0.184          0.029             16.81
## 25      0.148          0.031             16.56
## 5       0.137          0.017             16.37
## 11      0.129          0.018             14.22
## 17      0.135          0.018             12.44
## 22      0.215          0.062             12.08
## 23      0.143          0.021             11.07
## 21      0.172          0.021             10.98
## 4       0.182          0.012             10.74
## 7       0.148          0.013             10.68
## 19      0.183          0.014              7.38
## 16      0.178          0.013              7.32
## 15      0.166          0.011              6.75
```

```
## 10      0.165          0.006            4.32
## 14      0.154          0.006            4.28
## 18      0.187          0.008            4.21
## 3       0.129          0.002            2.69
## 8       0.170          0.001            0.48
## 6       0.205         -0.003           -2.37
## 2       0.197         -0.006           -6.80
## 12      0.222         -0.013           -7.21
## 24      0.171         -0.014           -8.90
```

The results show that Lionel Messi has the best numbers. He succeed his total amount of expected goals by approx. 36 goals, followed by Heung-Min Son with approx. 30 goals and Antoine Griezmann (approx. 22). It's important to note that Lionel Messi had an advantage as he also has the most goals scored (209) and thus his total number of "Performance_Goals" will be higher/lower tendentiously. But as we said before our purpose of the model was to take the total amount of goals into consideration as it is the most important number for a striker. Please refer back to the free kicks/penalties results above where we explained the model metrics more in detail.

Neymar, Edinson Cavani and Robert Lewandowski didn't performed so well in our model. As for Messi, Lewandowski also has much more goals (203) than the average player on the list and thus his "Performance_Goals" value will be tendentiously higher/lower. Next to these 3 players Pierre-Emerick Aubameyang is the only player who scored less goals than expected, approx. 2 goals.

Cristiano Ronaldo has a positive goal amount of value of aprrox. 3 goals which positions him on the 20th place of 25 players. As for Messi and Lewandowski, we also have to consider here, his sheer total amount of goals (182), which is over average. As expected these 3 players and also Harry Kane take with ease the most shots.

From a purely statistical point of view Erling Haaland has the best performance with a "Performance_xG" value of 6.2%, followed by Son with 5.2%. He also has the best Conversion Rate of 27.7%, which means that aprrox. every 4th shot of his finds his way behind the net. Interesting to note is that Edinson Cavani has the third best Conversion of 2.09% which means that approx. every 5th shot results in a goal.

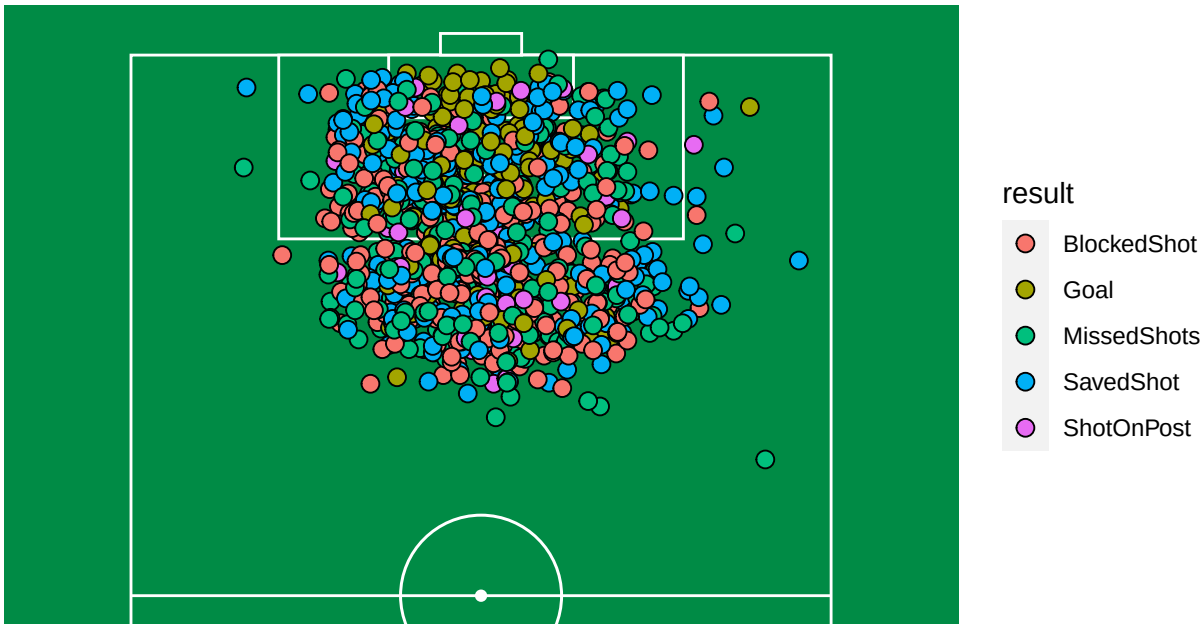
When focusing on the Average xG, it might give some insight about which players has a smart shot/position selection. Cavani has the highest Average xG with 22.2% which we can interpret as either he has tendentiously the smartest shot/position selection or that he tendentiously played in teams that provided him with good shot positions in average.

As Haaland is a young player it will be quite interesting to see, if he we will be able to outperform Lionel Messi in the Total Goals Performance ("Performance_Goals") in the future.

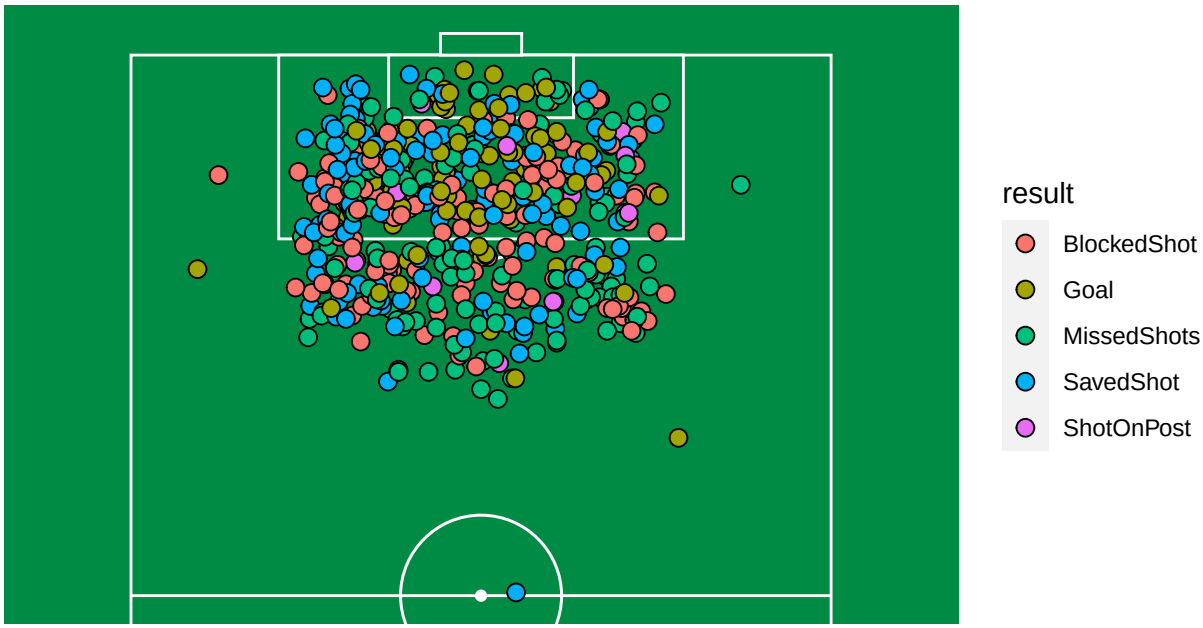
Let's look at the the shotmap of the top three player in our list.

```
for (strName in listPlayers) {
  print(plot_shot_player(TRUE , shot_data, strName, lowTshld, upTshld))
}
```

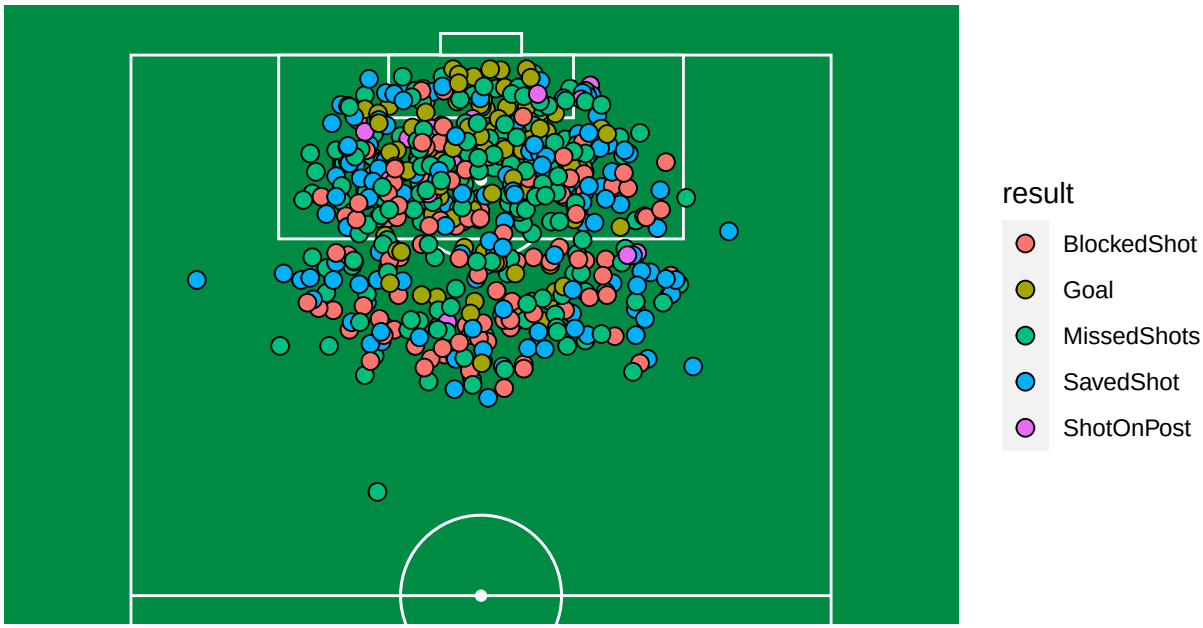
Lionel Messi shotmap where Expected Goals range between 0% − 100%




Son Heung−Min shotmap where Expected Goals range between 0% − 100%



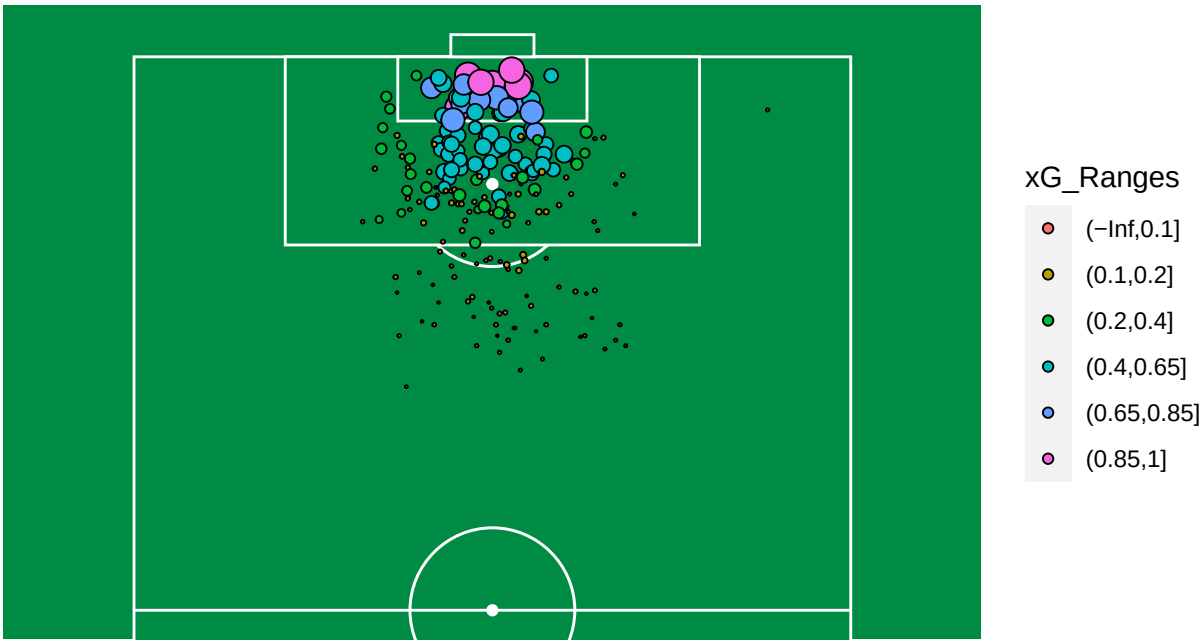
Antoine Griezmann shotmap where Expected Goals range between 0% − 100%



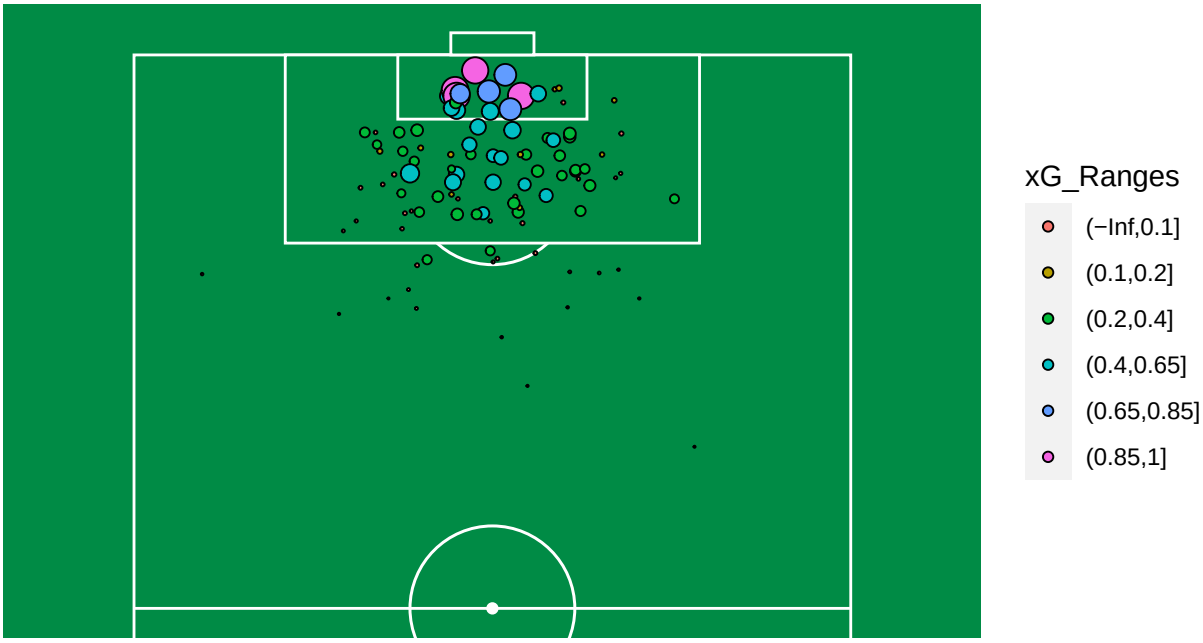

There is nothing unusual in the shotmap.The dots size is depending on the xG Value of each shot. We see that shots near to the goal and with a good degree to it, seem to have the biggest xG for each of these players. Let's plot only shots which resulted in a goal.

```
for (strName in listPlayers) {
  print(plot_shot_player(FALSE, shot_data, strName, lowTshld, upTshld))
}
```

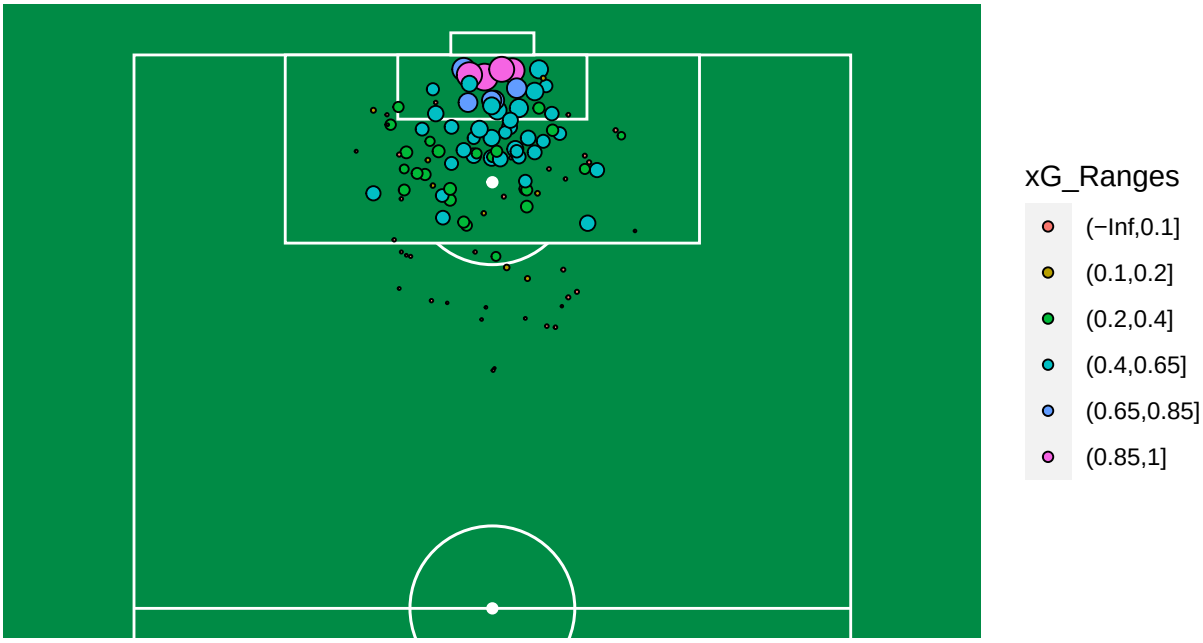
Lionel Messi goalmap where Expected Goals range between 0% − 100%



Son Heung−Min goalmap where Expected Goals range between 0% − 100%




Antoine Griezmann goalmap where Expected Goals range between 0% − 100%

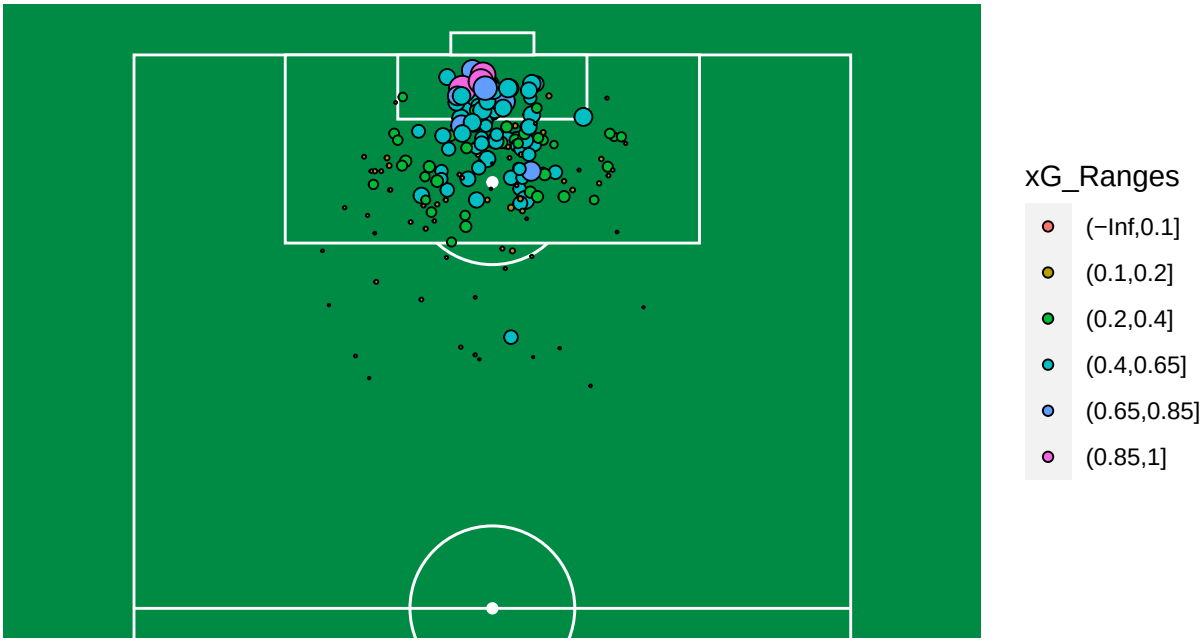



Pretty balanced for all of them. Interesting to see is, that all of them are pretty good regarding scoring goals with a xG of smaller 0.2

For your interest we also plotted Cristiano's goalmap down under

```
plot_shot_player(FALSE, shot_data, "Cristiano Ronaldo", lowTshld, upTshld)
```

Cristiano Ronaldo goalmap where Expected Goals range between 0% − 100%




Let's have a look into a all shots given by a player considering the xG Range, which means that we only consider situations where the shot had at least a 50% chance of becoming a goal. These shots can be seen as big chances.

```
lowTshld = 0.5
upTshld = 1.000
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {

  df_best <-results_ranges(TRUE, shot_data, df_best, strName, lowTshld, upTshld)
}
listPlayers <- df_best$Player[1:n]
df_best
```

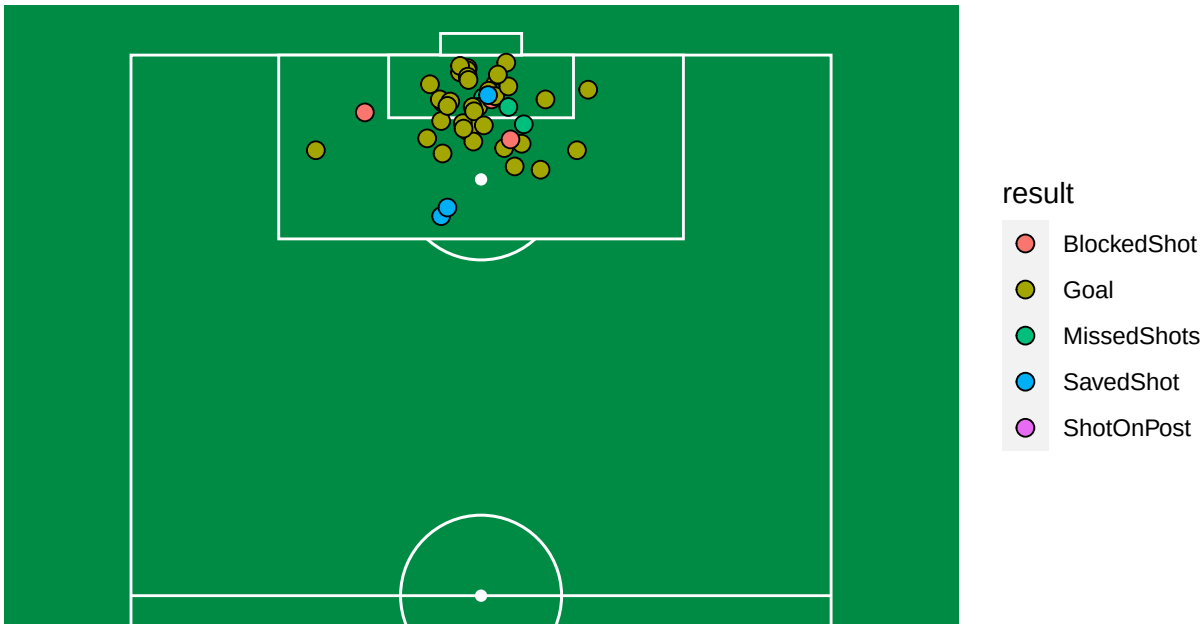
```
##                     Player Conversion_Rate Goals_Expected Goals Shots
## 16              Jamie Vardy           0.755          31.21    37    49
## 25               Iago Aspas           0.784          23.75    29    37
## 15               Sadio Mané           0.679          34.61    38    56
## 11            Ciro Immobile           0.679          16.74    19    28
## 9      Kylian Mbappe-Lottin           0.667          32.74    34    51
## 22           Erling Haaland           0.727          15.09    16    22
## 10            Romelu Lukaku           0.627          36.23    37    59
## 21     Alexandre Lacazette           0.667          27.38    28    42
## 20           Son Heung-Min           0.655          19.08    19    29
## 13       Antoine Griezmann           0.625          25.20    25    40
## 23      Zlatan Ibrahimovic           0.581          19.00    18    31
## 1             Lionel Messi           0.620          50.16    49    79
## 17         Gonzalo Higuaín           0.548          24.44    23    42
## 5               Harry Kane           0.585          39.84    38    65
## 18            Mauro Icardi           0.600          34.98    33    55
## 14           Sergio Agüero           0.571          34.05    32    56
## 24                  Neymar           0.589          35.28    33    56
## 4              Luis Suárez           0.591          54.47    52    88
```

```
## 8              Karim Benzema           0.577          44.02    41    71
## 7              Mohamed Salah           0.590          26.17    23    39
## 12            Edinson Cavani           0.571          44.31    40    70
## 6  Pierre-Emerick Aubameyang           0.584          63.63    59   101
## 19         Wissam Ben Yedder           0.520          31.85    26    50
## 2         Robert Lewandowski           0.583          80.01    74   127
## 3          Cristiano Ronaldo           0.522          56.40    48    92
##    Average_xG Performance_xG Performance_Goals
## 16      0.637          0.118              5.79
## 25      0.642          0.142              5.25
## 15      0.618          0.061              3.39
## 11      0.598          0.081              2.26
## 9       0.642          0.025              1.26
## 22      0.686          0.041              0.91
## 10      0.614          0.013              0.77
## 21      0.652          0.015              0.62
## 20      0.658         -0.003             -0.08
## 13      0.630         -0.005             -0.20
## 23      0.613         -0.032             -1.00
## 1       0.635         -0.015             -1.16
## 17      0.582         -0.034             -1.44
## 5       0.613         -0.028             -1.84
## 18      0.636         -0.036             -1.98
## 14      0.608         -0.037             -2.05
## 24      0.630         -0.041             -2.28
## 4       0.619         -0.028             -2.47
## 8       0.620         -0.043             -3.02
## 7       0.671         -0.081             -3.17
## 12      0.633         -0.062             -4.31
## 6       0.630         -0.046             -4.63
## 19      0.637         -0.117             -5.85
## 2       0.630         -0.047             -6.01
## 3       0.613         -0.091             -8.40
```

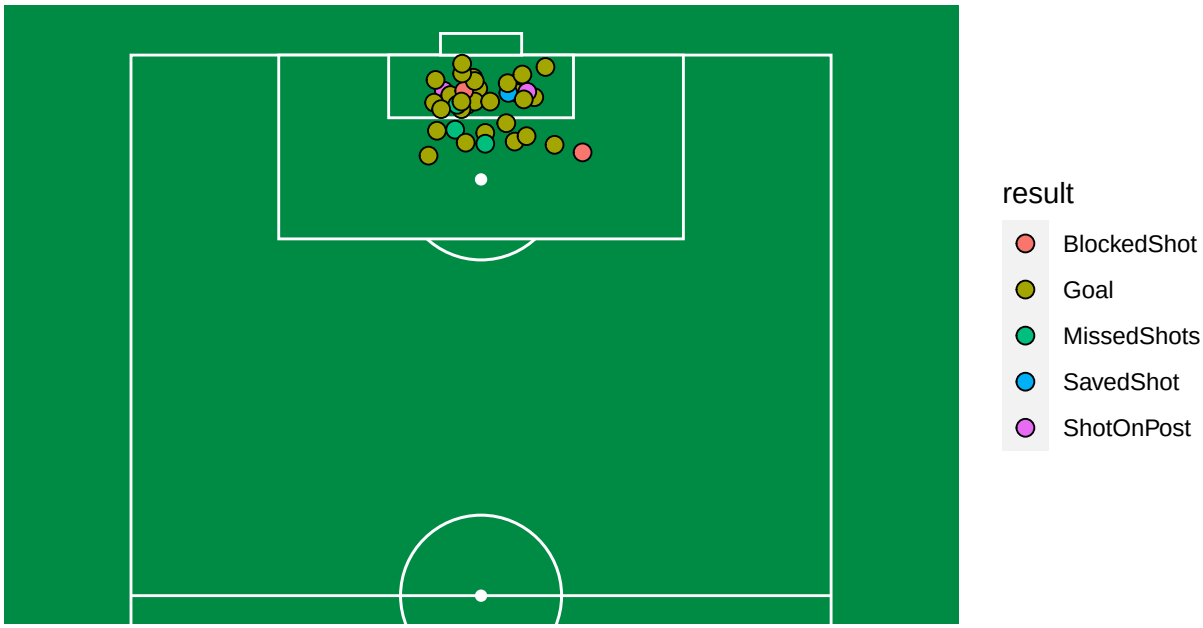
Jamie Vardy leads the list in this range with a positive value of approx. 6 goals. He is followed by Iago Aspas (approx. 5) and Sadio Mané (approx 3). It's quite interesting that most of the players (17 of 25) underperform in this range, which we classified as big chances, even though the the Conversion Rate is higher than 50% for every player, which means they all tend to score given a big chance (at least 50% xG).

```
for (strName in listPlayers) {
  print(plot_shot_player(TRUE , shot_data, strName, lowTshld, upTshld))
}
```

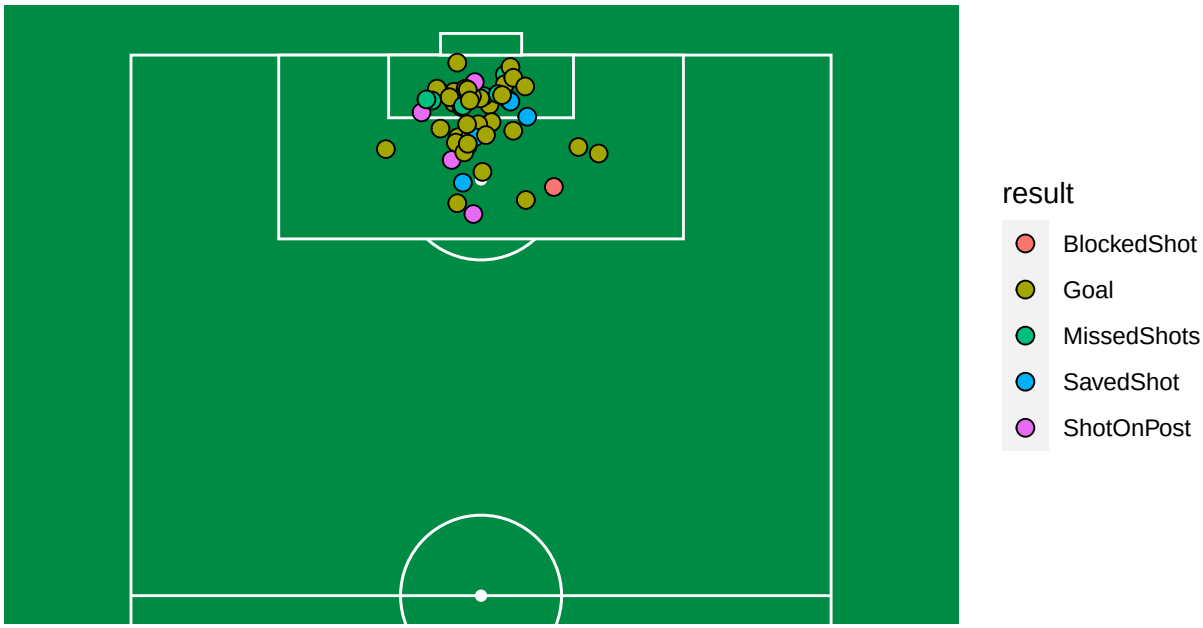
Jamie Vardy shotmap where Expected Goals range between 50% − 100%




Iago Aspas shotmap where Expected Goals range between 50% − 100%

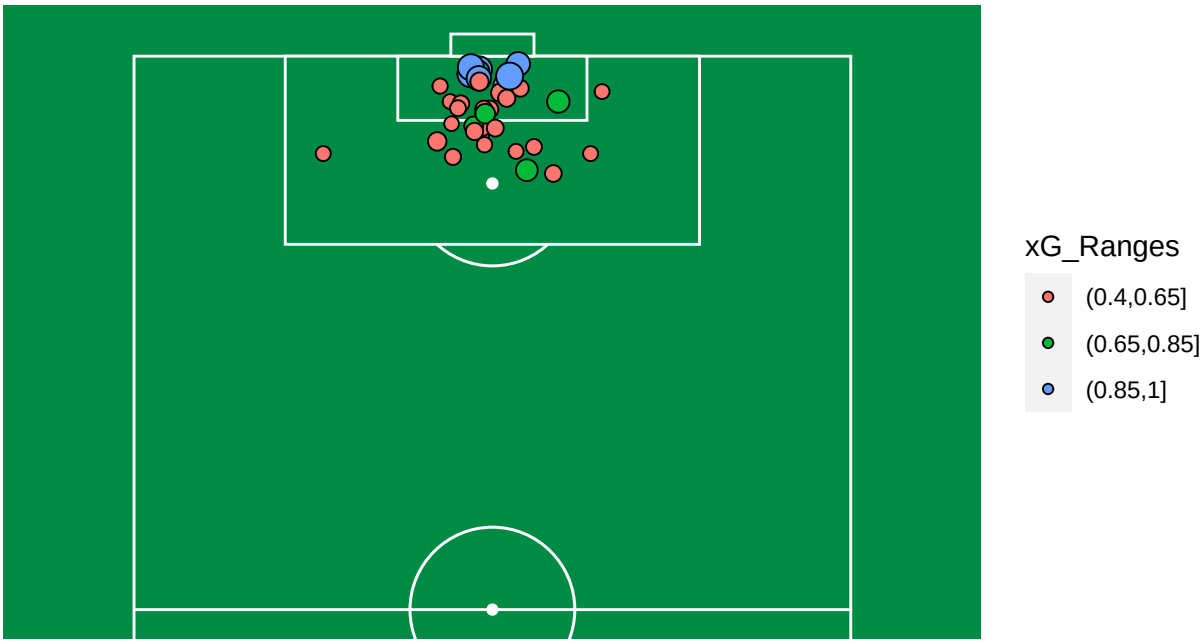


Sadio Mané shotmap where Expected Goals range between 50% − 100%

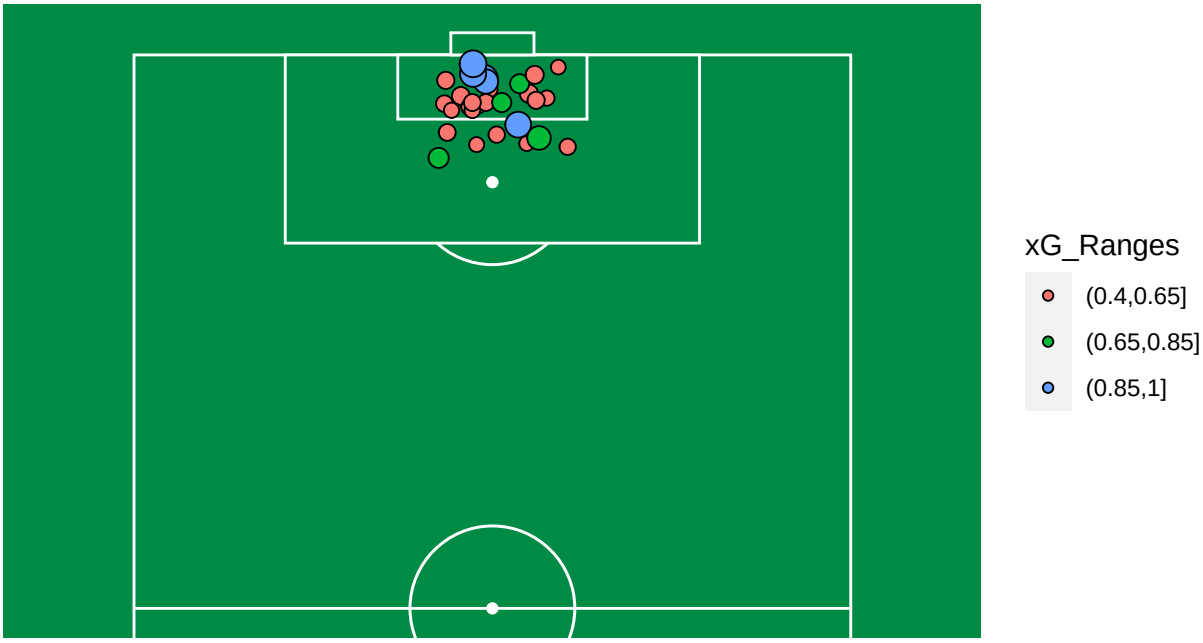



```
for (strName in listPlayers) {
  print(plot_shot_player(FALSE , shot_data, strName, lowTshld, upTshld))
}
```

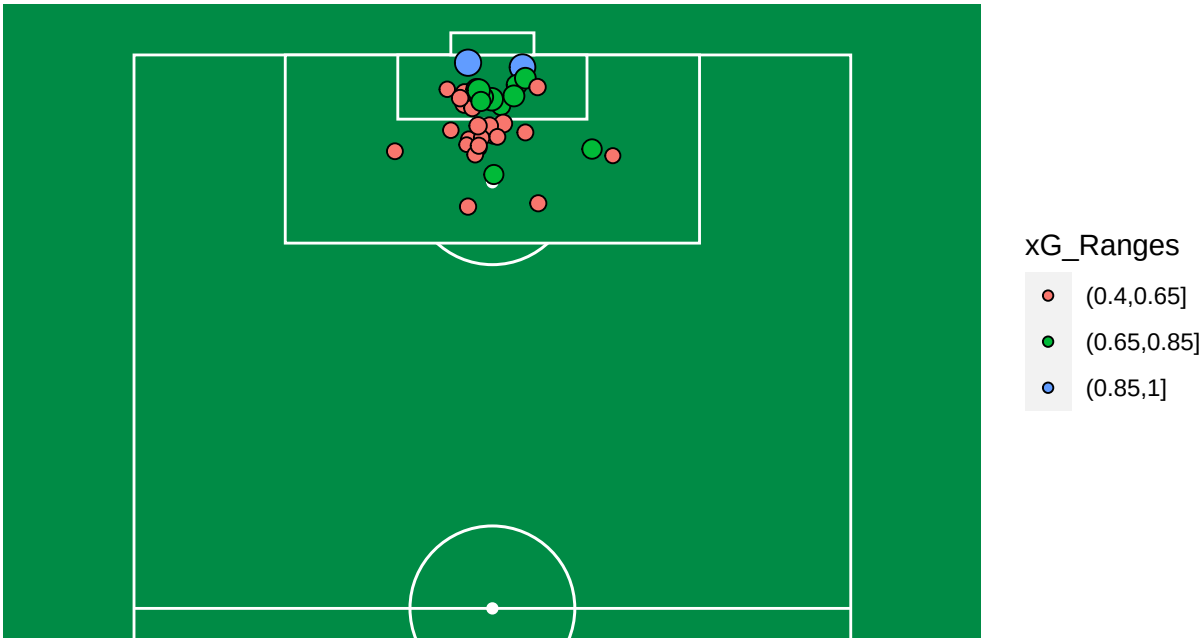
Jamie Vardy goalmap where Expected Goals range between 50% − 100%



Iago Aspas goalmap where Expected Goals range between 50% − 100%




Sadio Mané goalmap where Expected Goals range between 50% − 100%




We see that Sadio Mane really made the difficult goals compared to the other 2

Let's have a look into a all shots given within a xG range of 25% to 50%. These shots can be seen as middle chances.

```
lowTshld = 0.25
upTshld = 0.5
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {

  df_best <-results_ranges(TRUE, shot_data, df_best, strName, lowTshld, upTshld)
}
```

```
listPlayers <- df_best$Player[1:n]
df_best
```

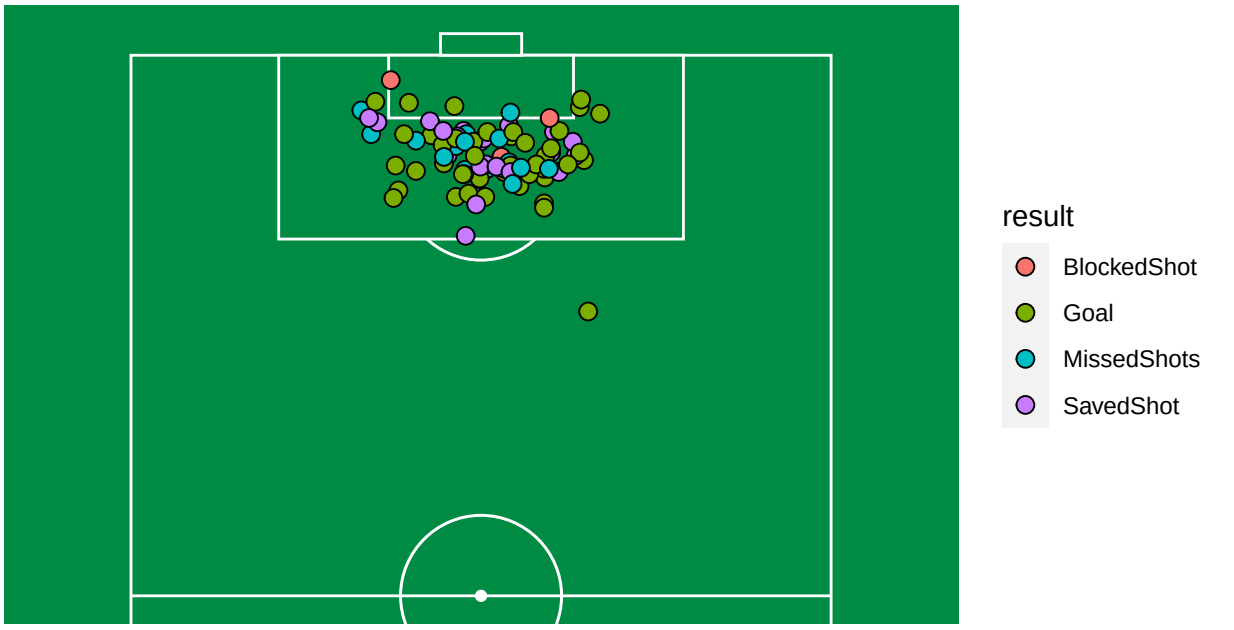
```
##                       Player Conversion_Rate Goals_Expected Goals Shots
## 17          Gonzalo Higuaín           0.500          31.08    42    84
## 19        Wissam Ben Yedder           0.462          38.58    48   104
## 20            Son Heung-Min           0.468          27.26    36    77
## 22           Erling Haaland           0.585          15.33    24    41
## 5                Harry Kane           0.450          49.66    58   129
## 3         Cristiano Ronaldo           0.422          53.80    62   147
## 13        Antoine Griezmann           0.462          35.53    43    93
## 9      Kylian Mbappe-Lottin           0.418          44.77    51   122
## 15               Sadio Mané           0.413          33.67    38    92
## 21      Alexandre Lacazette           0.408          35.67    40    98
## 10            Romelu Lukaku           0.424          38.02    42    99
## 7             Mohamed Salah           0.394          52.26    56   142
## 25               Iago Aspas           0.417          26.28    30    72
## 14            Sergio Agüero           0.410          30.96    34    83
## 23       Zlatan Ibrahimovic           0.400          29.44    32    80
## 6  Pierre-Emerick Aubameyang           0.397          47.50    50   126
## 12           Edinson Cavani           0.369          53.94    55   149
## 1              Lionel Messi           0.388          44.08    45   116
## 8             Karim Benzema           0.391          42.35    43   110
## 16              Jamie Vardy           0.359          37.49    37   103
## 18             Mauro Icardi           0.360          38.10    36   100
## 11            Ciro Immobile           0.339          42.24    40   118
## 4               Luis Suárez           0.366          66.67    64   175
## 24                    Neymar           0.353          39.17    36   102
## 2       Robert Lewandowski           0.354          73.90    69   195
##    Average_xG Performance_xG Performance_Goals
## 17      0.370          0.130             10.92
## 19      0.371          0.091              9.42
## 20      0.354          0.114              8.74
## 22      0.374          0.211              8.67
## 5       0.385          0.065              8.34
## 3       0.366          0.056              8.20
## 13      0.382          0.080              7.47
## 9       0.367          0.051              6.23
## 15      0.366          0.047              4.33
## 21      0.364          0.044              4.33
## 10      0.384          0.040              3.98
## 7       0.368          0.026              3.74
## 25      0.365          0.052              3.72
## 14      0.373          0.037              3.04
## 23      0.368          0.032              2.56
## 6       0.377          0.020              2.50
## 12      0.362          0.007              1.06
## 1       0.380          0.008              0.92
## 8       0.385          0.006              0.65
## 16      0.364         -0.005             -0.49
## 18      0.381         -0.021             -2.10
## 11      0.358         -0.019             -2.24
## 4       0.381         -0.015             -2.67
## 24      0.384         -0.031             -3.17
```

```
## 2       0.379          -0.025              -4.90
```

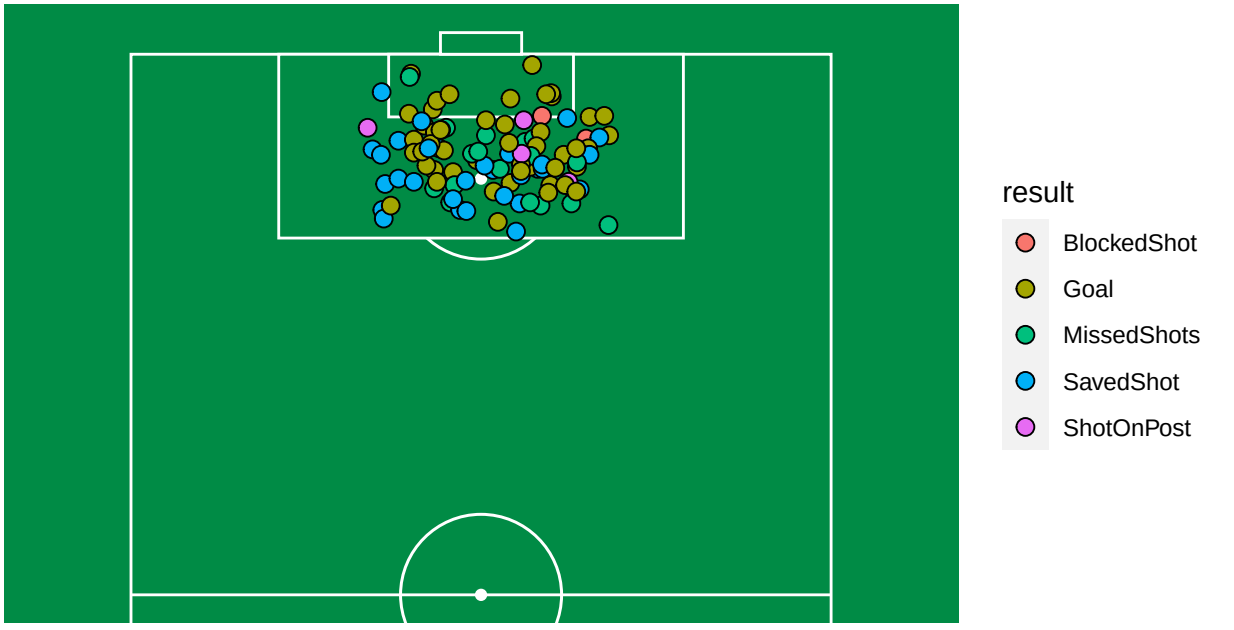
In this category Higuain leads the list with a Performance Goals value of almost 11. Haaland again conivinces us with a Conversion Rate of almost 60%.

```
for (strName in listPlayers) {
  print(plot_shot_player(TRUE , shot_data, strName, lowTshld, upTshld))
}
```

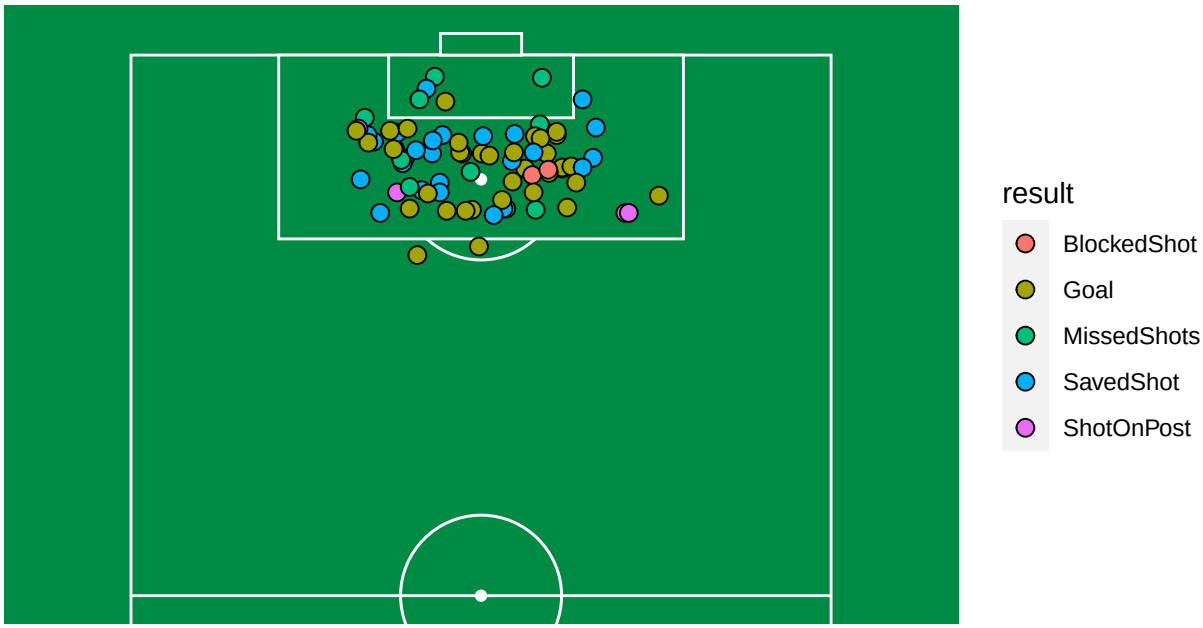
Gonzalo Higuaín shotmap where Expected Goals range between 25% − 50%




Wissam Ben Yedder shotmap where Expected Goals range between 25% − 50%



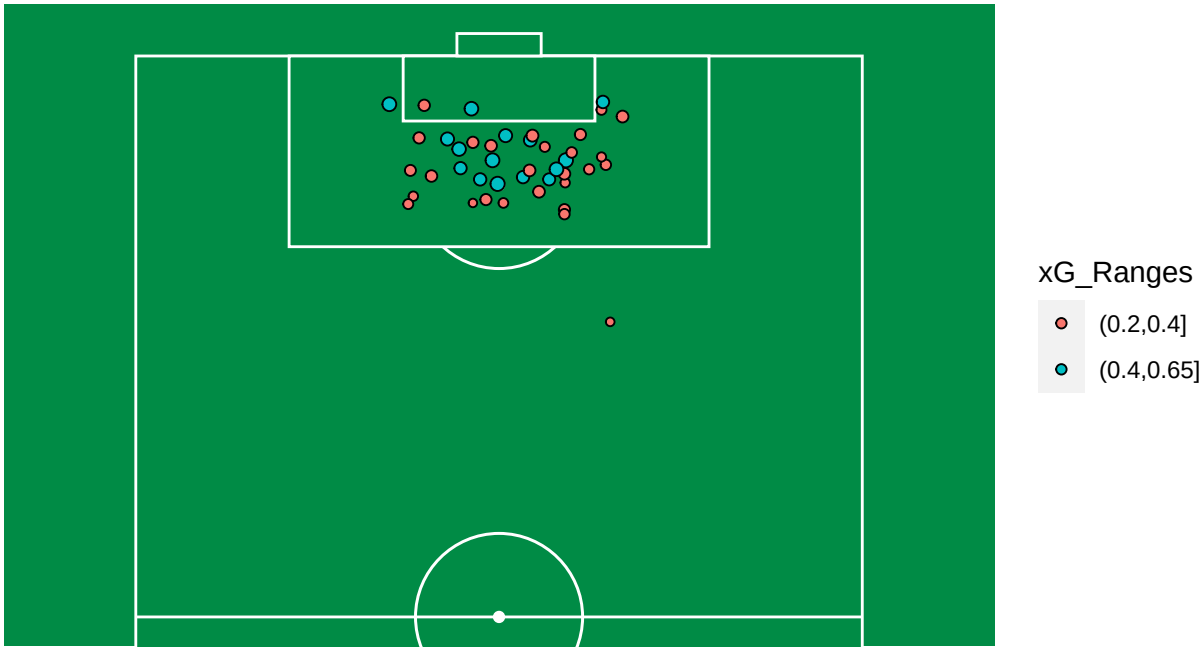
Son Heung−Min shotmap where Expected Goals range between 25% − 50%



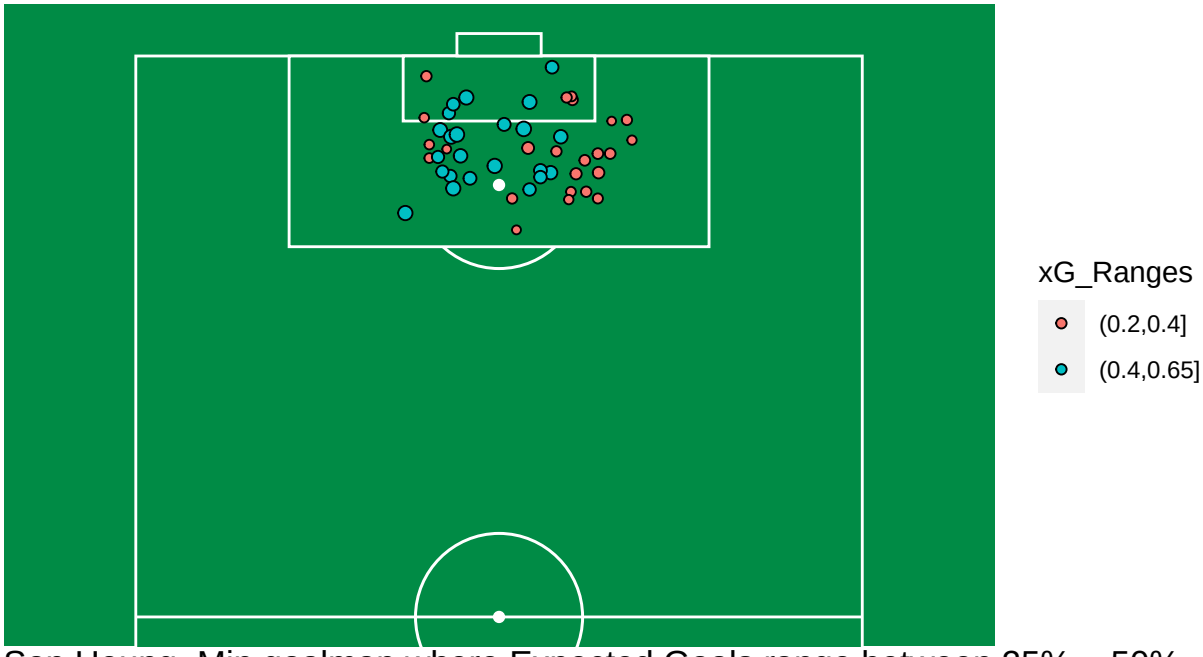

Interesting to see for the top 3 of our list is, that all of them are almost able to score every 2th shot for middle chances.

```
for (strName in listPlayers) {
  print(plot_shot_player(FALSE , shot_data, strName, lowTshld, upTshld))
}
```

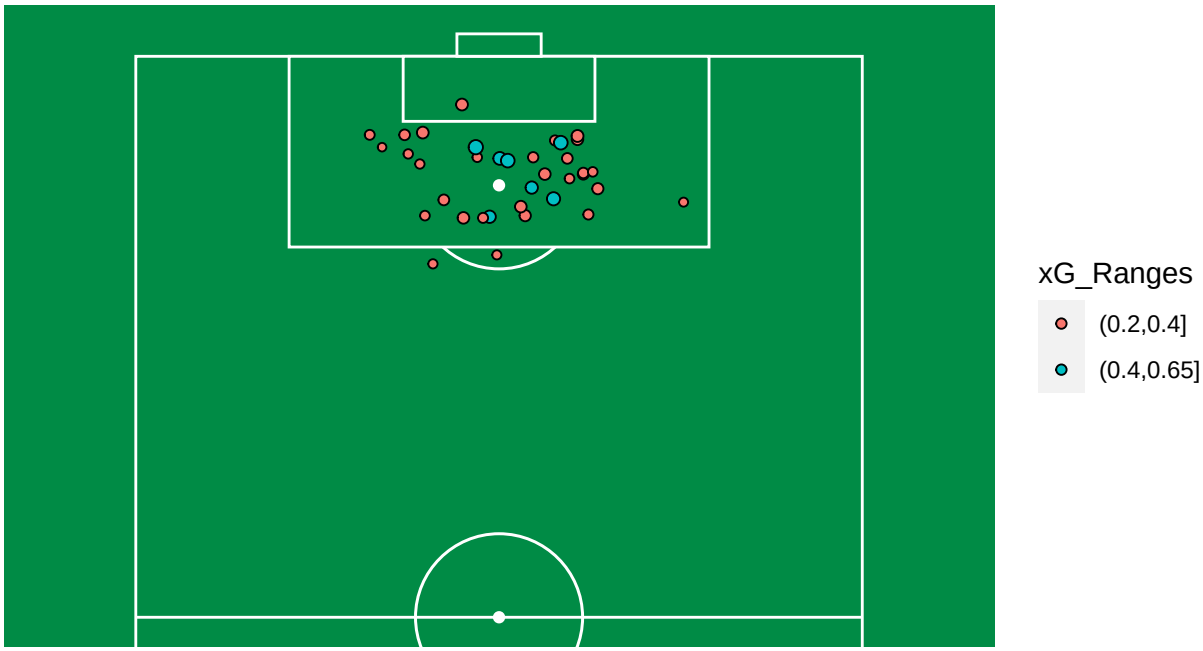
Gonzalo Higuaín goalmap where Expected Goals range between 25% − 50%



Wissam Ben Yedder goalmap where Expected Goals range between 25% − 50%




Son Heung−Min goalmap where Expected Goals range between 25% − 50%




Let's have a look into a all shots given by a player considering the xG Range, which means that we only consider situations where the shot had at least a 10% and a maximum of 25% chance of becoming a goal. These shots can be seen as small chances.

```
lowTshld = 0.0
upTshld = 0.25
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {

  df_best <-results_ranges(TRUE, shot_data, df_best, strName, lowTshld, upTshld)
```

```
}
listPlayers <- df_best$Player[1:n]
df_best
```

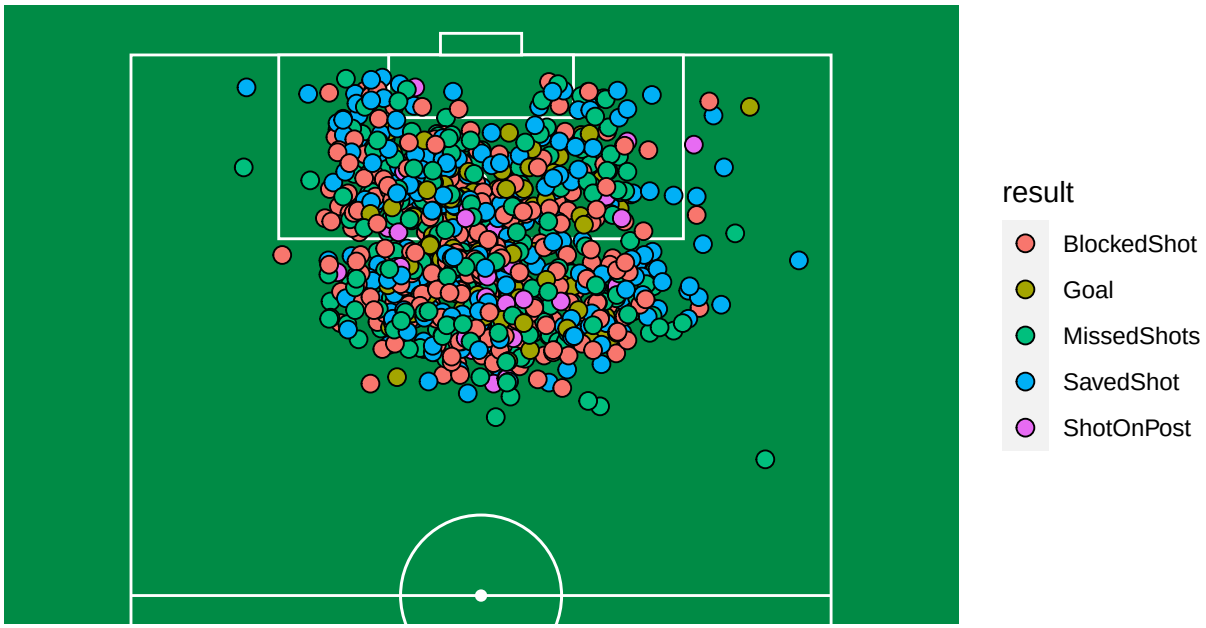
```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 1              Lionel Messi           0.105          79.13   115  1099
## 20           Son Heung-Min            0.105          27.08    48   459
## 4              Luis Suárez            0.095          46.58    62   656
## 13       Antoine Griezmann            0.093          29.26    44   472
## 11           Ciro Immobile            0.089          42.44    57   643
## 5               Harry Kane            0.070          45.37    56   796
## 7             Mohamed Salah           0.085          45.47    56   659
## 9      Kylian Mbappe-Lottin           0.096          30.71    40   415
## 23       Zlatan Ibrahimovic           0.088          27.72    37   420
## 18            Mauro Icardi            0.094          27.65    36   384
## 25              Iago Aspas            0.086          28.21    36   421
## 21      Alexandre Lacazette           0.089          28.83    35   395
## 2        Robert Lewandowski           0.081          55.73    60   743
## 19        Wissam Ben Yedder           0.080          26.18    30   374
## 14           Sergio Agüero            0.081          41.55    45   554
## 8            Karim Benzema            0.078          41.97    45   575
## 22          Erling Haaland            0.106          11.48    14   132
## 17         Gonzalo Higuaín            0.072          38.56    41   567
## 16             Jamie Vardy            0.081          31.01    33   408
## 3         Cristiano Ronaldo           0.063          70.21    72  1151
## 6  Pierre-Emerick Aubameyang          0.072          35.06    35   487
## 10           Romelu Lukaku            0.074          40.27    40   537
## 15              Sadio Mané            0.073          36.00    35   480
## 24                  Neymar            0.063          33.58    30   473
## 12           Edinson Cavani           0.062          24.86    21   336
##    Average_xG Performance_xG Performance_Goals
## 1       0.072          0.033             35.87
## 20      0.059          0.046             20.92
## 4       0.071          0.024             15.42
## 13      0.062          0.031             14.74
## 11      0.066          0.023             14.56
## 5       0.057          0.013             10.63
## 7       0.069          0.016             10.53
## 9       0.074          0.022              9.29
## 23      0.066          0.022              9.28
## 18      0.072          0.022              8.35
## 25      0.067          0.019              7.79
## 21      0.073          0.016              6.17
## 2       0.075          0.006              4.27
## 19      0.070          0.010              3.82
## 14      0.075          0.006              3.45
## 8       0.073          0.005              3.03
## 22      0.087          0.019              2.52
## 17      0.068          0.004              2.44
## 16      0.076          0.005              1.99
## 3       0.061          0.002              1.79
## 6       0.072          0.000             -0.06
## 10      0.075         -0.001             -0.27
## 15      0.075         -0.002             -1.00
```

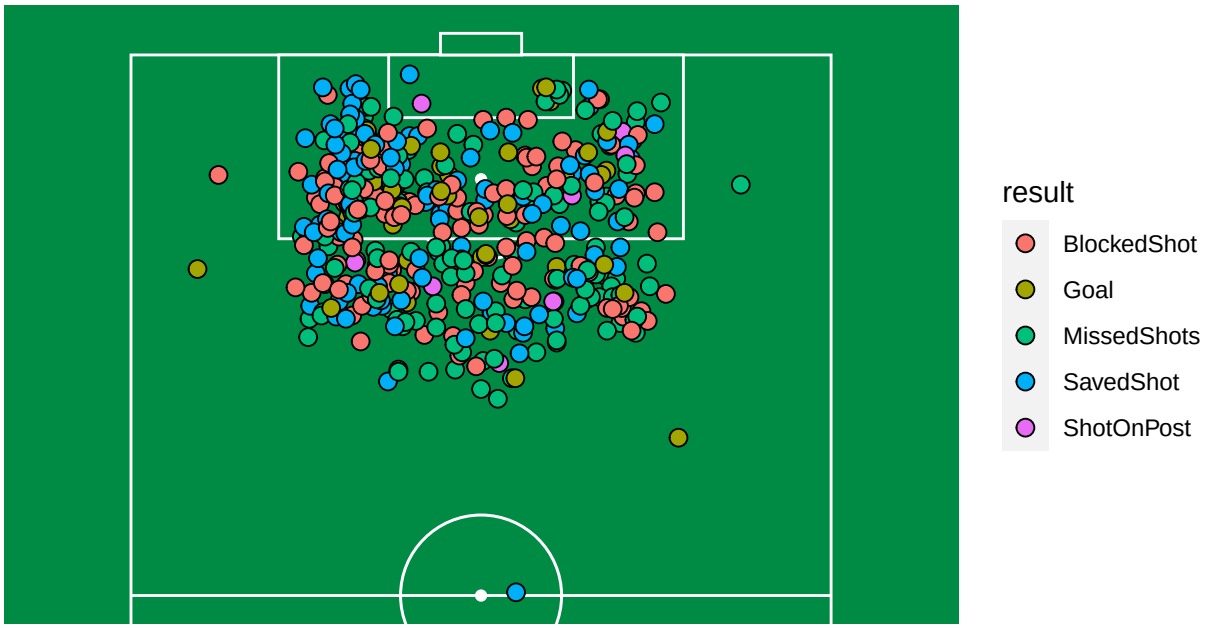
```
## 24       0.071          -0.008              -3.58
## 12       0.074          -0.012              -3.86
```

Messi really loves small chances. Interesting as he didn't performed so well for big chances. Son again is very visible far above in the result list. Suarez occupies the 3rd place. A name which shouldn't surprise you.

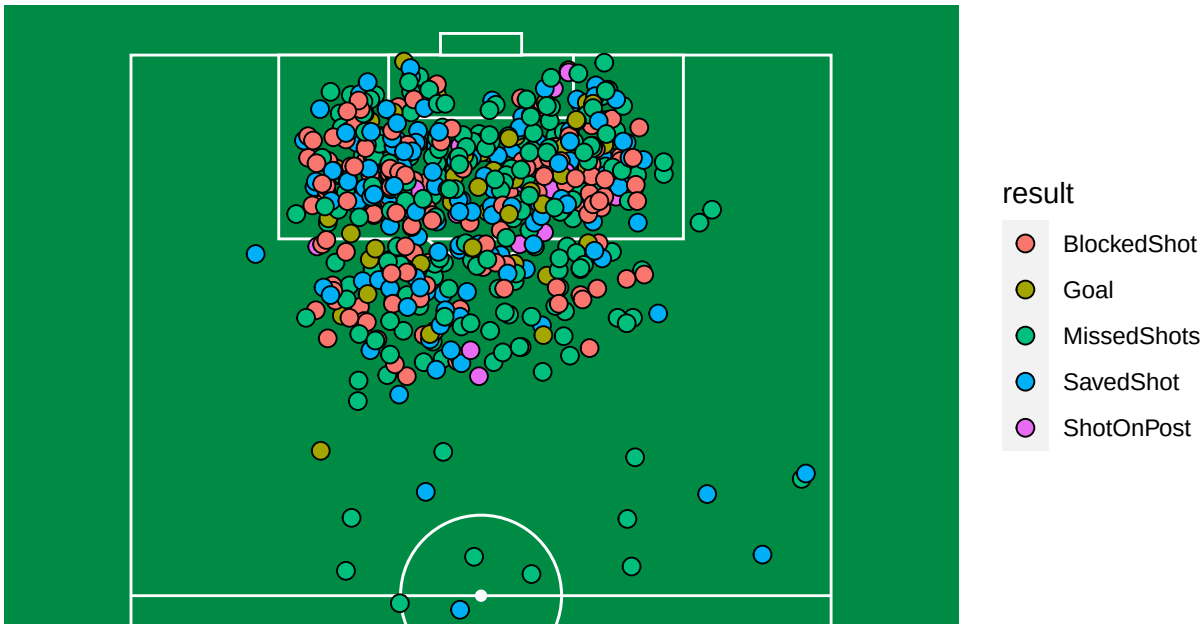
Here you can see the shot- and goalmap for the top 3

```
for (strName in listPlayers) {
  print(plot_shot_player(TRUE , shot_data, strName, lowTshld, upTshld))
}
```



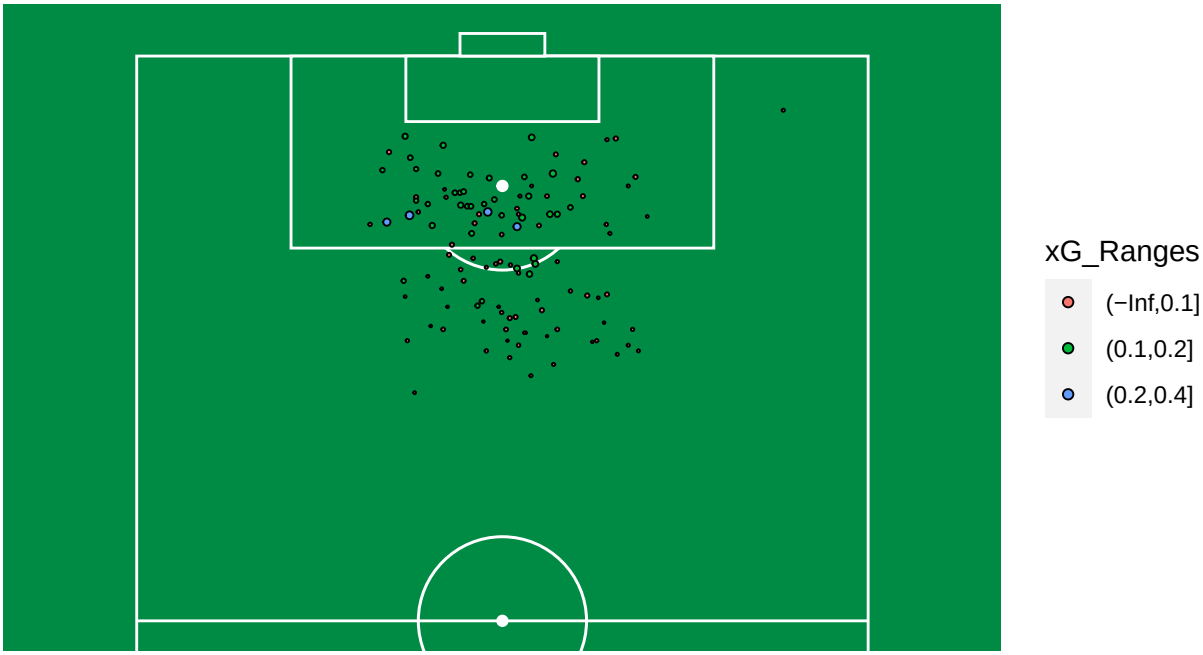



Luis Suárez shotmap where Expected Goals range between 0% − 25%

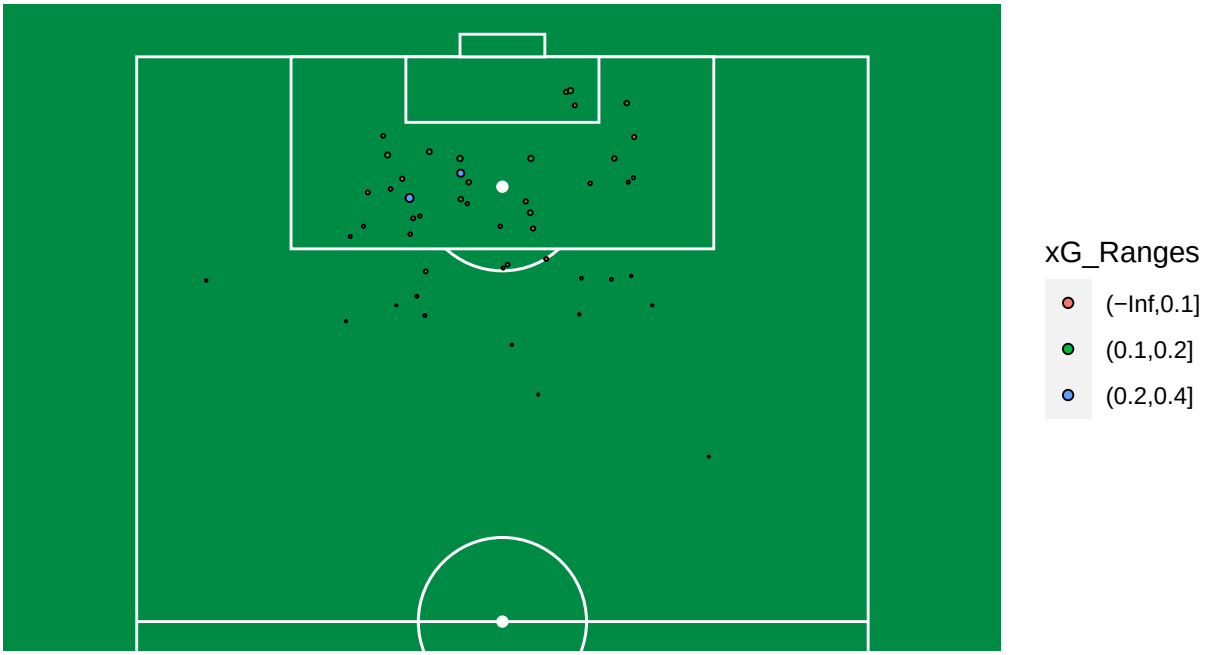



```
for (strName in listPlayers) {
  print(plot_shot_player(FALSE , shot_data, strName, lowTshld, upTshld))
}
```

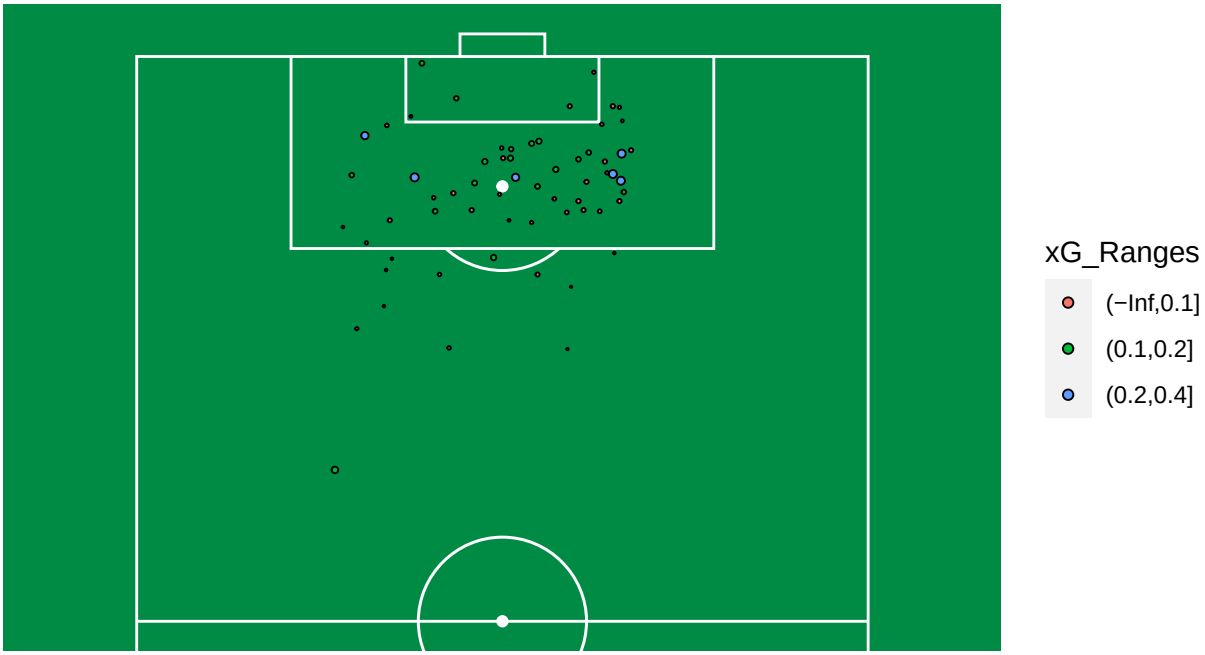
Lionel Messi goalmap where Expected Goals range between 0% − 25%



Son Heung−Min goalmap where Expected Goals range between 0% − 25%




Luis Suárez goalmap where Expected Goals range between 0% − 25%




Let's have a look who had the best values in the last season (2021/2022)

```
curr_shot_data <- shot_data[(shot_data$year == "2021" ),]
```

```
lowTshld = 0.0
upTshld = 1.00
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {

  df_best <-results_ranges(TRUE, curr_shot_data, df_best, strName, lowTshld, upTshld)
}
```

```r
listPlayers <- df_best$Player[1:n]
df_best
```

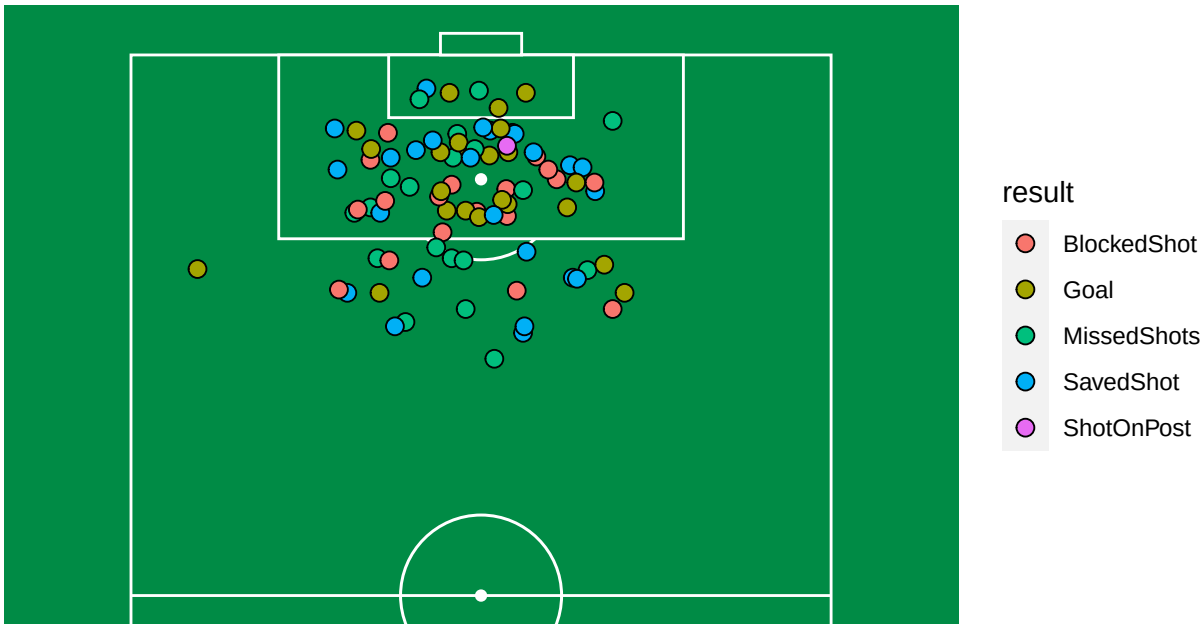
```
##                       Player Conversion_Rate Goals_Expected Goals Shots
## 20             Son Heung-Min           0.267          17.03    23    86
## 16               Jamie Vardy           0.273          10.01    15    55
## 11             Ciro Immobile           0.183          15.48    20   109
## 19         Wissam Ben Yedder           0.266          12.93    17    64
## 8              Karim Benzema           0.171          16.50    20   117
## 22            Erling Haaland           0.216          12.51    16    74
## 9       Kylian Mbappe-Lottin           0.175          21.88    25   143
## 25                Iago Aspas           0.165          10.88    14    85
## 23        Zlatan Ibrahimovic           0.157           6.58     8    51
## 24                    Neymar           0.200           8.70    10    50
## 10             Romelu Lukaku           0.167           6.26     7    42
## 4                Luis Suárez           0.125          17.00    17   136
## 3           Cristiano Ronaldo           0.139          15.12    15   108
## 14             Sergio Agüero           0.167           1.16     1     6
## 6  Pierre-Emerick Aubameyang           0.206          14.21    14    68
## 15                Sadio Mané           0.163          16.86    16    98
## 12            Edinson Cavani           0.111           3.73     2    18
## 7              Mohamed Salah           0.135          19.82    18   133
## 13         Antoine Griezmann           0.064           6.06     3    47
## 18              Mauro Icardi           0.143           7.20     4    28
## 21       Alexandre Lacazette           0.047           5.33     2    43
## 1                Lionel Messi           0.067           9.88     6    89
## 2          Robert Lewandowski           0.194          34.10    30   155
## 5                 Harry Kane           0.101          17.67    13   129
## 17           Gonzalo Higuaín             NaN            NaN     0     0
##    Average_xG Performance_xG Performance_Goals
## 20      0.198          0.069              5.97
## 16      0.182          0.091              4.99
## 11      0.142          0.041              4.52
## 19      0.202          0.064              4.07
## 8       0.141          0.030              3.50
## 22      0.169          0.047              3.49
## 9       0.153          0.022              3.12
## 25      0.128          0.037              3.12
## 23      0.129          0.028              1.42
## 24      0.174          0.026              1.30
## 10      0.149          0.018              0.74
## 4       0.125          0.000              0.00
## 3       0.140         -0.001             -0.12
## 14      0.193         -0.026             -0.16
## 6       0.209         -0.003             -0.21
## 15      0.172         -0.009             -0.86
## 12      0.207         -0.096             -1.73
## 7       0.149         -0.014             -1.82
## 13      0.129         -0.065             -3.06
## 18      0.257         -0.114             -3.20
## 21      0.124         -0.077             -3.33
## 1       0.111         -0.044             -3.88
## 2       0.220         -0.026             -4.10
## 5       0.137         -0.036             -4.67
```

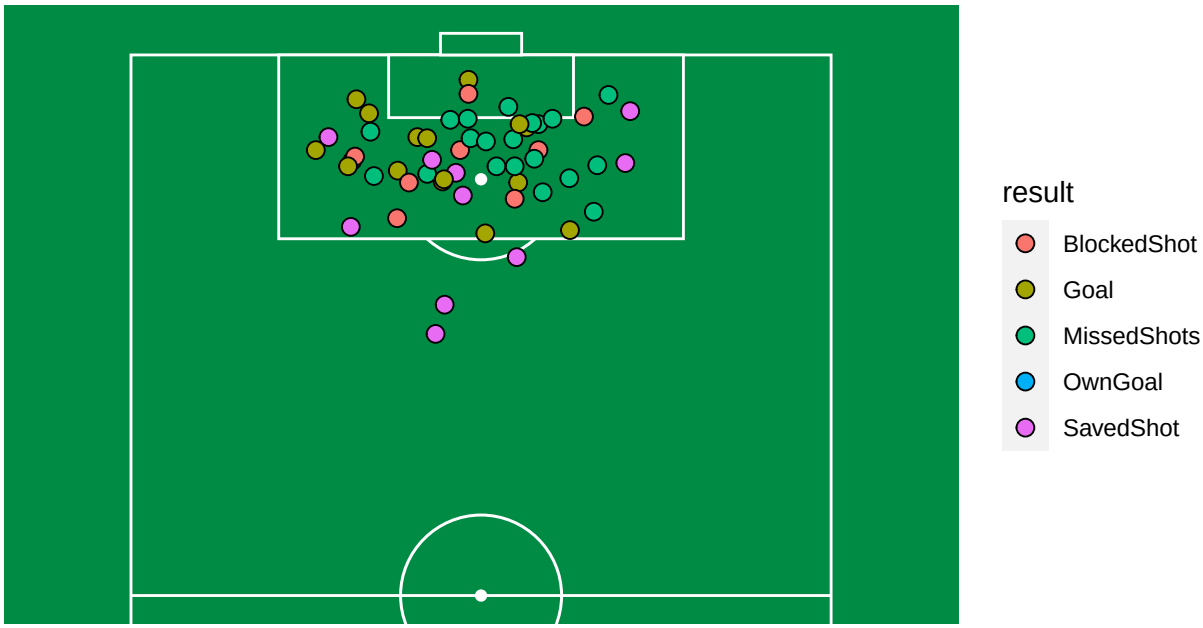
```
## 17         NaN             NaN                 NaN
```

The best performer of the last season was Son followed by Vardy and Immobile. Jamie Vardy has the best "Performance_xG" of 9.1%. Higauin has no values as he didn't played in the top 5 league Europe last season. From a statistical point of view Son's recent hype seems to be more than deserved.

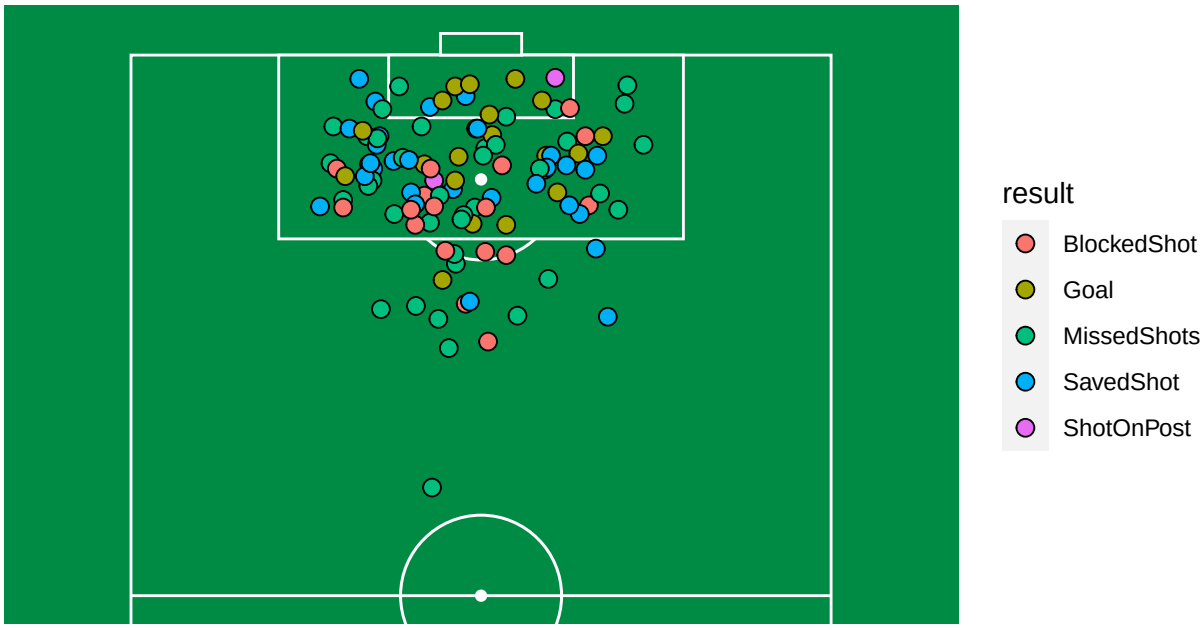
Here you can see the shot- and goalmaps.

```
for (strName in listPlayers) {
  print(plot_shot_player(TRUE , curr_shot_data, strName, lowTshld, upTshld))
}
```



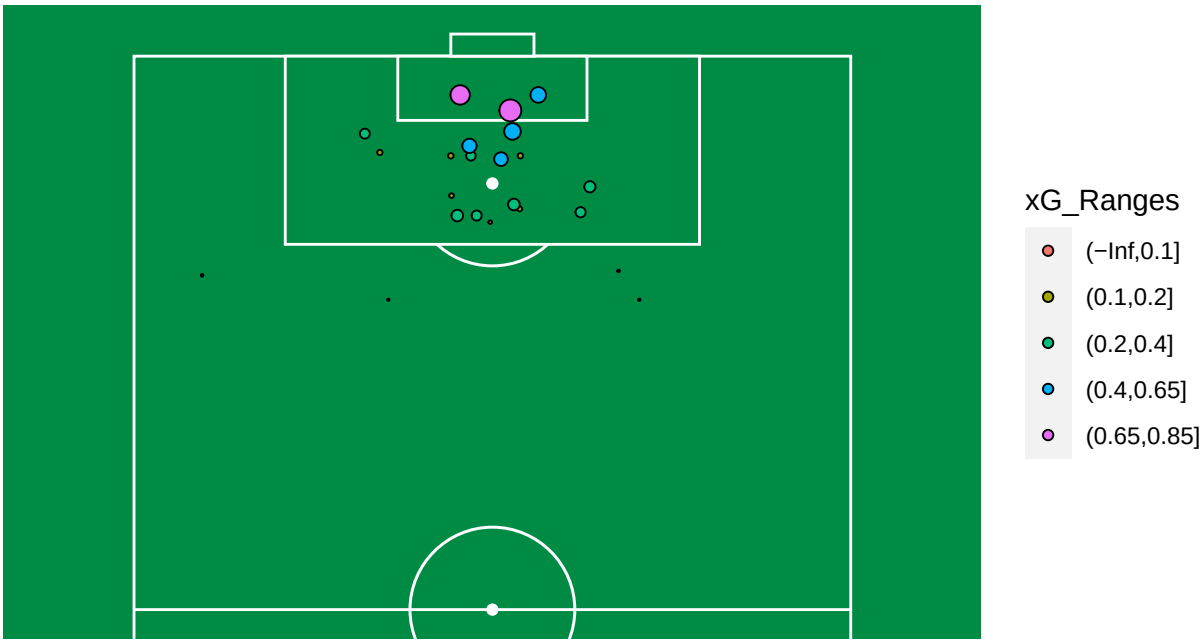



Ciro Immobile shotmap where Expected Goals range between 0% − 100%

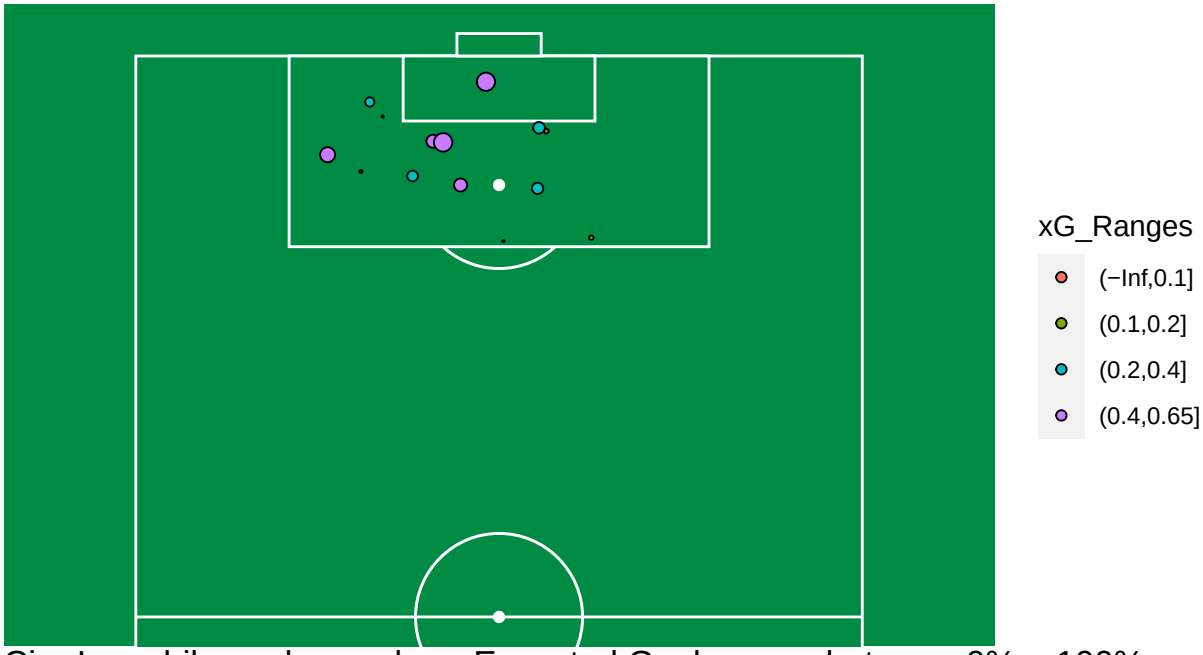



```
for (strName in listPlayers) {
  print(plot_shot_player(FALSE , curr_shot_data, strName, lowTshld, upTshld))
}
```

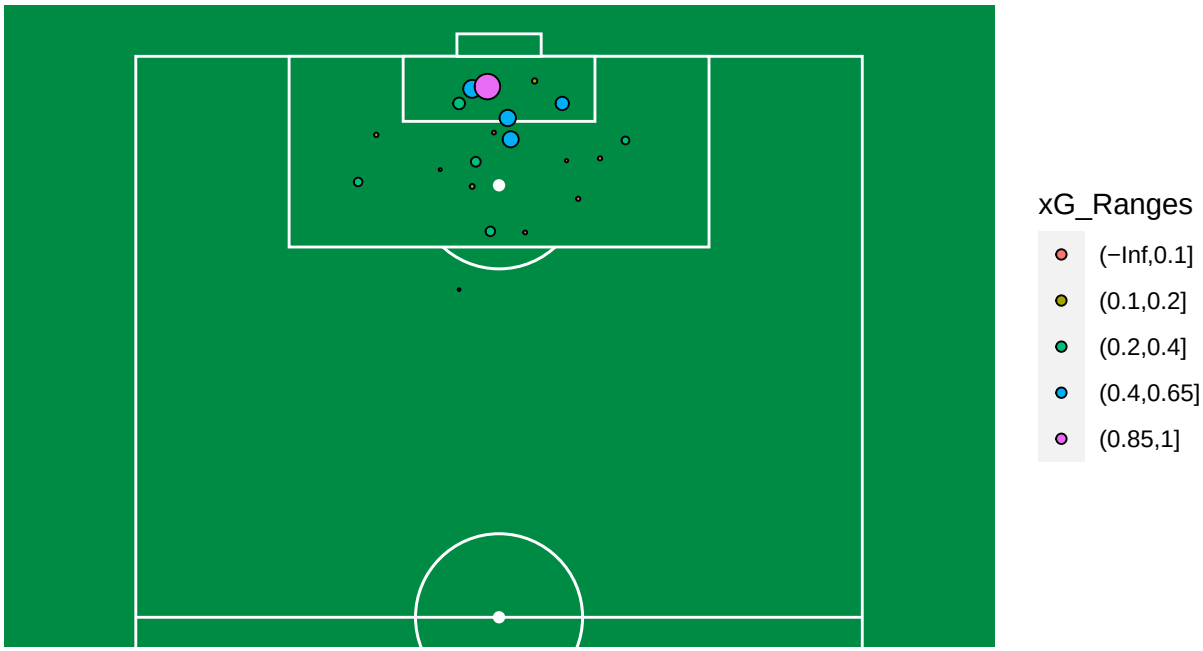
Son Heung−Min goalmap where Expected Goals range between 0% − 100%



Jamie Vardy goalmap where Expected Goals range between 0% − 100%



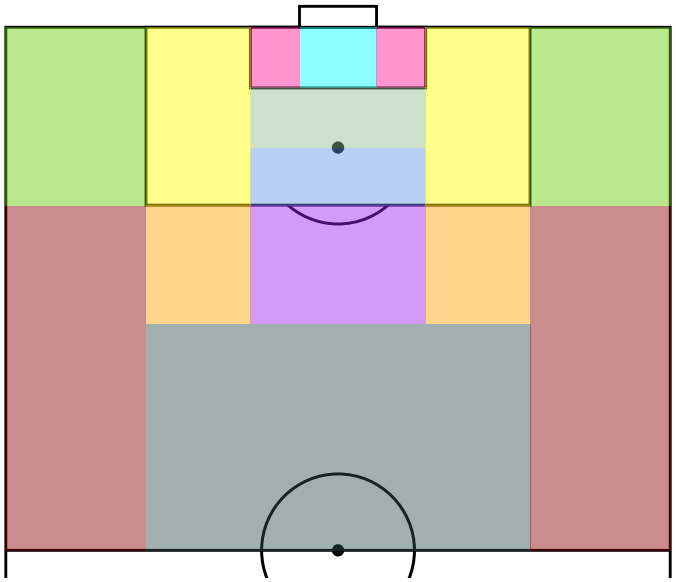

Ciro Immobile goalmap where Expected Goals range between 0% − 100%




#Now we will highlight the different areas which we defined before

```
pltTitle <- "Expected Goals (xG) divided into different areas with it's probabilities"
plot_areas_xG(xG_plot_areas, xGChar, pltTitle)
```

Expected Goals (xG) divided into different areas with it's probabilities




```
outbox = 'Outside Box'
insideBox = 'Inside Box'
inside5 = 'Inside 5'
areas_spec<- shot_data %>%
  mutate(xGAreas = case_when(X < 0.8294  & Y < 0.211 ~ 'Area 10',
                             X < 0.8294  & Y > 0.789 ~ 'Area 10',

                             X < 0.7163 & Y >= 0.211 & Y <= 0.789  ~ 'Area 9',
                             X >= 0.8294  & Y < 0.211 ~ 'Area 8',
                             X >= 0.8294  & Y > 0.789  ~ 'Area 8',

                             X >= 0.7163 & X < 0.8294  & Y >= 0.211 & Y <= 0.3678   ~ outbox,
                             X >= 0.7163 & X < 0.8294  & Y >= 0.6322 & Y <= 0.789  ~ outbox,
                             X >= 0.7163 & X < 0.8294  & Y > 0.3678 & Y < 0.6322  ~ outbox,

                             X >= 0.8294  & Y >= 0.211 & Y < 0.3678  ~ insideBox,
                             X >= 0.8294  & Y >= 0.6322 & Y <= 0.789 ~ insideBox,
                             X >= 0.8294  & X <= 0.8846 & Y > 0.3678 & Y < 0.6322  ~ insideBox,
                             X > 0.8846 & X < 0.9423 & Y > 0.3678 & Y < 0.6322    ~ insideBox,
                             X >= 0.9423 & Y > 0.3678 & Y < 0.44222  ~ insideBox,
                             X >= 0.9423 & Y > 0.55778 & Y < 0.6322 ~ insideBox,
                             X >= 0.9423 & Y >= 0.44222 & Y <= 0.55778  ~ insideBox,
                             TRUE ~ 'e'))

unique(sort(areas_spec$xGAreas))
```

```
## [1] "Area 10"     "Area 8"      "Area 9"      "Inside Box"  "Outside Box"
```

```
xmin <- c(0.8294) *100
xmax <- c(1) *100
ymin <- c(0.211) *100
ymax <- c(0.789) *100
insideAreas <- c("Inside Box")
```

```r
insideBox_areas <- data.frame(xmin, xmax, ymin, ymax, xGAreas)
```

```r
outsideAreas <- c("Outside Box")
outBox_areas <- data.frame(0.7163, 0.8294, 0.211, 0.789 , xGAreas)
```

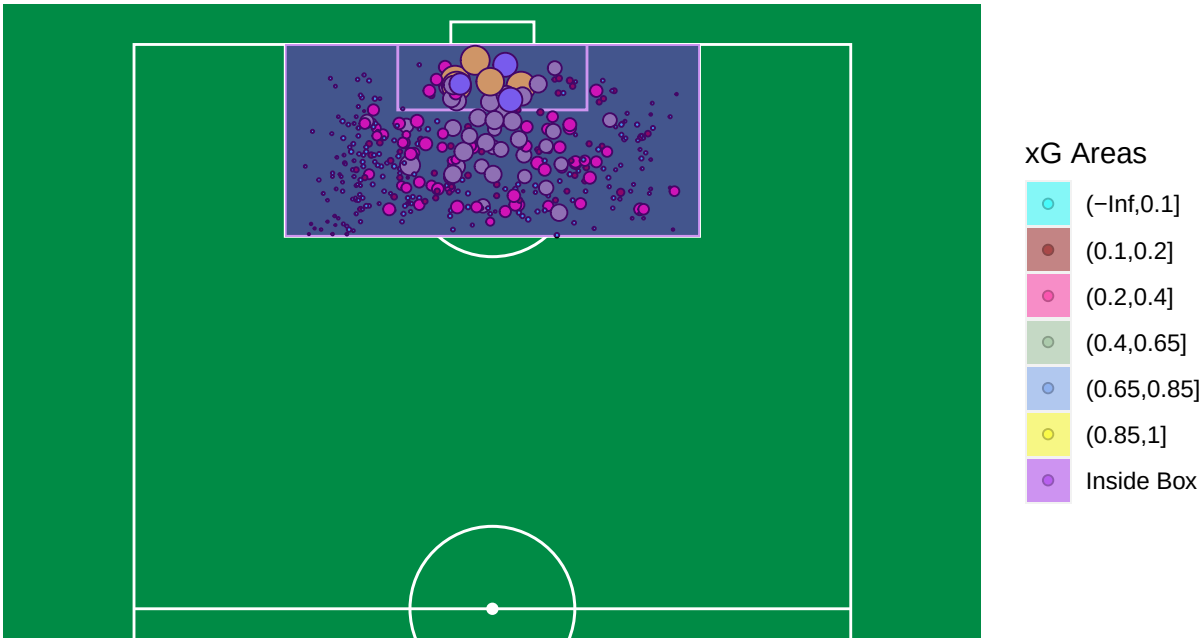
```r
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areas_spec, df_best, strName, insideBox)
  listPlayers <- df_best$Player[1:n]
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 20            Son Heung-Min           0.227          66.23    84   370
## 1              Lionel Messi           0.226         137.08   154   682
## 11            Ciro Immobile           0.180          94.86   110   612
## 17          Gonzalo Higuaín           0.196          85.83    98   499
## 9       Kylian Mbappe-Lottin           0.239         104.00   116   486
## 25                Iago Aspas           0.223          68.57    80   359
## 22           Erling Haaland            0.283          41.03    52   184
## 13        Antoine Griezmann           0.226          81.61    91   402
## 15                Sadio Mané           0.213          99.06   108   508
## 5                 Harry Kane           0.209         121.72   130   621
## 16               Jamie Vardy           0.213          95.84   104   489
## 7              Mohamed Salah           0.193         115.30   123   637
## 19         Wissam Ben Yedder           0.223          92.59    99   443
## 21       Alexandre Lacazette           0.220          85.69    92   418
## 23        Zlatan Ibrahimovic           0.199          67.89    73   367
## 4               Luis Suárez           0.226         159.21   164   727
## 18              Mauro Icardi           0.218          97.60   102   467
## 10            Romelu Lukaku           0.204         108.50   112   548
## 3          Cristiano Ronaldo           0.181         159.85   162   893
## 8              Karim Benzema           0.197         122.11   123   623
## 6  Pierre-Emerick Aubameyang           0.240         140.50   140   583
## 14            Sergio Agüero           0.180          99.01    98   544
## 24                   Neymar           0.208          97.94    88   424
## 2         Robert Lewandowski           0.210         200.26   188   894
## 12            Edinson Cavani           0.223         116.75   104   467
##    Average_xG Performance_xG Performance_Goals
## 20      0.179          0.048             17.77
## 1       0.201          0.025             16.92
## 11      0.155          0.025             15.14
## 17      0.172          0.024             12.17
## 9       0.214          0.025             12.00
## 25      0.191          0.032             11.43
## 22      0.223          0.060             10.97
## 13      0.203          0.023              9.39
## 15      0.195          0.018              8.94
## 5       0.196          0.013              8.28
## 16      0.196          0.017              8.16
## 7       0.181          0.012              7.70
## 19      0.209          0.014              6.41
## 21      0.205          0.015              6.31
## 23      0.185          0.014              5.11
```

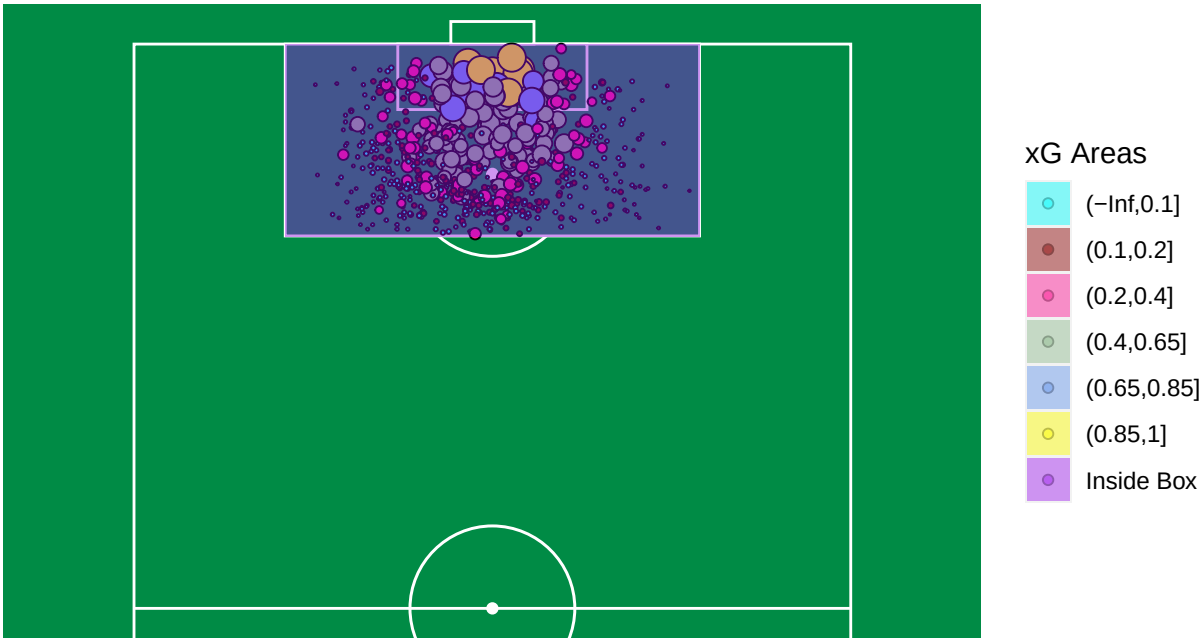
```
## 4       0.219          0.007             4.79
## 18      0.209          0.009             4.40
## 10      0.198          0.006             3.50
## 3       0.179          0.002             2.15
## 8       0.196          0.001             0.89
## 6       0.241         -0.001            -0.50
## 14      0.182         -0.002            -1.01
## 24      0.231         -0.023            -9.94
## 2       0.224         -0.014           -12.26
## 12      0.250         -0.027           -12.75
```

```
for (strName in listPlayers) {
  print(plot_areas(areas_spec, strName , insideBox_areas, insideAreas ))
}
```

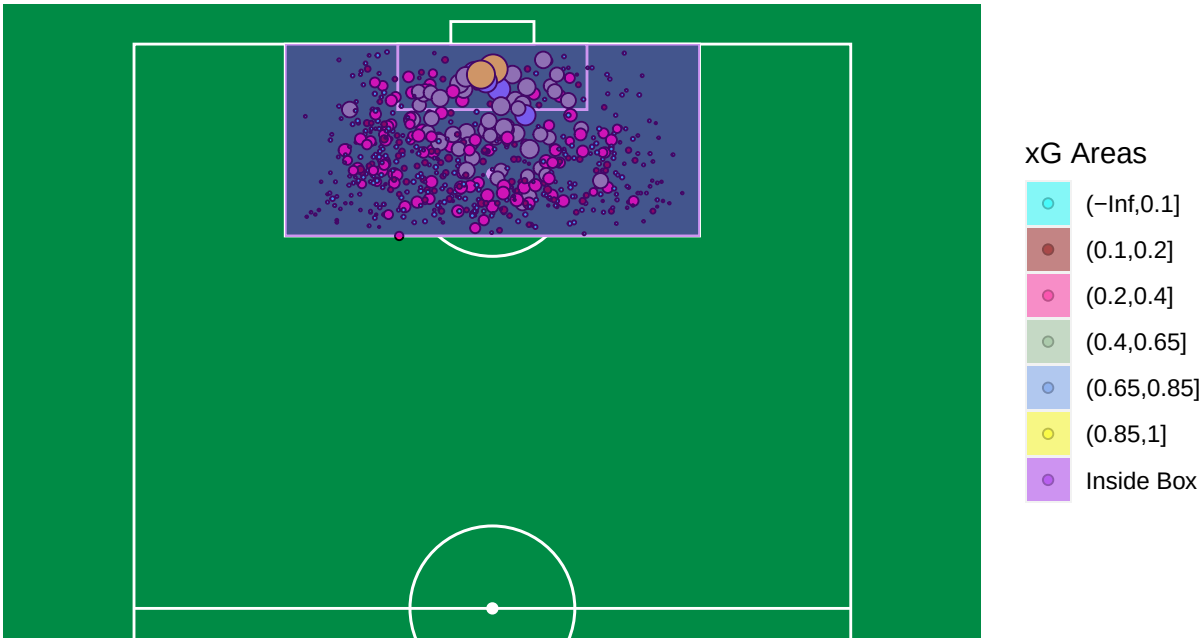
Son Heung−Min goalmap Inside Box



Lionel Messi goalmap Inside Box




Ciro Immobile goalmap Inside Box




Let's look who is the best outside the box.

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areas_spec, df_best, strName, outbox)
}
listPlayers <- df_best$Player[1:n]
df_best
```

```
##                    Player Conversion_Rate Goals_Expected Goals Shots
## 1            Lionel Messi           0.094          33.78    53   563
```

```
## 13         Antoine Griezmann           0.110          8.01    20   182
## 20             Son Heung-Min           0.090          6.59    16   178
## 23        Zlatan Ibrahimovic           0.102          7.11    13   127
## 2         Robert Lewandowski           0.090          9.30    15   166
## 14             Sergio Agüero           0.089          7.59    13   146
## 5                 Harry Kane           0.057         12.72    18   318
## 9       Kylian Mbappe-Lottin           0.098          3.86     9    92
## 4                 Luis Suárez           0.082          7.90    13   158
## 25                Iago Aspas            0.092          8.97    14   152
## 21       Alexandre Lacazette            0.099          5.99    11   111
## 12            Edinson Cavani            0.128          5.77    10    78
## 7              Mohamed Salah            0.056          8.62    11   196
## 24                    Neymar            0.059          9.72    11   187
## 22            Erling Haaland            0.182          0.85     2    11
## 10             Romelu Lukaku            0.050          6.06     7   141
## 3          Cristiano Ronaldo            0.043         17.43    18   415
## 19         Wissam Ben Yedder            0.054          3.85     4    74
## 18              Mauro Icardi            0.046          2.86     3    65
## 17           Gonzalo Higuaín            0.042          7.94     8   189
## 16               Jamie Vardy            0.048          3.09     3    63
## 11             Ciro Immobile            0.032          5.93     5   156
## 6  Pierre-Emerick Aubameyang            0.035          5.02     4   114
## 8              Karim Benzema            0.031          5.59     4   127
## 15                Sadio Mané            0.018          4.93     2   112
##    Average_xG Performance_xG Performance_Goals
## 1       0.060          0.034             19.22
## 13      0.044          0.066             11.99
## 20      0.037          0.053              9.41
## 23      0.056          0.046              5.89
## 2       0.056          0.034              5.70
## 14      0.052          0.037              5.41
## 5       0.040          0.017              5.28
## 9       0.042          0.056              5.14
## 4       0.050          0.032              5.10
## 25      0.059          0.033              5.03
## 21      0.054          0.045              5.01
## 12      0.074          0.054              4.23
## 7       0.044          0.012              2.38
## 24      0.052          0.007              1.28
## 22      0.077          0.105              1.15
## 10      0.043          0.007              0.94
## 3       0.042          0.001              0.57
## 19      0.052          0.002              0.15
## 18      0.044          0.002              0.14
## 17      0.042          0.000              0.06
## 16      0.049         -0.001             -0.09
## 11      0.038         -0.006             -0.93
## 6       0.044         -0.009             -1.02
## 8       0.044         -0.013             -1.59
## 15      0.044         -0.026             -2.93
```

Over 25% of Messis goals is outside the box. He leads this list with around 19 goals more than expected. From a purely statistical point of view, Antoine Griezmann is the best performer in this list, followed by Mbappe and Cavani.

After analyzing the inside and outside area of the box, we will go in further detail for all the different 10 areas which we mentioned before.

Down under you can see the results.

Area 1

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 1")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 25               Iago Aspas           0.654          14.48    17    26
## 11            Ciro Immobile           0.650          10.64    13    20
## 17         Gonzalo Higuaín            0.571          10.02    12    21
## 9       Kylian Mbappe-Lottin          0.778          12.53    14    18
## 22           Erling Haaland           0.733           9.66    11    15
## 4               Luis Suárez           0.617          27.82    29    47
## 18             Mauro Icardi           0.578          25.25    26    45
## 20            Son Heung-Min           0.750          11.66    12    16
## 19        Wissam Ben Yedder           0.600          17.70    18    30
## 14            Sergio Agüero           0.526          19.76    20    38
## 16              Jamie Vardy           0.545          18.28    18    33
## 5                Harry Kane           0.519          29.16    28    54
## 21      Alexandre Lacazette           0.500          17.18    16    32
## 15               Sadio Mané           0.486          18.48    17    35
## 23       Zlatan Ibrahimovic           0.429          10.56     9    21
## 6  Pierre-Emerick Aubameyang          0.559          40.19    38    68
## 7             Mohamed Salah           0.607          19.29    17    28
## 13        Antoine Griezmann           0.500          15.34    13    26
## 1              Lionel Messi           0.632          26.49    24    38
## 24                   Neymar           0.536          17.72    15    28
## 10            Romelu Lukaku           0.434          27.56    23    53
## 8             Karim Benzema           0.471          28.61    24    51
## 3          Cristiano Ronaldo          0.444          37.01    32    72
## 12            Edinson Cavani          0.466          33.52    27    58
## 2         Robert Lewandowski           0.462          50.05    42    91
##    Average_xG Performance_xG Performance_Goals
## 25      0.557          0.097              2.52
## 11      0.532          0.118              2.36
## 17      0.477          0.094              1.98
## 9       0.696          0.082              1.47
## 22      0.644          0.089              1.34
## 4       0.592          0.025              1.18
## 18      0.561          0.017              0.75
## 20      0.729          0.021              0.34
## 19      0.590          0.010              0.30
## 14      0.520          0.006              0.24
## 16      0.554         -0.009             -0.28
## 5       0.540         -0.021             -1.16
## 21      0.537         -0.037             -1.18
## 15      0.528         -0.042             -1.48
## 23      0.503         -0.074             -1.56
## 6       0.591         -0.032             -2.19
```

```
## 7       0.689         -0.082            -2.29
## 13      0.590         -0.090            -2.34
## 1       0.697         -0.065            -2.49
## 24      0.633         -0.097            -2.72
## 10      0.520         -0.086            -4.56
## 8       0.561         -0.090            -4.61
## 3       0.514         -0.070            -5.01
## 12      0.578         -0.112            -6.52
## 2       0.550         -0.088            -8.05
```

Area 2

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 2")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 13         Antoine Griezmann           0.333          7.36    11    33
## 11             Ciro Immobile           0.282          8.81    11    39
## 21       Alexandre Lacazette           0.257          7.42     9    35
## 19         Wissam Ben Yedder           0.312          8.48    10    32
## 20             Son Heung-Min           0.312          3.68     5    16
## 25                Iago Aspas           0.381          6.97     8    21
## 16              Jamie Vardy           0.312          4.11     5    16
## 22            Erling Haaland           0.800          3.14     4     5
## 10             Romelu Lukaku           0.259          6.99     7    27
## 18              Mauro Icardi           0.244         11.30    11    45
## 23        Zlatan Ibrahimovic           0.182          7.06     6    33
## 17           Gonzalo Higuaín           0.211          5.11     4    19
## 7              Mohamed Salah           0.182          7.62     6    33
## 9       Kylian Mbappe-Lottin           0.227          7.26     5    22
## 24                    Neymar           0.250          8.54     6    24
## 8              Karim Benzema           0.133          7.29     4    30
## 6  Pierre-Emerick Aubameyang           0.225         12.44     9    40
## 4                Luis Suárez           0.200         14.46    11    55
## 5                 Harry Kane           0.159         10.78     7    44
## 3          Cristiano Ronaldo           0.146         10.74     6    41
## 15                Sadio Mané           0.071          7.06     2    28
## 12            Edinson Cavani           0.103          8.55     3    29
## 14             Sergio Agüero           0.088          8.94     3    34
## 2         Robert Lewandowski           0.135         13.00     7    52
## 1               Lionel Messi           0.154         12.52     6    39
##    Average_xG Performance_xG Performance_Goals
## 13      0.223          0.110              3.64
## 11      0.226          0.056              2.19
## 21      0.212          0.045              1.58
## 19      0.265          0.047              1.52
## 20      0.230          0.082              1.32
## 25      0.332          0.049              1.03
## 16      0.257          0.055              0.89
## 22      0.628          0.172              0.86
## 10      0.259          0.000              0.01
## 18      0.251         -0.007             -0.30
```

```
## 23      0.214         -0.032            -1.06
## 17      0.269         -0.058            -1.11
## 7       0.231         -0.049            -1.62
## 9       0.330         -0.103            -2.26
## 24      0.356         -0.106            -2.54
## 8       0.243         -0.110            -3.29
## 6       0.311         -0.086            -3.44
## 4       0.263         -0.063            -3.46
## 5       0.245         -0.086            -3.78
## 3       0.262         -0.116            -4.74
## 15      0.252         -0.181            -5.06
## 12      0.295         -0.192            -5.55
## 14      0.263         -0.175            -5.94
## 2       0.250         -0.115            -6.00
## 1       0.321         -0.167            -6.52
```

Area 3

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 3")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 10             Romelu Lukaku           0.252          43.05    52   206
## 13         Antoine Griezmann           0.315          30.26    39   124
## 20             Son Heung-Min           0.365          23.63    31    85
## 25                Iago Aspas           0.274          24.41    31   113
## 7              Mohamed Salah           0.292          43.43    50   171
## 23        Zlatan Ibrahimovic           0.265          32.49    39   147
## 8              Karim Benzema           0.264          54.03    60   227
## 15                Sadio Mané           0.250          42.43    48   192
## 3          Cristiano Ronaldo           0.220          64.55    70   318
## 1               Lionel Messi           0.303          53.82    59   195
## 4                Luis Suárez           0.297          68.39    73   246
## 5                 Harry Kane           0.244          45.51    50   205
## 14             Sergio Agüero           0.259          39.95    44   170
## 22            Erling Haaland           0.275          14.97    19    69
## 9       Kylian Mbappe-Lottin           0.331          36.66    40   121
## 12            Edinson Cavani           0.260          44.53    47   181
## 21       Alexandre Lacazette           0.244          31.96    32   131
## 2         Robert Lewandowski           0.221          89.24    89   402
## 6  Pierre-Emerick Aubameyang           0.260          56.55    56   215
## 17           Gonzalo Higuaín           0.244          40.84    40   164
## 19         Wissam Ben Yedder           0.246          36.21    35   142
## 16                Jamie Vardy           0.197          40.59    39   198
## 11             Ciro Immobile           0.192          30.95    29   151
## 18              Mauro Icardi           0.179          44.46    42   234
## 24                    Neymar           0.258          45.30    39   151
##    Average_xG Performance_xG Performance_Goals
## 10      0.209          0.043              8.95
## 13      0.244          0.071              8.74
## 20      0.278          0.087              7.37
## 25      0.216          0.058              6.59
```

```
## 7       0.254          0.038             6.57
## 23      0.221          0.044             6.51
## 8       0.238          0.026             5.97
## 15      0.221          0.029             5.57
## 3       0.203          0.017             5.45
## 1       0.276          0.027             5.18
## 4       0.278          0.019             4.61
## 5       0.222          0.022             4.49
## 14      0.235          0.024             4.05
## 22      0.217          0.058             4.03
## 9       0.303          0.028             3.34
## 12      0.246          0.014             2.47
## 21      0.244          0.000             0.04
## 2       0.222         -0.001            -0.24
## 6       0.263         -0.003            -0.55
## 17      0.249         -0.005            -0.84
## 19      0.255         -0.009            -1.21
## 16      0.205         -0.008            -1.59
## 11      0.205         -0.013            -1.95
## 18      0.190         -0.011            -2.46
## 24      0.300         -0.042            -6.30
```

Area 4

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 4")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 1               Lionel Messi           0.209          29.61    49   235
## 17           Gonzalo Higuaín           0.175          14.38    24   137
## 3          Cristiano Ronaldo           0.196          19.45    28   143
## 9       Kylian Mbappe-Lottin           0.261          20.98    29   111
## 20              Son Heung-Min           0.253          12.09    20    79
## 5                  Harry Kane           0.241          18.14    26   108
## 11              Ciro Immobile           0.181          20.15    28   155
## 24                     Neymar           0.234          11.40    18    77
## 7               Mohamed Salah           0.172          22.17    28   163
## 15                 Sadio Mané           0.172          20.99    26   151
## 8               Karim Benzema           0.164          17.15    22   134
## 6  Pierre-Emerick Aubameyang           0.176          14.58    19   108
## 16                Jamie Vardy           0.214          13.61    18    84
## 2         Robert Lewandowski           0.169          32.59    36   213
## 25                Iago Aspas           0.178          10.15    13    73
## 18              Mauro Icardi           0.167          10.84    13    78
## 13         Antoine Griezmann           0.176          13.52    15    85
## 10             Romelu Lukaku           0.161          18.60    20   124
## 19         Wissam Ben Yedder           0.163          15.39    16    98
## 4                Luis Suárez           0.162          22.44    23   142
## 22             Erling Haaland           0.125           5.04     5    40
## 23        Zlatan Ibrahimovic           0.116           8.21     8    69
## 21       Alexandre Lacazette           0.146          15.96    15   103
## 12            Edinson Cavani           0.169          17.09    15    89
```

```
## 14             Sergio Agüero           0.054          11.54     6   112
##    Average_xG Performance_xG Performance_Goals
## 1       0.126          0.083             19.39
## 17      0.105          0.070              9.62
## 3       0.136          0.060              8.55
## 9       0.189          0.072              8.02
## 20      0.153          0.100              7.91
## 5       0.168          0.073              7.86
## 11      0.130          0.051              7.85
## 24      0.148          0.086              6.60
## 7       0.136          0.036              5.83
## 15      0.139          0.033              5.01
## 8       0.128          0.036              4.85
## 6       0.135          0.041              4.42
## 16      0.162          0.052              4.39
## 2       0.153          0.016              3.41
## 25      0.139          0.039              2.85
## 18      0.139          0.028              2.16
## 13      0.159          0.017              1.48
## 10      0.150          0.011              1.40
## 19      0.157          0.006              0.61
## 4       0.158          0.004              0.56
## 22      0.126         -0.001             -0.04
## 23      0.119         -0.003             -0.21
## 21      0.155         -0.009             -0.96
## 12      0.192         -0.023             -2.09
## 14      0.103         -0.049             -5.54
```

Area 5

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 5")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 21       Alexandre Lacazette           0.171          13.34    20   117
## 14             Sergio Agüero           0.132          18.62    25   190
## 19         Wissam Ben Yedder           0.142          14.80    20   141
## 15                Sadio Mané           0.147          10.20    15   102
## 11             Ciro Immobile           0.117          24.21    29   247
## 22            Erling Haaland           0.236           8.25    13    55
## 16               Jamie Vardy           0.152          19.43    24   158
## 18              Mauro Icardi           0.154           5.98    10    65
## 17           Gonzalo Higuaín           0.114          15.48    18   158
## 4                Luis Suárez           0.118          25.83    28   237
## 9       Kylian Mbappe-Lottin           0.131          26.54    28   214
## 23        Zlatan Ibrahimovic           0.113           9.60    11    97
## 1                Lionel Messi           0.091          14.70    16   175
## 6  Pierre-Emerick Aubameyang           0.118          16.87    18   152
## 5                  Harry Kane           0.090          18.06    19   210
## 20             Son Heung-Min           0.092          15.14    16   174
## 7              Mohamed Salah           0.091          22.99    22   242
## 12            Edinson Cavani           0.109          13.31    12   110
```

```
## 25                Iago Aspas           0.087          12.35    11   126
## 2         Robert Lewandowski           0.103          15.50    14   136
## 10             Romelu Lukaku           0.072          12.01    10   138
## 13         Antoine Griezmann           0.097          15.01    13   134
## 8              Karim Benzema           0.072          15.02    13   181
## 3           Cristiano Ronaldo           0.082          28.07    26   319
## 24                    Neymar           0.069          14.83    10   144
##    Average_xG Performance_xG Performance_Goals
## 21      0.114          0.057              6.66
## 14      0.098          0.034              6.38
## 19      0.105          0.037              5.20
## 15      0.100          0.047              4.80
## 11      0.098          0.019              4.79
## 22      0.150          0.086              4.75
## 16      0.123          0.029              4.57
## 18      0.092          0.062              4.02
## 17      0.098          0.016              2.52
## 4       0.109          0.009              2.17
## 9       0.124          0.007              1.46
## 23      0.099          0.014              1.40
## 1       0.084          0.007              1.30
## 6       0.111          0.007              1.13
## 5       0.086          0.004              0.94
## 20      0.087          0.005              0.86
## 7       0.095         -0.004             -0.99
## 12      0.121         -0.012             -1.31
## 25      0.098         -0.011             -1.35
## 2       0.114         -0.011             -1.50
## 10      0.087         -0.015             -2.01
## 13      0.112         -0.015             -2.01
## 8       0.083         -0.011             -2.02
## 3       0.088         -0.006             -2.07
## 24      0.103         -0.034             -4.83
```

Area 6

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 6")
}
df_best
```

```
##                     Player Conversion_Rate Goals_Expected Goals Shots
## 1             Lionel Messi           0.108          26.62    45   416
## 13       Antoine Griezmann           0.194           5.56    20   103
## 20           Son Heung-Min           0.122           4.41    11    90
## 5              Harry Kane           0.081           8.26    14   172
## 2       Robert Lewandowski           0.107           7.32    13   122
## 21     Alexandre Lacazette           0.123           4.74     9    73
## 23      Zlatan Ibrahimovic           0.106           5.36     9    85
## 25              Iago Aspas           0.101           6.63    10    99
## 14          Sergio Agüero           0.076           5.67     8   105
## 3        Cristiano Ronaldo           0.063          10.76    13   207
## 9      Kylian Mbappe-Lottin           0.121           1.88     4    33
## 12          Edinson Cavani           0.128           3.95     6    47
```

```
## 24                    Neymar           0.078           6.39     8   103
## 4                Luis Suárez           0.068           5.66     7   103
## 22            Erling Haaland           0.222           0.74     2     9
## 18              Mauro Icardi           0.071           2.10     3    42
## 11             Ciro Immobile           0.048           4.37     5   104
## 6  Pierre-Emerick Aubameyang           0.056           3.67     4    72
## 19         Wissam Ben Yedder           0.057           2.06     2    35
## 10             Romelu Lukaku           0.045           4.49     4    88
## 17           Gonzalo Higuaín           0.040           6.70     6   149
## 16               Jamie Vardy           0.027           2.11     1    37
## 8              Karim Benzema           0.037           4.18     3    82
## 7              Mohamed Salah           0.039           6.53     5   128
## 15                Sadio Mané           0.024           4.16     2    85
##    Average_xG Performance_xG Performance_Goals
## 1       0.064          0.044             18.38
## 13      0.054          0.140             14.44
## 20      0.049          0.073              6.59
## 5       0.048          0.033              5.74
## 2       0.060          0.047              5.68
## 21      0.065          0.058              4.26
## 23      0.063          0.043              3.64
## 25      0.067          0.034              3.37
## 14      0.054          0.022              2.33
## 3       0.052          0.011              2.24
## 9       0.057          0.064              2.12
## 12      0.084          0.044              2.05
## 24      0.062          0.016              1.61
## 4       0.055          0.013              1.34
## 22      0.082          0.140              1.26
## 18      0.050          0.021              0.90
## 11      0.042          0.006              0.63
## 6       0.051          0.005              0.33
## 19      0.059         -0.002             -0.06
## 10      0.051         -0.006             -0.49
## 17      0.045         -0.005             -0.70
## 16      0.057         -0.030             -1.11
## 8       0.051         -0.014             -1.18
## 7       0.051         -0.012             -1.53
## 15      0.049         -0.025             -2.16
```

Area 7

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 7")
}
df_best
```

```
##                    Player Conversion_Rate Goals_Expected Goals Shots
## 7              Mohamed Salah           0.088           2.11     6    68
## 4                Luis Suárez           0.109           2.20     6    55
## 14              Sergio Agüero           0.122           1.84     5    41
## 9       Kylian Mbappe-Lottin           0.085           2.01     5    59
## 20              Son Heung-Min           0.057           2.20     5    88
## 23        Zlatan Ibrahimovic            0.095           1.81     4    42
```

```
## 12             Edinson Cavani           0.129          1.83     4    31
## 25                 Iago Aspas           0.075          2.23     4    53
## 10              Romelu Lukaku           0.057          1.64     3    53
## 16                Jamie Vardy           0.077          0.99     2    26
## 21       Alexandre Lacazette           0.053          1.25     2    38
## 17           Gonzalo Higuaín           0.050          1.28     2    40
## 1                Lionel Messi           0.054          7.35     8   147
## 19         Wissam Ben Yedder           0.051          1.79     2    39
## 2          Robert Lewandowski           0.045          2.02     2    44
## 22             Erling Haaland           0.000          0.11     0     2
## 24                     Neymar           0.036          3.28     3    84
## 5                  Harry Kane           0.027          4.38     4   146
## 8               Karim Benzema           0.022          1.44     1    45
## 15                 Sadio Mané           0.000          0.76     0    27
## 18               Mauro Icardi           0.000          0.80     0    23
## 6  Pierre-Emerick Aubameyang           0.000          1.39     0    42
## 11              Ciro Immobile           0.000          1.61     0    52
## 3           Cristiano Ronaldo           0.024          6.86     5   208
## 13          Antoine Griezmann           0.000          2.53     0    79
##    Average_xG Performance_xG Performance_Goals
## 7       0.031          0.057              3.89
## 4       0.040          0.069              3.80
## 14      0.045          0.077              3.16
## 9       0.034          0.051              2.99
## 20      0.025          0.032              2.80
## 23      0.043          0.052              2.19
## 12      0.059          0.070              2.17
## 25      0.042          0.033              1.77
## 10      0.031          0.026              1.36
## 16      0.038          0.039              1.01
## 21      0.033          0.020              0.75
## 17      0.032          0.018              0.72
## 1       0.050          0.004              0.65
## 19      0.046          0.005              0.21
## 2       0.046         -0.001             -0.02
## 22      0.054         -0.054             -0.11
## 24      0.039         -0.003             -0.28
## 5       0.030         -0.003             -0.38
## 8       0.032         -0.010             -0.44
## 15      0.028         -0.028             -0.76
## 18      0.035         -0.035             -0.80
## 6       0.033         -0.033             -1.39
## 11      0.031         -0.031             -1.61
## 3       0.033         -0.009             -1.86
## 13      0.032         -0.032             -2.53
```

Area 8

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 8")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
```

```
## 15                Sadio Mané             0.5          0.04     1     2
## 5                 Harry Kane             0.2          0.11     1     5
## 11             Ciro Immobile             0.2          0.30     1     5
## 1               Lionel Messi             0.1          0.61     1    10
## 25                Iago Aspas             0.2          0.64     1     5
## 4                Luis Suárez             0.0          0.03     0     2
## 13         Antoine Griezmann             0.0          0.06     0     2
## 20             Son Heung-Min             0.0          0.06     0     2
## 21       Alexandre Lacazette             0.0          0.06     0     3
## 12            Edinson Cavani             0.0          0.07     0     2
## 9       Kylian Mbappe-Lottin             0.0          0.08     0     2
## 8              Karim Benzema             0.0          0.10     0     2
## 16               Jamie Vardy             0.0          0.27     0     4
## 24                     Neymar             0.0          0.29     0     5
## 3          Cristiano Ronaldo             0.0          0.75     0    15
## 2         Robert Lewandowski             NaN           NaN     0     0
## 6  Pierre-Emerick Aubameyang             NaN           NaN     0     0
## 7              Mohamed Salah             NaN           NaN     0     0
## 10             Romelu Lukaku             NaN           NaN     0     0
## 14             Sergio Agüero             NaN           NaN     0     0
## 17           Gonzalo Higuaín             NaN           NaN     0     0
## 18              Mauro Icardi             NaN           NaN     0     0
## 19         Wissam Ben Yedder             NaN           NaN     0     0
## 22            Erling Haaland             NaN           NaN     0     0
## 23        Zlatan Ibrahimovic             NaN           NaN     0     0
##    Average_xG Performance_xG Performance_Goals
## 15      0.022          0.478              0.96
## 5       0.022          0.178              0.89
## 11      0.061          0.139              0.70
## 1       0.061          0.039              0.39
## 25      0.129          0.071              0.36
## 4       0.013         -0.013             -0.03
## 13      0.031         -0.031             -0.06
## 20      0.029         -0.029             -0.06
## 21      0.021         -0.021             -0.06
## 12      0.033         -0.033             -0.07
## 9       0.040         -0.040             -0.08
## 8       0.049         -0.049             -0.10
## 16      0.067         -0.067             -0.27
## 24      0.057         -0.057             -0.29
## 3       0.050         -0.050             -0.75
## 2         NaN            NaN               NaN
## 6         NaN            NaN               NaN
## 7         NaN            NaN               NaN
## 10        NaN            NaN               NaN
## 14        NaN            NaN               NaN
## 17        NaN            NaN               NaN
## 18        NaN            NaN               NaN
## 19        NaN            NaN               NaN
## 22        NaN            NaN               NaN
## 23        NaN            NaN               NaN
```

Area 9

```r
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 9")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 12            Edinson Cavani           0.400           0.24     2     5
## 20             Son Heung-Min           0.154           0.30     2    13
## 8              Karim Benzema           0.500           0.45     2     4
## 5                 Harry Kane           0.057           0.80     2    35
## 7              Mohamed Salah           0.333           0.03     1     3
## 19         Wissam Ben Yedder           0.100           0.37     1    10
## 13         Antoine Griezmann           0.059           0.46     1    17
## 3          Cristiano Ronaldo           0.036           1.48     2    55
## 4                Luis Suárez           0.045           0.66     1    22
## 23        Zlatan Ibrahimovic           0.031           0.90     1    32
## 16               Jamie Vardy           0.000           0.02     0     2
## 14            Sergio Agüero            0.000           0.03     0     1
## 21       Alexandre Lacazette           0.000           0.04     0     3
## 17           Gonzalo Higuaín           0.000           0.05     0     4
## 18             Mauro Icardi            0.000           0.05     0     5
## 9       Kylian Mbappe-Lottin           0.000           0.11     0     5
## 15               Sadio Mané            0.000           0.12     0     6
## 2         Robert Lewandowski           0.000           0.14     0     5
## 10             Romelu Lukaku           0.000           0.14     0     4
## 1               Lionel Messi           0.033           1.17     1    30
## 11             Ciro Immobile           0.000           0.19     0    15
## 25                Iago Aspas           0.000           0.26     0    12
## 24                    Neymar           0.000           0.35     0    12
## 6  Pierre-Emerick Aubameyang           0.000           0.50     0    16
## 22            Erling Haaland             NaN            NaN     0     0
##    Average_xG Performance_xG Performance_Goals
## 12      0.048          0.352              1.76
## 20      0.023          0.131              1.70
## 8       0.112          0.388              1.55
## 5       0.023          0.034              1.20
## 7       0.011          0.322              0.97
## 19      0.037          0.063              0.63
## 13      0.027          0.032              0.54
## 3       0.027          0.009              0.52
## 4       0.030          0.015              0.34
## 23      0.028          0.003              0.10
## 16      0.011         -0.011             -0.02
## 14      0.034         -0.034             -0.03
## 21      0.015         -0.015             -0.04
## 17      0.012         -0.012             -0.05
## 18      0.010         -0.010             -0.05
## 9       0.021         -0.021             -0.11
## 15      0.020         -0.020             -0.12
## 2       0.028         -0.028             -0.14
## 10      0.034         -0.034             -0.14
## 1       0.039         -0.006             -0.17
## 11      0.013         -0.013             -0.19
```

```
## 25      0.022         -0.022             -0.26
## 24      0.029         -0.029             -0.35
## 6       0.031         -0.031             -0.50
## 22        NaN            NaN               NaN
```

Area 10

```
df_best <- setNames(data.frame(matrix(ncol =length(col_header), nrow = 0)), col_header)
for (strName in listPlayersFinal) {
  df_best <- results_area(TRUE, areasDf, df_best, strName, "Area 10")
}
df_best
```

```
##                      Player Conversion_Rate Goals_Expected Goals Shots
## 20            Son Heung-Min            1.00           0.03     1     1
## 5                Harry Kane            0.25           0.08     1     4
## 10             Romelu Lukaku            0.00           0.01     0     1
## 11             Ciro Immobile            0.00           0.01     0     1
## 12           Edinson Cavani             0.00           0.01     0     2
## 19        Wissam Ben Yedder             0.00           0.01     0     1
## 25                Iago Aspas            0.00           0.01     0     1
## 14             Sergio Agüero            0.00           0.02     0     1
## 18              Mauro Icardi            0.00           0.02     0     1
## 4                Luis Suárez            0.00           0.04     0     5
## 9       Kylian Mbappe-Lottin            0.00           0.04     0     3
## 13         Antoine Griezmann            0.00           0.04     0     2
## 23        Zlatan Ibrahimovic            0.00           0.05     0     2
## 7              Mohamed Salah            0.00           0.06     0     3
## 24                   Neymar             0.00           0.06     0     3
## 16               Jamie Vardy            0.00           0.20     0     1
## 1                Lionel Messi           0.00           0.32     0     9
## 3          Cristiano Ronaldo            0.00           0.44     0    11
## 2         Robert Lewandowski             NaN            NaN     0     0
## 6  Pierre-Emerick Aubameyang             NaN            NaN     0     0
## 8              Karim Benzema             NaN            NaN     0     0
## 15               Sadio Mané              NaN            NaN     0     0
## 17           Gonzalo Higuaín             NaN            NaN     0     0
## 21       Alexandre Lacazette             NaN            NaN     0     0
## 22             Erling Haaland            NaN            NaN     0     0
##    Average_xG Performance_xG Performance_Goals
## 20      0.028          0.972              0.97
## 5       0.020          0.230              0.92
## 10      0.015         -0.015             -0.01
## 11      0.012         -0.012             -0.01
## 12      0.007         -0.007             -0.01
## 19      0.011         -0.011             -0.01
## 25      0.012         -0.012             -0.01
## 14      0.021         -0.021             -0.02
## 18      0.019         -0.019             -0.02
## 4       0.008         -0.008             -0.04
## 9       0.012         -0.012             -0.04
## 13      0.020         -0.020             -0.04
## 23      0.024         -0.024             -0.05
## 7       0.020         -0.020             -0.06
## 24      0.021         -0.021             -0.06
```

```
## 16      0.201         -0.201            -0.20
## 1       0.036         -0.036            -0.32
## 3       0.040         -0.040            -0.44
## 2         NaN            NaN              NaN
## 6         NaN            NaN              NaN
## 8         NaN            NaN              NaN
## 15        NaN            NaN              NaN
## 17        NaN            NaN              NaN
## 21        NaN            NaN              NaN
## 22        NaN            NaN              NaN
```

#Herewith the notebook is completed. Big Thanks for sticking this long. We hope you enjoyed our analysis. We appreciate your feedback. See you next time!